

A mismatch that slows down the evolution of education

Comparing the perceptions of primary schools teachers on digital education materials with the perceptions of publishers

Master thesis

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Abstract

Digitalisation is a worldwide trend in various contexts such as at home, work and school. Especially in the Netherlands, the digital becomes more and more important and ICT has also become an important policy area. Although digitalisation is embraced in the Netherlands, the adoption of digital technologies in education is diffuse. Several studies have been conducted on the reasons for this diffuse adoption, however, none of them has focused in the Netherlands. Besides that, most studies are focused on the adoption of digital education materials in secondary school and focus on teachers, while publishers of digital education materials are an important actor as well. Therefore, the aim of this study is to get an in depth understanding of both teachers' and publishers' perceptions on digital education materials in primary school. Through semi-structured interviews and focus groups the data for this study was obtained. The interviews and focus groups made clear there is a mismatch between the teachers and schools' view on digital education materials and the publishers' view. The main mismatches relate to following themes: financial problems, digital skills, technological barriers and opportunities, institutional characteristics, collaboration between publishers and government. These seven themes made clear that conversation and collaboration between all actors involved is needed on all fronts, to take away the barriers for the adoption of digital education materials in primary school. However, it has to be considered that the adoption of technology is not a linear, but a continuous process. Technology is constantly changing and developing, so the actors involved have to think of a platform through which continuous communication can be established.

Keywords: digitalisation, education, digital education material, publishers, teachers

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Chapter 1 Introduction

Knowledge and information is increasingly becoming available digitally. Especially in the Netherlands, where digitalisation is relatively widely adopted, digital technologies and services become more and more important in various contexts such as at home, work and school. The internet was firstly introduced in the Netherlands in 1988 (Anand, 2005), and research done by Internet Life Stats shows that by 2014, 96.04 per cent of the Dutch population had internet access at home (Internet Live Stats, 2016). With this percentage, the Netherlands are the sixth country in the world when it comes to internet access.

The European Commission researched the digitalisation of all European countries and judged them on five aspects: connectivity, digital skills, online activity, integration of digital technology and digital government services (European Commission, 2015). The results showed the Netherlands are the third ranked European country when it comes to digitalisation, just behind Denmark and Sweden.

ICT is also an important policy area in the Netherlands. The Dutch government campaigns with slogans like 'The Netherlands is digitalising' and the government offers more and more services online, like changing your address or applying for grants (Rijksoverheid, 2014). The Netherlands are one of the leading countries in the adoption of digital technologies at school as well. A report from OECD shows that in 2012, almost 95 per cent of the Dutch 15-year-old students used computers at school (OECD, 2015). Here, the Netherlands are the leading country worldwide. On average, they use computers at school for 25 minutes a day (OECD, 2015). The generation of children that is in school now, consists of 'digital natives' (Prensky, 2001): they have never lived without digital technologies and interacting with digital devices has become second nature.

Although it seems from these different reports that the digitalisation is embraced in the Dutch society in general, at Dutch homes and at Dutch schools, the digitalisation at school is stagnating and various stakeholders have called for action (SLO, 2014). The development of using digital technologies in education is diffuse. Zhao and Frank (2003) compare the adoption of digital education materials in schools with the arrival of zebra mussels in the Canadian waters: a few years after they were first sighted, they had swamped the lakes of the eastern United States and Canada, in which they caused tremendous ecological changes (Vanderploeg et al., 2002). Of course the zebra mussels and the adoption of digital education materials in primary schools are quite different phenomena, however there also are some strong similarities between them. Both were introduced into environments in which they were foreign. In all situations and kinds of context, the introduction, survival and dispersal of an alien species is a complex process. In that way, the zebra mussels are an interesting metaphor to give a first and abstract declaration for the diffuse adoption of digital education materials in primary schools.

The diffuse adoption of digital education material is supported by figures as well. For example, the OECD report shows that only twenty per cent of the Dutch students uses computers during mathematics lessons, compared to an average of over thirty per cent (OECD, 2015). Unfortunately, the report does not contain statistics on other lessons than mathematics, however this already gives an interesting insight in the diffuse adoption of digital education materials. Furthermore, there are implications that a schools philosophy influences to which extent digital education materials are used (in 't Veld, 2007).

While these statistics on their own are already a source of inspiration for future research, there are more themes that need to be investigated further. Most of the above mentioned reports focus on secondary school students (13 to 18 year olds), resulting in a lack of information about

the adoption of digital education materials in primary school (4 to 12 year olds), not only in the Netherlands but on a worldwide basis (Holloway et al., 2013). However there is not enough time to do research on the adoption of digital education materials in primary schools worldwide. Therefore, this study will focus on the Netherlands, since this is one of the most interesting cases. As mentioned above, it is shown that although computers are used by almost every Dutch student, they are used only 25 minutes a day on average and not during all types of lessons. Besides that, six out of seven primary school teachers in the Netherlands is female (DUO, 2016), which might also play a role in the adoption of digital education materials and makes the Netherlands an even more interesting case.

Since there are several definitions of digital education materials, it is important to first have a clear definition before moving on. For this research, the definition by Nokelainen (2006, p. 179) is used: “digital education materials are all materials that are developed for educative goals, published in digital form and meant to use on a digital device.” This means digital education materials include things as webpages, JAVA applets and individual learning modules.

Multiple stakeholders are involved in the adoption of digital education materials. The two most important stakeholders are the primary school teachers and the publishers. In the following paragraphs their roles will be explained. The first stakeholder that can be distinguished, is the group of primary school teachers. Since children spend thirty hours a week at school, it can be said that teachers have an important impact on the cognitive, emotional, but also digital development of children. Teachers are the key mediators in school, including in relation to digital skills (Donoso & Ribbens, 2014). However, this huge impact that teachers can make also means that they have the power to decide not to use digital education materials. Much research, mostly from a technology acceptance point of view (Davis, Bagozzi & Warshaw, 1989; Venkatesh, Morris, Davis & Davis,

2003, Hirsch & Silverstone, 1992) has been done on the implementation of digital education materials by teachers and the personal factors that are important here. Institutional factors have been distinguished in several studies as well, which shows that the school boards have to be mentioned as a stakeholder as well.

Although much research has been done on the implementation of digital education materials by teachers, there is a gap in the literature when it comes to research about the use of digital education materials to teach younger children. Holloway, Green and Livingstone (2013) concluded that less than twenty per cent of the research done on the use of digital technologies, is done on children younger than nine years old. This research will try to fill this gap by focusing on teachers of younger children (4 to 12 year-olds). Besides that, there has been a growing dissatisfaction with explaining the adoption of digital education material from a quantitative point of view, as results have proven to be inconsistent (Bourgonjon et al., 2013).

Besides teachers, a second stakeholder can be distinguished, namely the group of Dutch publishers of digital education materials. They try to adapt to the digitalising world by developing digital education materials and digital learning platforms. But since the adoption of digital education materials is diffuse and sometimes unsuccessful, there seems to be a mismatch between what publishers aim for and what the teachers wish for. Therefore, it is interesting to see where this mismatch comes from. Therefore we need to give the publishers a voice in the debate as well, but to our knowledge, only one (corporate) study to date has studied the perceptions of publishers. This study, commissioned by the publisher 'Uitgeverij DaVinci', found that key values in developing digital education materials were differentiation, cooperative learning, thinking skills, IT literacy and teacher support (Huibers, Voermans & Hoorn, 2010).

This study aims to gain more knowledge on the perceptions of publishers and teachers. As such, it responds to calls to research the adoption of digital education material by young children and to investigate the role of publishers. By filling these gaps, it can be shown that the proposed study is scientifically relevant. This study can contribute to a mutual understanding between teachers and publishers. This mutual understanding can serve as a catalyst for the development of digital education material that is attuned more to the needs of the teachers, while still taking into account the market logic in which publishers need to operate. This study aims to develop a set of guidelines, which makes this study societally relevant as well.

We need to take a step back to figure out the barriers in a Dutch context and to look beyond the quantitative models that have been developed yet. Because of the inconsistent findings the quantitative models have resulted in, a multi-stakeholder perspective is important. A holistic approach is needed to understand teachers' and publishers' perceptions on the affordances and limitations of digital education materials in primary schools.

The proposed study focuses on the following two questions:

RQ1: What are the expectations and perceptions of primary school teachers on the adoption of digital education materials?

RQ2: What are the expectations and perceptions of publishers on the adoption of digital education materials?

Chapter 2 Theoretical framework

In this theoretical framework, the most important concepts of the proposed study will be explained and framed within an existing body of literature. First, attention will be paid to the role of digital technologies in children's lives, both at home and at school. After that, the theoretical framework will dive deeper into the evolution of education, more specifically, the adoption of digital education materials. In this paragraph, the development of digital education materials and the role of the publishers will be discussed. Third, the adoption of digital education materials in class will be discussed. Previous research has revealed some of the reasons why the adoption of digital education materials in schools and class is asymmetrically and diffuse.

2.1 Young children and digital technologies

Digital technologies are increasingly important in the lives of young children. Research done by Brouwer et al. (2011) shows that 78 per cent of the Dutch pre-schoolers are already online. Exploratory qualitative research done by Van Kruistum and Van Steensel (2016) on children between zero and eight years old, confirms this and shows that most children at this age are familiar with online practices. The digital technologies are mostly used for playing games, communicating with friends and family, watching videos and clips and entertainment purposes. How often the digital technologies are used, seems to depend on the interests of the child and the family context. For example, some children in the research already knew how to use the remote at the age of three, while others were totally not interested in it and preferred playing with traditional toys, such as dolls or action figures.

Research on the adoption of digital technologies in primary schools in the Netherlands is scarce to non-existent. To our knowledge, the exploratory report of Van Kruistum &

Van Steensel (2016) on children's adoption of digital technologies is one of the only available sources. In their research, parents and children frequently mentioned the use of educational apps and software, like Scula and Ambrasoft as well. Both platforms are developed by educational publishers, to help children practice their school exercises at home. This shows that young children not only get exposed to digital technologies at home, but also at school. The degree in which this takes place, differs per school. Some children in the research done by Van Kruistem and Van Steensel (2016) were attending a so called 'iPad school', which means the biggest part of their lessons is taught by using a tablet. In most schools however, digital education materials are only used on the side and are not dominant in the classroom. For example, in some schools, one morning a week was spent on using tablets in class.

The differences between these schools show that the adoption of digital education materials is fragmented and diffuse. Therefore, it is important to take a look at how education is evolving and which role the publishers have in here. This will be explored in the following paragraph.

2.2 Education in evolution

Digital learning is a relatively fragmented research domain in which different terms, like e-learning, digital learning and digital education materials are used. Therefore, it is important to first have a clear view of what is understood by the concept of digital education materials. For the proposed study, the term digital education materials will be used. This term is chosen, because it is exhaustive. In some studies, the term 'methods' is used instead of 'materials'. However 'materials' is a broader term, that also covers separate applications that are used and that are not part of a method for example. According to Nokelainen (2006, p. 179) "digital education materials are all

materials that are developed for educative goals, published in digital form and meant to use on a computer.” This means digital education materials cover a very broad range of education materials, it can be a WebQuest for example, but it can also be an application.

Besides that, digital education materials distinct themselves from other education materials by two characteristics. First, digital education materials are multimodal. This means they are able to excite more than one sense at a time. The second characteristic is adaptivity, meaning that the material can adapt to the level of the pupil (Reints & Wilkens, 2012).

Different studies have shown that the expectations of digital education materials have been very high in the last couple of years. Pennings, Esmeijer and Leendertse (2008) predicted the following development paths for the use of IT in education:

- digital education materials as an appliance in addition to printed education materials
- digital education materials as an appliance that replace printed education materials
- digital education materials as an appliance to transform the current education materials into new educational concepts

From this point of view, educational materials are an appliance that can be used to support educational views and to realise educational goals. However, according to Stichting Surf (2004), an IT cooperation organization for education, educational materials can only support educational views when there is a good connection between both.

The following learning concepts can be derived from Stichting Surf's (2004) research, yet it is unclear to what extent digital education materials are used to support these goals in Dutch primary schools:

- transfer concept → the teacher as a source of information, digital education materials can be an appliance for presentation, demonstration and courseware

- independent learning concept → pupils form their own learning process, digital education materials are the source of information and a digital portfolio gives insights and reflection
- experiencing learning concept → learning by practicing, digital education materials as an appliance for casuistry, simulation and communication with external experts
- cooperative learning concept → pupils learn from each other, digital education materials are an appliance for communication (discussion, chat, email) and knowledge sharing (exchange of documents)
- negotiation learning concept → pupils decide on the learning content, digital education materials are the source of information, a transfer model and a portfolio

Publishers are very likely to frame their digital education materials in an educational strategy that aligns with the aforementioned learning concepts. While research has provided insights on the nature of digital education materials, it is apparent that the voice of publishers is seldom heard. At least to our knowledge there is only one report available that gives some insights in the perceptions of publishers on digital education materials (Huibers et al., 2010). In a report by the University of Twente called 'De uitgever aan het woord' (Publishers speaking) publishers forward two key elements in which digital education materials distinguish themselves from other publishers, namely innovation and quality (Huibers et al., 2010). This means publishers of education materials highly value the needs and wishes of schools / teachers, by being innovative and delivering the highest possible quality. For example publishers like Zwijsen and ThiemeMeulenhoff do this by delivering special interactive whiteboard software with their education materials, because they have noticed that already 67 per cent of primary schools has an interactive whiteboard (Intomart, 2009).

The ongoing digitalisation is asking a lot from the publishers. Instead of publishing books that are used for eight or ten years, they now have to adapt to the constant evolution of digital technologies. Besides that, they have to respond quickly to the changing wishes and needs of the teachers, that go hand in hand with the evolution of digital technologies.

Another thing that affects publishers, is the increase in production costs, since the production costs of digital education materials is high in comparison to printed education material (Higgins, Xiao & Katsipataki, 2012). Only when the product is sufficiently successful, lower reproduction and distribution costs allow publishers to gain profit. In addition, non-educational or commercial publishers are also interfering in this field. They offer e-learning solutions in different ways. For example, Microsoft has recently launched an educational version of the popular game Minecraft (Tweakers, 2016). This means more competition for the educational publishers, and a possible decrease in revenues. So for the publishers, the financial aspect will possibly form an important aspect of their perception on digital education materials and may explain some of the downsides as perceived by teachers (Huibers et al., 2010). Schools are affected as well as they notice that the prices of digital education materials increase more rapidly in comparison than the prices of offline education materials (NMa, 2011).

Although publishers of digital education materials can get in a tough position, new opportunities open up for them as well. The quality of education is perceived as being decreasing, which ensures that parents spend more time to educate their children at home (Huibers et al., 2010). Publisher Zwijsen already responded to this, by creating an online platform for parents, called zwijsenouders.nl, which gives parents insight in the education materials that are used at school (Huibers et al., 2010). Although this example shows that publishers are already responding to the changes in education, it is not clear what their expectations and perceptions of digital

education materials are, and how they explain the diffuse adoption of their materials. Therefore, the second research question is set up to study this in detail. This research questions studies the expectations and perceptions that publishers have of digital education materials.

It is important to study these expectations, since there still seems to be a mismatch between the materials developed and the wishes and needs of the teachers. This becomes clear in the results of Kennisnet's (2015) research, which shows that thirty per cent of the materials used in class are digital. Twenty per cent of the teachers use digital materials more than fifty per cent of the time. While at the same time, all educational publishers offer digital education materials. There thus appears a discrepancy between the push of digital education materials and the adoption of these digital education materials. In the next paragraph, the perceptions of teachers that have been derived from previous research will be explored, to see how they differ from the publishers perspectives.

2.3 The adoption of digital education materials in class

Much research has already been done on the adoption of digital technologies in class. This has resulted in eight models of individual acceptance of IT (Venkatesh et al., 2003). From these eight models, the Technology Acceptance Model is the most influential model, therefore this model will be overviewed more in-depth in the following sub-paragraph. Yet, the TAM model is also the most criticised model. The Unified Theory of Acceptance and Use of Technology (UTAUT) is a response to that and will be elaborated on as well.

2.3.1 The Technology Acceptance Model

The TAM is a model that has been developed in the field of psychology and is an extension to the theory of reasoned action (TRA) (Fischbein, 1979). The TAM aims to model how users come to accept and use a certain technology. The model suggests that there are a number of factors that influence new users' attitude when they are presented to a new technology. The TAM focuses on perceived usefulness, perceived ease of use and subjective norm as the most important factors in the decision-making process of using or not using digital technologies in a specific context (Davis et al., 1989). Several researchers have applied the model in an educational context (e.g. Hu, Clark & Ma, 2003; Park, 2009). Perceived usefulness analyses to which extent a user finds a new technology useful. The perceived ease of use refers to which extent the user is able to use the new technology, without making extra efforts. And third, subjective norm builds a bridge between perceived usefulness and perceived ease of use. Attitudes and intentions are linked with the actual adoption of technologies, with social pressure as a moderator. Subjective norm is the extent to which an individual thinks people around him or her think the behavior should be performed (Davis et al., 1989).

Parks' (2009) study is one of the examples for education that supports the TAM model. Park studied the mobile learning acceptance of 567 students, by conducting a survey. The factors identified in the TAM model all appeared to have a significant impact on students' mobile learning acceptance.

However, some researchers argue that findings based on TAM-models are proven to be inconsistent (Bourgonjon et al., 2013). For instance, Huang and Xie (2008) surveyed 156 managers about the use of IT. The model they found, showed a significant influence of perceived

usefulness on attitude. However, it did not show a significant effect of perceived ease of use on attitude, which is inconsistent with the TAM.

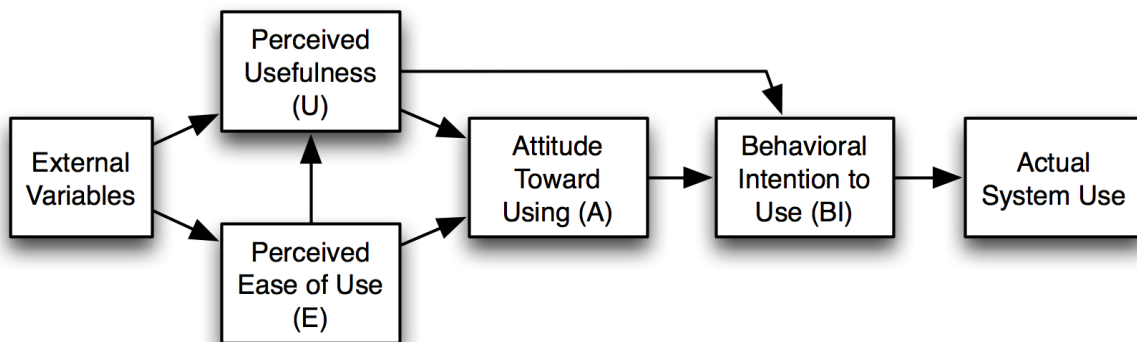


Figure 1: A visualisation of the TAM model developed by Davis et al. (1989)

Because findings from the TAM are inconsistent, several researchers have made additions. Teo (2009) has tried to build a new model that is based on some factors of the TAM (i.c. perceived ease of use and perceived usefulness) and complemented them with other potential barriers (i.c. attitude towards computer use, computer self-efficacy, technological complexity and facilitating conditions). However, these six variables still account for only 27.1 per cent of the variance of behavioral intention, which means 72.9 per cent is still unaccounted for.

Venkatesh et al. (2003) combined the TAM with seven other models, namely Theory of Reasoned Action (TRA), the Motivational Model (MM), Theory of Planned Behavior (TPB), the model of PC utilization (MPCU), the innovation diffusion theory (IDT) and the social cognitive theory (SCT). The integration of these eight models has resulted in the Unified Theory of Acceptance and Use of Technology (UTAUT), which according to Venkatesh, et al. (2003) predicts seventy per cent of user acceptance of information technology innovations. Based on these theories, four core determinants of adaption and usage of technology are identified, namely

performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al., 2003). Performance expectancy refers to the degree to which somebody thinks that using the system will increase his or her job performance. This concept is related to perceived usefulness from the TAM. Effort expectancy can be defined as the ease that is associated with the use of the system, which thus relates to perceived ease of use that has been conceptualized within the TAM. The third construct is social influence, which refers to which extent an individual perceives that important other individuals believe the system should be used, this is in line with the subjective norm from the TAM. The fourth construct from the UTAUT is facilitating conditions and can be defined as the degree to which an individual feels the organisation supports use of the system. UTAUT recognises four moderators that influence these four constructs, these are gender, age, experience with similar systems and voluntariness of use.

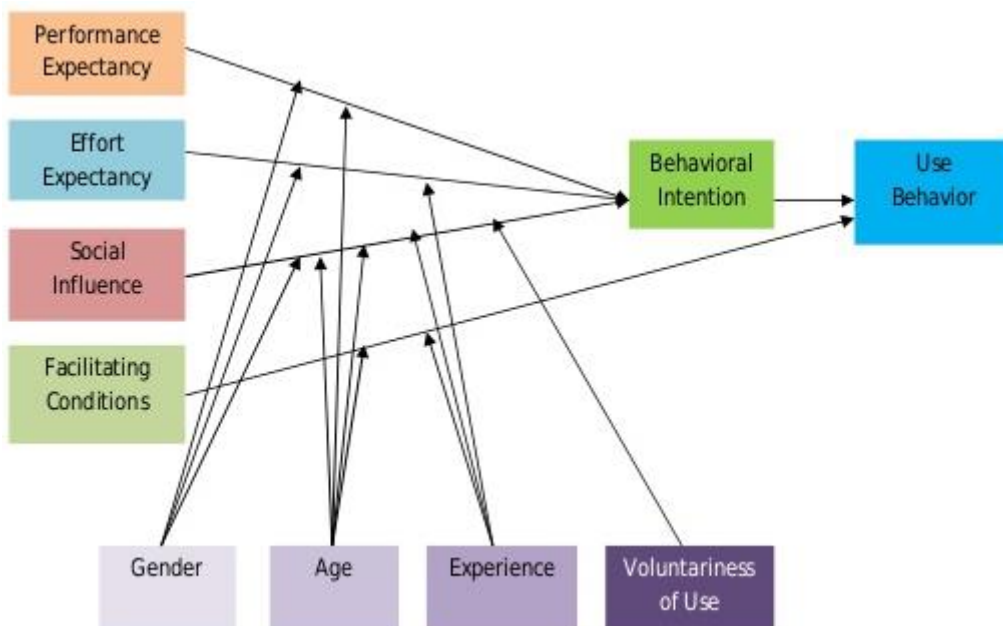


Figure 2: A visualisation of the UTAUT model developed by Venkatesh et al. (2003)

Although the UTAUT model claims to account for seventy per cent of user acceptance of information technology innovations, there still is dissatisfaction with the explanatory power of this model. Several studies have shown limited validation of the UTAUT model in regard to education (e.g. Cheng, Wang, Stephen, Kinshuk, & Peng, 2011; Schaik, 2009). Therefore researchers have argued to take one step back and use a more holistic perspective to understand the adoption of digital technologies in class (e.g. Van Kruistum & Steensel, 2016). One such holistic approach that can be applied is the domestication theory, which is more inclusive in accounting for the factors that might influence the perceptions of teachers on digital technologies.

2.3.2 Domestication

The domestication perspective describes the processes taking place in the adoption of media, including digital technologies. It links internal and external factors to create an image of the use of digital technologies (Hirsch & Silverstone, 1992). This means it looks at both the technology and its user, in that way, it is a holistic approach, because it looks at all facets of the adoption of technology.

Domestication can be described in terms of four steps (Haddon, 1995). Appropriation stands for the general process of adoption, hereby it is important to take a look at how the technology is used and which barriers there are for using the technology. In the case of education, this can refer to a lack of digital skills for example. The second step is objectification, which means that digital devices are not only bought because they are useful, but that the appearance also plays a role. After objectification, the next step is incorporation, which means the accessibility of the digital technologies and who is using it is the subject of investigation. In the case of education, this can refer to a lack of digital devices for example. The final step is conversion, which shows how a

new digital technology is completely accepted. This step is reached when digital education materials are adopted, that is, when they are fully integrated in the daily routines of the user (Frissen, 2004). However, a technology rarely gets fully domesticated (Berker et al., 2006). During all of the four steps mentioned above, the focus is in structures and dynamics of one particular social context.

Hynes and Rommes (2006) criticise Haddon's four step description, because they see domestication as a non-linear process. They see domestication as a continuous interplay between the technology and its users, in which both the technology and its users change (Mansell & Silverstone, 1996). They look at appropriation, objectification and incorporation as symbolic concepts that interact in the domestication of technology. Although domestication might not be a linear process, there has to be some form of appropriation, before the process can go on.

There is no consensus about the exact process of domestication, however there is consensus about the possibility to apply domestication to several different contexts. While domestication theory has mainly been applied to the family context, Sørensen (2006) argues that domestication is not limited to the family context, but that it is a process that appears in every social context where digital technologies are involved. Therefore, it has been argued that the perspective can be applied to the school context as well (Buabeng-Andoh, 2012). According to Haddon (1995), it is important to have a clear view of who is responsible for decisions about the use of new digital technologies. Especially in a school context this is important, since not only the teachers have to make these decisions, but they are influenced by the school direction and management as well. Therefore, the barriers for the adoption of digital technologies have to be split up into personal characteristics and institutional characteristics (Buabeng-Andoh, 2012).

2.3.3 Personal characteristics

Both the TAM model and the domestication perspective show that various factors can facilitate or impede the adoption of digital technologies and digital education materials in class. Besides the factors that can be distinguished from both the TAM and the UTAUT-model, some other personal factors can be distinguished that are not included in one of these models. The TAM and UTAUT-model in some way both mention a lack of skills and a low expectancy of technologies as factors that might influence the adoption of digital technologies. Van Dijk and Hacker (2003) take this a step further, by arguing that this lack of skills or low expectancy might not be the barrier in itself. They found that lack of elementary digital experience, caused by lack of interest is an important barrier. This means the problem is not that teachers are not capable to learn digital skills, but that their interest has to be stirred first.

Although a correlation between these two factors is not proven, it is interesting that besides a lack of interest in digital matters, age plays a role as well. It might be the case that older teachers, who did not grow up with digital technologies themselves, are less interested in them. Elsaddani (2013), Kubiak (2013) and Rana (2012) all concluded that younger teachers on average have a more positive attitude about digital education materials than their older colleagues. Younger teachers also apply digital education materials more often. In relation to this, Carey (1992) argues that the behavioral change that is needed for the implementation of digital technologies, is often not taken into consideration. Innovation, more specifically, the implementation of digital technologies, might be in conflict with current habits in the case of older teachers.

For example, there are worries about the interpersonal relations and peer relationships that might be destroyed by the startling inroads of technologies into classrooms (Mouisset-Lacan,

2012). Serres (2012) even compares the exponential growth of technologies to the invention of writing, to argue that it is an alarming societal shift.

Rogers (1986) adds some more criteria that may have impact on the adoption process. The first is socio-economic status. In the case of the adoption of digital education materials in schools, it can be questioned if this is a personal characteristic or an institutional characteristic, since it does not depend on the specific socio-economic status of a teacher if digital materials will be adopted. However, in general, Rogers (1986) sees that the higher the socio-economic status, the sooner a new technology is adopted. This is related to some of the other criteria he mentions, like observability. Observability is the extent to which an innovation is visible for an individual. People with a higher socio-economic status, are more likely to have peers who have already adopted the innovation. This means, they have a bigger chance to see it and are more likely to adopt it as well. That means, schools in more developed areas in the Netherlands might be more likely to adopt digital education materials.

All these factors mentioned in the paragraphs above imply that different teachers will have different perceptions and expectations of digital education materials, the first research question of this study is set up to investigate these different perceptions and expectations more in detail. However, one more thing has to be taken into account. A study by Swait and Wood (2002) showed that the extent to which people feel a need for change differs from person to person. This means that the adoption of technology might not necessarily be related to somebody's digital skills, age or socio-economic status, but to their personality in general. Some people do have a more positive attitude towards changes and innovation than others.

2.3.4 Institutional characteristics

Institutions can influence the adoption of technologies in several ways, especially in terms of availability and because they can impact personal characteristics. King et al. (1994) distinguish six kinds of actions through which an institution can influence the adoption of technology. The first of these is knowledge building, this action needs to be undertaken to help build the base of knowledge that is necessary to adopt innovation, in this case, digital education materials. For example, this can be done by offering teachers a digital skills training. In that way, their self-efficacy will increase, which will probably result in a better adoption of digital education materials (Buabeng-Andoh, 2012). Teachers should also have the possibility to learn and share their digital experiences with their colleagues, because that positively influence the use of digital education materials (Wadmany, 2008).

The second kind of action that is distinguished by King et al. (1994) is knowledge deployment. It underlines the fact that it is important to create a literate and educated population to adopt an innovation (Mathias, 1972). This does not necessarily have to be in the form of digital skills training for the teachers, but can also be in the form of repositories of knowledge, so that the teachers can search for information themselves. Another way of knowledge deployment is encouraging teachers who already have the knowledge to lead the others through the process of innovation. King et al. (1994) see knowledge deployment as one of the most important factors in innovation, because it is not possible to apprehend innovation potential without a significant number of informed individuals.

Third, King et al. (1994) mention subsidy as one of the six ways in which an institution influences the adoption of technology. This simply means that an institution needs a budget to adopt an innovation, more specifically, schools need to invest in digital education materials.

Besides that, mobilisation can be seen as an important factor. This can be defined as encouraging individuals to think in a particular way with respect to an innovation. According to Kling and Iacono (1988), the diffusion of the adoption of IT is affected by encouraging a positive or negative view of an innovation. Kling and Iacono (1988) state that it is not only the digital literacy of the teachers themselves that is important for the adoption of digital education materials. The adoption of digital education materials also depends on the digital literacy of the school direction and management and their ambitions to realise high digital literacy of their employees. This finding is corroborated by the 'Vier in Balans model' (Kennisset, 2015), this model describes the requirements that are needed to adopt digital education materials at schools. Vision and expertise of the school boards and teachers are two of the factors that are described in this model, which is in line with the factors mentioned by Kling and Iacono.

Fifth, it is important that an institution meets the standards for adopting an innovation and that it sets its own standards to successfully adopt it. This means, technical support is a key point as well. As stated in the 'Vier in Balans monitor' (Kennisset, 2015), this is still a problem for the majority of Dutch primary schools.

The last category of actions King et al. (1994) have distinguished is innovation directive. The teachers need to be commanded to use innovations.

2.4 Mismatch

Although there exist barriers to implement digital education materials, the number of teachers that use digital education materials has increased in the fast few years. Only one per cent of the teachers does not use digital education materials at all. For most teachers, thirty per cent of the materials they use are digital. Only twenty per cent of the teachers uses digital materials more than

fifty per cent of the time (Kennisnet, 2015). If digital education materials are used, the materials delivered by the educational publishers are the most popular way to make use of digital materials, 75 per cent of the teachers uses them (Kennisnet, 2015).

The materials delivered by the publishers are the most used digital education materials. However, teachers are not always satisfied with these digital education materials developed by the publishers. In most cases, the digital education material delivered is a digital version of the book, while the power of digital education materials is in their possibility to have a multimedia approach of different learning styles: listening, coming up with solutions, watching, playing, searching, communicating, etcetera. This makes clear there is a mismatch that has to be further investigated.

In sum, the goal of this thesis is to study the perceptions of both primary school teachers and educational publishers on digital education materials, to see whether there are differences. An answer to this question will be retrieved from focus groups and interviews, which will be explained in the following chapter.

Chapter 3 Method

3.1 Research design

In line with a call for new research on the adoption of digital education materials in schools beyond the Technology Acceptance Model (Bagozzi, 2007), this study adopts a more holistic perspective, by taking one step back and studying teachers' perceptions and publishers' perceptions from a qualitative point of view.

Since qualitative research methods are applicable to get to the core of a concept (Philipsen & Vernooy-Dassen, 2004), this study is done on a qualitative basis. This is in line with Blumer (1969, p. 28), who claims that especially when exploration and theoretical refinement are the main goals, close examination of a few well-selected participants is likely to be more informative than, for example, doing a survey and generally analyse hundreds of respondents.

For this study, the interview method is considered as a valuable tool for the reason that interviews can be used when there is a need to attain highly personalized data, if opportunities for probing are required and if a good return rate is important (Gray, 2004). For the conducted research, all these three reasons apply. There is a need to hear about the personal perceptions of both primary school teachers and publishers about the adoption of digital education materials. Because this study aims to reveal the perceptions of the teachers and publishers, probing is important. Probing is helpful to gain deeper understanding of the perceptions. And finally a good return rate is important, especially for the publishers, since there are not so many of them in the Netherlands.

An additional reason to use interviews is that they are ideal for getting to know people's perceptions (Sofaer, 1999) and thus for getting a sophisticated image of affordances and limitations of digital education materials. For this study, we adopt a particular type of interview

method, namely focus groups. Focus groups are used, because they are an effective method to investigate complex behavior and motivations (Morgan, 1993). Besides that, it creates cuing phenomena, that is, perceptions can be compared and contrasted to what others say, which is particularly relevant to this study as the perceptions of teachers (and publishers) may differ. And third, focus groups help to learn more about the degree of consensus on a topic (Kitzinger, 1995). So focus groups will help to find out whether the teachers under study have the same perceptions on digital education materials or whether there are differences, based on external factors such as age, digital skills or school context.

Focus groups would be useful for the publishers as well, for the same reasons stated above. However, it was decided to conduct interviews instead of focus groups, since the number of publishers in the Netherlands is rather limited and because it would be difficult to gather these high level managers at one single location and time. Therefore, it is expected that holding a focus group will be hard to achieve.

3.2 Participants

During this thesis project, the aim was to interview at least fifteen primary school teachers, which could take place in three focus groups of five teachers. The aim was to use purposive sampling to select these teachers, as there was a need for rich data and respondents that meet specific criteria (Tongco, 2007). In this study, the main criterium was that teachers did not widely adopt digital education materials yet. However, it was hard to find such teachers, because interactive whiteboards have been widely adopted yet. Therefore, the teachers in the sample all adopted digital education materials in some way yet, however they all want to make more use of digital education materials than they do at the moment. This criterium ensured that the teachers that were

included in the sample were able to tell something about the thresholds and barriers they face while adopting digital education materials. The second criterium was that the teachers teach pupils between four and twelve years old. It was most likely that interviewing these teachers produced the most interesting results. Lists with primary schools provided by the local government were used to contact schools. Schools were approached both by making phone calls and by sending emails. After approaching these schools, fifteen primary school teachers were selected to participate in the focus groups. Nine of the teachers were female, six of them were male. On average, only one out of seven primary school teachers is male in the Netherlands (DUO, 2014). However, for this study having a representative sample was less important than having a sample with teachers that met specific criteria. Having almost as much male respondents as female respondents, created the opportunity to see if there were differences between male and female respondents in the adoption of digital education materials. The teachers that were interviewed were between 25 and 62 years old, which made it possible to explore if age was moderator in the adoption of digital education materials as well.

The amount of publishers interviewed was seven. The reason that less publishers than teachers were interviewed, is that there are not that many publishers of digital education materials. In total, there are eleven publishers who publish digital education materials for primary schools in the Netherlands. All these publishers were approached by email to ask if they wanted to participate. Eight of them stated they were willing to participate, these are Blink, DaVinci, Instruct, Kwintessens, Klasse TV, Malmberg, YoungCrowds and Zwijsen. However, the representative of Malmberg had to withdraw his participation to the research due to personal reasons. In Appendix C, an overview of all respondents that participated in this study, is provided.

3.3 Procedure

Before conducting the interviews, a significant amount of time was spent to get familiar with several interview techniques. To become familiar with interview techniques, an article written by Hermanowicz (2002) proved to be especially useful. He mentions twenty-five factors that are important to get a great interview. Amongst other, particular attention was paid to doing thorough research of the publishers and investigate their websites in depth, to get insight in the digital education materials they offer and what their vision was. At the start of each interview, the participants were introduced to the topic, signed an informed consent form and were told that there were no wrong answers.

During the interviews, notes were taken and all interviews were taped on audio, so that they could be transcribed for the analysis. The interviews took about one hour on average, with the shortest interview taking 41 minutes and the longest interview one and a half hour. All interviews took place at the publishers' office. One interview with a publisher took place in a restaurant in Amsterdam, because this was more convenient for both the interviewee and the researcher.

To prepare for the focus groups with the primary school teachers, Krueger and Casey's book (2010) was studied. One of the things they mention is that the environment of the focus group has to be permissive and nonthreatening. Therefore, all focus groups took place at the schools where the primary school teachers were working. The moderator read through the questioning route several times, to be well prepared. Before the focus group started, the purpose of the focus group was explained, the ground rules were explained and the participants were told that there were no wrong answers. Besides that, they were told to carefully listen to each other, but have an open discussion. During the focus groups, it was important to control dominant talkers. People who

talked little were encouraged to share their opinion as well, because it is important to hear from everyone (Krueger and Casey, 2014).

The first weeks of the data collection were spent by finding and interviewing the primary school teachers. The primary school teachers were interviewed in focus groups that took about an hour. The focus groups contained three types of questions (Kitzinger, 1995): engagement questions, which make the teachers feel comfortable, exploration questions, which lead respondents to the heart of the discussion and an exit question, to see if anything was missed during the discussion. Some demographic information about the participants was collected as well. This is relevant to see if for example age or gender make any difference.

The performance expectancy that teachers had of digital education materials was studied by asking them how useful they found digital education materials, to which extent they prefer them over printed materials and how they evaluate the quality of the available materials. To get more information about their effort expectancy, questions about their digital skills were asked, questions for example were how long they had been using digital technologies, how easy they found using digital technologies and what thoughts they have on the development of new technologies. As their seemed to be a third person effect, the teachers were also asked to reflect on the digital skills of their colleagues. Besides that, they were also asked about social influence. They were asked to which extent they were pushed or stimulated to use digital education materials. This is related to the facilitating conditions as well, they were also asked if they found there were enough digital devices available, if the network worked well and if the board was supportive in letting the teachers use digital education materials.

The data collected from focus groups with the teachers, was used as a starting point for the interviews with the publishers. The reasons given by the teachers to use or not to use digital

education materials, were incorporated in the interview guide for the interviews with the publishers to get to know more about their perceptions on digital education materials. This was helpful to get to know their view on why teachers should adopt digital education materials.

The focus group and interviews were semi-structured, to make sure that the same topics were covered during each focus group and interview. A semi-structured interview is an incomplete script, in which topics are prepared, but there is a need for improvisation (Myers & Newman, 2007). The reason to choose for this design was that several topics needed to be investigated, but that it was also important to leave space to elaborate on interesting answers. Semi-structured interviews created the possibility to anticipate and ask more questions if needed. A topic list for the focus groups with the teachers is included in Appendix A. The topic list for the interviews with the publishers was created after conducting the focus groups, because the results from the focus group will be used as a guideline for the interviews with the publishers. This topic list can be found in Appendix B.

3.4 Analysis

Since interviews were conducted, the data consists of audio recordings and hand-written notes. This data were processed according to the principles of thematic analysis (Clarke & Braun, 2006). This method of analysis was chosen because it allows to systematically analyse the data from the focus groups and interviews. thematic analysis adopts guidelines for the development of categories and concepts and for an understanding of the relationship between the various categories (Pidgeon & Henwood, 1997). Thereby, thematic analysis adopts some of the principles of grounded theory to systematically analyse the data (Pidgeon & Henwood, 1997). It differs from

grounded theory in that the goal is not to create an encompassing theory and that it does not start from a blank canvas (Clarke & Braun, 2006).

First of all, the interviews were transcribed literally. After transcribing the interviews, the analysis process started. The analysis of the data was guided by the three coding phases Boeije (2010) distinguishes and by the six stages Braun and Clarke (2006) distinguish. The first step Braun and Clarke (2006) mention was 'familiarising yourself with the data', which refers to transcribing the data, reading it extensively and noting down initial ideas. After each interview was transcribed, every interview was read extensively and initial ideas were written down. These ideas mainly were about the sensitizing concepts.

The second phase was 'generating initial codes' (Braun & Clarke, 2006), which is similar to 'open coding' (Boeije, 2010). During this phase, labels were attached to different parts of the transcriptions, labelling the different perceptions teachers and publishers have about digital education materials. This labelling process was analysed continuously, to see if changes had to be made.

During the third phase, there was a 'search for themes' (Braun & Clarke, 2006). This is similar to what Boeije (2010) calls 'axial coding'. This step consists of comparing texts with the same label and see where there are similarities, differences and nuances. During this step, it appeared to be necessary to split some labels up into different labels, delete labels, merge labels and to create a hierarchical structure. Different groups of participants have been identified during this phase as relating different codes to one another resulted in understanding patterns between respondents. For example a group of teachers that is really positive about digital education materials and does not see any restrictions, and a group of teachers that has a negative attitude about digital education materials.

The fourth step was 'reviewing the themes' (Braun & Clarke, 2006) or 'selective coding' (Boeije, 2010). During this phase, a distinction was made between the less important categories and the categories that could be used for the final report. The fifth phase resulted in defining and naming the themes that were identified during the fourth phase. The concepts that were found during the coding process were merged together into a conceptual framework. The relationships between different labels were investigated, which resulted in patterns that are used to answer the research question. The answer to the research question was formulated during the sixth phase, namely 'producing the report'. The results of this can be found in chapter 4.

The thematic analysis was done by using ATLAS.ti, a software program that helps organising and coding qualitative data in an efficient manner. For the open coding process, it was really easy to select a text fragment and provide it with a code. After the open coding, all text fragments with the same code could be easily organised and merged together into one document. In that way, it was easy to read all fragments and compare them to see whether there were similarities or differences and to merge codes or add new codes. ATLAS.ti was able to provide an overview of how many times each code was used, in order to see which codes were potentially important. ATLAS.ti also made it possible to see which codes were often used together, so that the relationship between different codes could be discovered as well. For example, the codes about 'high costs' and 'available digital devices' often occurred together. Many teachers referred to devices as very expensive, which was a barrier for them. It was very useful that ATLAS.ti showed that these codes occurred together, in this way, the coding process went smoothly.

3.5 Reliability and validity

Qualitative research, like every research, needs to adhere to several standards of reliability and validity. Reliability can be defined as the stability of findings (Silverman, 2011) and to which extent a study can be repeated by another researcher (Baarda, De Goede & Teunissen, 2001).

Moisander and Valtonen (2006) mention two ways to improve the reliability of qualitative research, which differs from improving the reliability of quantitative research. By describing the research strategy and methods used for analysis, the research becomes transparent. The methods of analysis used for this study are described in detail in the previous paragraph. Besides that, Moisander and Valtonen (2006) mention the importance of operationalising the core concepts. Silverman (2011) adds a third factor that is important to improve the reliability of qualitative research. It is important that interviewees are asked more or less the same questions. To improve this, the same topic list was used for the interviews.

Besides reliability, validity is important. This refers to the truthfulness of findings (Silverman, 2011). It questions if the concepts pretended to be measured are really measured. Qualitative research is better at this than quantitative research, because it allows respondents to contextualize their answers and describe phenomena in their own words. Therefore, constant comparison is important. This was done during the axial coding phase, where codes were compared to see if there were similarities and differences. Silverman also mentions respondent validation, which is sending back the results of the research to all participants. This gives the interviewees to give feedback on the results. If they recognize themselves in the results, it would be a sign of a good validity. Therefore, all respondents received a draft of the results and were asked if they recognised themselves in the results. The respondents confirmed they recognised the results, so this was a sign of good validity.

Chapter 4 Results

In this chapter, the results of the thematic analysis will be presented in order to understand and explain the perceptions and expectations that both primary school teachers and publishers have of digital education materials. The coding process consisted of three phases. During the open coding phase 96 codes were found. The codes that were found during the open coding phase were compared and merged into new codes during the axial coding phase. This resulted in 17 axial codes. The axial codes were looked over again to see how they could be combined and merged into a number of themes. This resulted in seven themes, that will be discussed in this chapter. The concepts that were found during the axial coding phase, will be used as guidelines for discussing each theme. In paragraph 4.1, all emergent themes will be introduced shortly. From paragraph 4.2 onwards, all themes will be further elaborated on one by one.

4.1 Emergent themes

4.1.1 Mismatch between costs and available budget

This theme arose from both the interviews with the publishers and the focus groups with the teachers. Publishers have to deal with the problem that producing digital education materials is more expensive than printed education materials. Besides that, they have to develop a new business model. Instead of selling books, they are now selling licenses that give access to digital education materials. Schools, on the other hand, have to deal with the costs of digital education materials as well as the digital devices to use digital education materials. These costs often transcend the budgets that schools have.

4.1.2 Mismatch between required digital skills and obtained digital skills

The theme digital skills mainly arose from the focus groups with the teachers, in which they stated that many of their colleagues still have difficulties with using computers, tablets or interactive whiteboards. Some teachers also stated their scare of the complexity of technological developments. However, publishers saw this problem too, but in general did not believe that it is their task to enhance these digital skills.

4.1.3. Mismatch between technological barriers and opportunities

Many teachers mentioned they face technological issues, which can be very broad. Two sub-themes were discovered within this theme. The most heard issue was a lack of digital devices, which is related to the 'financial problems' theme. But there were also other technological issues, like a bad internet connection. This makes it harder for publishers to make the step to publish more digital materials, because schools do not have the required internet connection and digital devices to use these materials yet. However, some publishers had a different point of view on this and did think that digital devices like tablets or laptops are not the future.

4.1.4. Mismatch between vision of school boards and vision of publishers

Many schools nowadays are part of a foundation that manages several schools. As a result of this, decisions are not made on the level of one individual school, but on the level of the foundation. This slows down the adoption of digital education materials.

4.1.5. Mismatch between publishers' products and teachers' wishes

In general, the teachers believed there are too little digital education materials available to use as compared to printed materials. Therefore, they mainly use digital materials besides the materials they have been using for years. To which extent the publishers agree with the statement of too little materials available agree, differed per publisher.

4.1.6. Mismatch between the publishers

Both teachers and publishers agreed that publishers have to collaborate more, to make it easier for teachers to work with digital education materials. The platform 'Basispoort' is a good start in this, but there still is many space for improvement. A lack of collaboration between publishers was one of the barriers for teachers to use digital education materials.

4.1.7. Mismatch between the governmental policy and development of education

Finally, a third actor was found to be involved in the process of adopting digital education materials. Several teachers and publishers mentioned that the government plays an important role in the further adoption of digital education materials. They expect more governmental support to ease this process. Three subthemes were discovered within this theme: VAT, vision and quality assessment.

4.2 Mismatch between costs and available budget

In their study, King et al. (1994) have distinguished six ways in which an institution influences the adoption of technology. One of these is subsidy, which in the case refers to schools having enough budget to adopt digital education materials. If there is not enough budget available or costs are too high, this is a constraint in the adoption process.

All teachers that were interviewed agreed that the costs of adopting digital education materials are a stumbling block at the moment. “It is undoable to keep everything up to date with the financial resources we have. When you buy something, two years later something better, newer and faster has already been developed. And that makes it difficult”, was what one of the teachers said. Another teacher added to this: “You have to work with a method for ten years, but in the meantime the publishers added software to it. You have to buy that software now, while you thought you bought it out.” Although most publishers offer licenses per year, one of the schools bought the licenses for the same period as they bought the method itself: “When we buy a method, we buy out the software, we do not buy licenses per year. However, that means the methods have become more expensive as well.” This is in line with the findings of the NMa (2011), who stated that schools are affected because the prices of digital education materials increase more rapidly in comparison to the prices of printed education materials. When we look at Haddon’s (1995) steps of domestication, we see that the high costs of digital education materials already arise during the first step: appropriation. During this step, it is important to take a look at the barriers there are for using a certain technology. Because the costs throw up such a high threshold, the domestication process often already ends during the step of appropriation. There is no budget available to even purchase digital education materials, which makes adoption impossible.

However, not only teachers encounter the problem of high costs for digital education materials. In 2012, Higgins et al. concluded that the costs are a barrier for publishers as well. Costs for the production of digital education materials tend to be higher than the production costs for printed education materials. These findings were partly supported in the current study.

Publishers recognise this problem, but do not always agree with the teachers:

“It is a serious problem, but it is only a perception that the costs are high. They are not high. If you compare the costs of digital education materials to the costs of traditional materials, digital is much cheaper. But teachers do not want to let go of traditional materials, so digital materials come on top of it. And then it becomes more expensive”

(René Visser, KlasseTV)

Lian van de Wiel from publisher Blink sees the development of selling licenses per year as a huge step forward to lowering the threshold for teachers to adopt digital education materials: “It is an important starting point. If you choose for a certain method now, it does not mean you have to stick to it for the next eight years. With books, that was the case, because they are really expensive and have to be depreciated in eight or ten years. It is a big advantage to offer a license price per year, so that a school has little risk. If you choose a certain method now and do not appreciate it, you can choose a different method the next year.”

Most publishers use this model of licenses per year and they sell them per child or per class. However, not all publishers work with this system, which might be a financial threshold for schools. For example, René Visser only sells licenses per school:

“A license costs two euros per child, that is nothing. We do not want schools to use our products only for one or two classes, that would be too complicated. So we oblige them to use KlasseTV for all the school. It is not that expensive and if you really think it is important, you will still take it.”

(René Visser, KlasseTV)

DaVinci also has a system that has to be adopted throughout the school. They even go a step further than KlasseTV, by contracting schools not for one year but for ten years:

“We do not sell books, but a way of thinking. You cannot change the mindset of teachers in one year, that takes two or three years at least. Therefore, we have chosen to work together with schools for a period of ten years. If they cannot pay all the money at once, they can pay in ten years. We combine the information and knowledge we already have with our vision, it is not that expensive”,

(Liesbet van Oosten, DaVinci)

Other publishers do actually agree with the teachers that digital education materials are expensive and admit that digital education materials are sometimes more expensive than printed materials. This difference might be declared by the fact that KlasseTV and DaVinci are relatively new players on the market. From their foundation onwards, they have been focused on publishing digital education materials. Other publishers, like Kwintessens and Zwijsen have been existing for over 150 years and now have to shift from printed educational materials to digital education materials, which might make the process more expensive for them. Martijn Wabeke from publisher Kwintessens states:

“For our method ‘Trefwoord’, the subscription price for the digital version is a bit higher than for the printed version, but you get a lot more as well. We deliver videos for ‘Trefwoord’ each quarter of a year and that is a very costly process. However, we have tried to bring

the prices of digital materials and printed materials closer to each other in the last few years, to really help schools make that transition.”

(Martijn Wabeke, Kwintessens)

Publishers also explained that the prices of digital education materials are relatively high, because the production process is expensive as well. Publishers highlight several reasons why digital education materials are potentially more expensive than printed materials. “Publishing digital education materials is not a way to do things cheaply. It absolutely is not, because if you want to use all opportunities, it is really difficult. You need to hire people who have knowledge of a certain discipline, but you also need people who can produce all different types of media and a designer who is working on how everything should look like”, says Martijn Wabeke. Jos Cöp from publisher Zwijsen agrees that producing good digital education materials is an expensive process: “If you take a look at the software we have developed, that costs hundreds of thousands of euros to develop. If you want to develop a good application, you cannot do that for less than fifty thousand euros.” Liesbet van Oosten looks at the financial perspective from a different point of view, because she does not think that digital education materials necessarily have to consist of applications or software. She argues that publishers can make the process of developing digital education materials as cheap or as expensive as they want to. China and Japan are mentioned as examples of countries where they have provided cheap solutions. However, they agree it can be an expensive process:

“The process of developing new things costs a lot of money. And for the traditional publishers, they have hired people with a lot of knowledge of geography or history and who

are really good at writing content. But now they have to hire IT specialists as well. It is hard for them to start and think in a completely different way. For us, that is more easy because we are relatively small. People always say there is not enough money for education in the Netherlands, but that is not true, there is more than enough money available for education.”

(Liesbet van Oosten, DaVinci)

YoungCrowds also sees a chance here for businesses. They are the only publisher that works together with both profit and non-profit organisations. Organisations approach them, after which they decide to collaborate or not. They have worked with Ziggo, the Anne Frank Foundation and the Metropole Orchestra for example:

“For example, the Metropole Orchestra existed seventy years and wanted to give something back to the community. So, they came to us and we developed music lessons for primary school. The organisations, like the Metropole Orchestra pay us to develop these materials. Schools only have to pay the shipping costs, which takes the financial threshold for them to use these materials away.”

(Roland Pelle, YoungCrowds)

4.3 Mismatch between required digital skills and obtained digital skills

Previous studies have shown that the digital skills of teachers are a barrier in the adoption of digital education methods (Davis et al., 1989; Venkatesh et al., 2003). The current study has shown that this barrier still exists. “When a computer does not work for a minute, they stop using it. Then somebody else takes a look at it, and only one more button has to be pressed to make the

computer work again. I take the time for that, but many of my colleagues do not”, argued one of the teachers. Another teacher added to that: “And it is the same for the interactive whiteboard. Sometimes they call me that it does not work, and it appears that it is just not plugged in. It takes me a lot of time to help colleagues solve simple things like this.” Van Dijk and Hacker (2003) argued that in many cases a lack of digital skills was caused by a lack of interest. However, this research does not support that argument. Most teachers mentioned that their colleagues were really eager to learn how to deal with digital education materials, but found it very difficult.

Besides that, although the teachers that were interviewed feel they are digitally savvy enough themselves, they are a bit worried about the complexity of developments. Although they know how to work with digital devices, there still is a huge variance in digital devices. Different digital devices are running different operating systems, which scare teachers:

“I do not know how it will turn out if in the future we have children with iPads and children with Samsung Galaxy Tabs or other tablets in class. How will that work with all those operating systems next to each other. You really have to stand above that as a teacher and have to know how to solve things, because otherwise a child cannot do his work.”

(Teacher, 61 years old)

It were mainly the older teachers who were worried about the complexity of developments, which is in line with the UTAUT model from Venkatesh et al. (2003), in which age is one of the four moderators in the adoption of digital education materials. Elsaddani (2013), Kubiak (2013) and Rana (2012) also concluded that younger teachers have a more positive attitude about digital education materials than their older colleagues and adopt them sooner. However, in general, these

findings were not confirmed in the current study. Except for when it comes to the complexity of developments, teachers from different age groups had similar opinions. According to the UTAUT model digital skills are not only moderated by age, but also by gender. More specifically, it is believed that women experience more difficulties in dealing with technologies. In the current study, the moderating role of gender was not confirmed. The female participants did not experience more difficulties in dealing with technologies than the male participants.

It differed per school if teachers had the feeling their colleagues really want to learn how to adopt digital education materials. Some teachers argued their colleagues really wanted to do so, but just found it very difficult and had to be supported. Other teachers found their colleagues did not put many effort in it to really understand how to use digital tools, however they did not blame their colleagues for that: "It is always the same subjects that are suffering if you have a lack of time, it is drawing, crafts and the digital aspect."

Nevertheless, the teachers said there have been several attempts to make their colleagues more digitally proficient, for example by giving them workshops and by helping them whenever they had questions: "But maybe we should have done more", they admit. An other teacher adds: "I think as a teacher, I am not the designated person to make my colleagues digitally proficient, it is the task of the board to work on that." These problems that teachers encounter are related to the concept of social influence that is part of the UTAUT model (Venkatesh et al., 2003). If teachers try to convince their colleagues to use digital education materials, this is probably not convincing enough. It would be more convincing if the board stimulates them to use digital education materials, because they are in a higher position and will have more influence on the teachers. It also a part of the six kinds of actions that King et al. (1994) have distinguished, through which an institution can

influence the adoption of technology. Knowledge building is the first of these actions and can be done by offering teachers digital skills trainings for example.

The way publishers deal with the huge differences in digital skills among teachers, differs as well:

“I have no insight in how big this problem is. But if it is still the case that many teachers see their own digital skills as a barrier, I think they have to move on. Digitalisation is part of their discipline and you cannot ignore digitalisation in education anymore. We should ensure that our materials are as user-friendly as possible, but when digital skills are the real problem, we cannot do anything on that.”

(Jos Cöp, Zwijsen)

Martijn Wabeke is more concerned with the problem and tries to contribute to a solution. He sees the same problems with his own colleagues as well and argues that two types of skills are missing. According to him, people have too little knowledge of how they can use an operating system like Windows. Second, he thinks people sometimes do not realise how many possibilities the materials they are working with have. René de Wild from publisher Instruct agrees to this: “We feel that schools are surprised when you give an extensive manual. When you buy something nowadays, you feel lucky if you still get a manual, but I think it is just normal that we deliver a manual that is understandable for everybody.”

It might not only be a general lack of digital skills that causes a barrier, but also the huge difference in digital skills between teachers:

“Most teachers find digital tools really interesting, maybe not all teachers are that IT-minded, but that does not matter. The role of the teacher is changing into a pedagogue or coach. As for the children, we should focus on talent management for the teachers as well. It is no problem if not all teachers understand every IT tool, it is alright as long as some other teachers or teacher aides do understand it”,

(Liesbet van Oosten, DaVinci)

Because a lack of digital skills was often encountered, remediation is an important concept to help solve this mismatch. The way in which publishers give substance to this remediation differs. Publishers DaVinci for example, organises an ‘unwrapping day’ on which they go to the schools and unwrap all packages together: “On that day, we take a look at how everything works and if everybody is able to work with it. It is no problem if you have difficulties to open the PowerPoint then, because we and your colleagues are more than willing to help you.” René Visser agrees with DaVinci:

“The standard level of teachers is not very high. But we are all able to turn on a TV or a computer. So, teachers do not need that many digital skills. We have to make are applications easy enough so that everybody can use them. Besides the materials for the children, we also have a teachers channel that is focused in professionalisation of teachers. With that channel, we try to help them to better deal with digital technologies.”

(René Visser, KlasseTV)

Although remediation is offered in several ways, it might not only be the digital skills themselves that cause a problem. The fear teachers have or might have, is seen as a barrier as well. “You can always grab a book from the shelf, but when the interactive whiteboard or computer does not work, you are lost”, says René Visser. Lian van de Wiel recognises the fears teachers sometimes have, but is also optimistic:

“We try to make everything we develop as user-friendly as possible. The power of our products is that they are so simple to use, that teachers can fully focus on teaching. They are there to teach and not to dive into complicated technical issues as well. Our digital education materials should be so user-friendly that ninety-eight percent of the teachers is able to use them with the skills they have now. Sometimes, they are a little bit scared of IT. But when you just turn the computer on, most of them are fine.”

(Lian van de Wiel, Blink)

4.4 Mismatch between technological barriers and wishes

From the focus groups with the teachers, it became clear that they still encounter several technological issues that withhold them from using more digital education materials. For them, these issues have to be solved first to make the next step in adopting digital education materials.

4.4.1 Digital devices

The number of available digital devices differed per class and school. At the school in Rotterdam, all classes had two computers in the classroom and the school had a ‘computer street’, with 24 computers. This allows the children to use the computers at least two times a week. At the other

schools, the number of digital devices per class differed from two to five. However, some classes had the possibility to have tablets for all children one afternoon per week. This lack of digital devices is a barrier in the incorporation step that is distinguished in Haddon's (1995) process of domestication. During the step of incorporation, the accessibility of the digital technologies are the subject of investigation. Because of a lack of digital devices, digital education materials are not as available as they should be, which makes it impossible for primary schools teachers to fully adopt digital education materials and to reach the step of conversion, the fourth and final step that Haddon distinguishes. This step is reached when digital education materials are adopted and fully integrated in the daily routines of teachers (Frissen, 2004).

Many teachers felt the lack of digital devices in their class was a constraint in adopting digital education materials: "The children could do the exercises on their tablets as well, but we need to have the tablets in class then. It is impossible to plan all exercises that can be done on a tablet on the same afternoon. We need more devices to do that." The lack of digital devices makes it impossible to support all learning goals that are set up for primary schools. Without having enough digital devices, the goals of independent learning and experiencing learning (Stichting Surf, 2004) cannot be met, because children cannot practice individually by using a digital device.

At some schools, the trend of 'bringing your own digital device' is now coming up. This began with bringing your own headset for example, but schools are now considering to let children bring their own tablet or laptop to class. However, the teachers that were interviewed were skeptical about this: "I think that is impossible. I have some children in my class who cannot prepare a presentation at home, because they do not have a computer. You cannot oblige all parents to buy a tablet or laptop for their children to bring it to school." This connects with Rogers' findings (1986) that socio-economic status influences the adoption of new technologies. In this case it is not the

socio-economic status of the teacher or school itself, but of its pupils and their families. This is in line with Van Kruistem and Van Steensel's (2016) findings that there are huge differences between families when it comes to the availability of digital devices.

However, even if each child would have their own digital device, teachers see some constraints: "In a class with 25 children, you also have at least one digital device that is not working. You simply do not have the time to solve that."

Although the teachers agreed there was a lack of digital devices, all classes were provided with an interactive whiteboard, except the kindergarten in Rotterdam. However, they had interactive whiteboards in the hallway, so were still able to use them.

The presence of interactive whiteboards and the lack of other devices is also related to the available materials. For example publisher Kwintessens stated they mainly focus on interactive whiteboards, because they are present in every classroom: "Unfortunately it is not the case yet that the computer – child ratio is 1:1 or 1:2 yet. If every child brings its own digital device, it would be easier to make that step. But that step has not been made yet, so we mainly focus on the interactive whiteboard." Teachers still have to print the worksheets and the children have to fill them in by hand: "You can imagine the next step is letting the children do these exercises digitally. But we are not that far yet, it is not what we have to deal with now." Jos Cöp adds to that: "It is the icing on the cake at the moment, if you give children extra exercises, you let them do them digitally. But that does not work, you need one digital device per child. And the crazy thing is, most of the times the children already have these digital devices." Publisher Instruct, who mainly focuses its education materials on typing skills, also encounters this problem: "We often see that there are only two computers per classroom. When those computers are not there, you cannot make typing education a real part of education, it will stay an extracurricular activity then", says René de Wild.

However, opinions on the need of digital devices differed per publisher as well. Publisher DaVinci assumes there are three digital devices per class, for them, this is enough:

“When you want to use computers to fill in worksheets, then every child needs a computer, but you do not have to think that way. Robotics and an international learning environment in which we are in touch with all the world are the future.”

(Liesbet van Oosten, DaVinci)

For example, DaVinci has developed a greenhouse in which the children can grow their own plants. It is computer-controlled and the children can decide how much water, how much light and which type of light they want to give the plants. This is in line with the cooperative learning and negotiation learning goal (Stichting Surf, 2004) that are set up for primary schools. Pupils can learn from each other, by helping each other with growing plants in the greenhouse. At the same time, children are given the possibility to make their own choices in what they want to learn and how they want to learn it. In this way it is possible for digital education materials to be part of the second or third development paths for the use of IT in education that Pennings et al. (2008) distinguish. Namely, digital education materials as a replacement of printed education materials or digital education materials as a means to transform the current education materials into new educational concepts.

Liesbet van Oosten also sees a future in virtual reality: “I also like holograms and virtual reality. So that when we talk about pyramids, we have the pyramids in class or that somebody from the Rijksmuseum comes to give you a virtual tour in the classroom. I believe that is the future, but I do not know how soon this will be the case.” Roland Pelle also thinks the future is in virtual reality,

for several reasons. First of all, they are convinced that it is not possible to let every child bring their own device: “A friend of mine is the director of a primary school in the north of the country. He has to give breakfast to forty out of hundred forty children everyday, because they do not get this at home.” This again refers to the differences there are between families and different regions of a country (Van Kruistem & Steensel, 2016) and to the role of the socio-economic status of the children. Second, YoungCrowds believes in virtual reality as a better way to learn things: “We just did a test regarding a megalith, children recorded a lesson about megaliths. I saw it last week and it feels like you are in between those children on the megaliths. Virtual reality feels like it has been live and is better remembered than a book or a computer lesson.”

4.4.2 Network

But not only the lack of digital devices was seen as a barrier to adopt digital education materials by the teachers. They also encountered several network problems, in some cases the network was not stable enough and turned off while the teacher was teaching, which they found very annoying. They also think this is related to the digital skills of their colleagues: “That the network does not work or just drops off sometimes, is not very motivating. If you have difficulties working with computers and they stop working all the time, why should you really do your best to understand them?”, was what one of the teachers mentioned. Except from the network being not stable, in many schools the network is too small as well to wider adopt digital education materials. “It is just not possible to let hundred children use computers or tablets at the same time, the network cannot handle that, our system administrators have told us”, was another quote by one of the teachers. The teachers that were interviewed see the development of the network infrastructure as one of the main requirements to further adopt digital education methods. This supports King’s et al. (1994)

fifth way in which an institution can influence the adoption of technology, namely by meeting the required standards. The 'Vier in Balans monitor' (Kennisnet, 2015) stated this was still a problem for the majority of Dutch primary schools and those findings were confirmed in the current study.

4.5 Institutional characteristics

All teachers that were interviewed for this research, were teaching at a school that is part of a foundation. In the Netherlands, this type of organizational structure is more and more common. In total, there are around 7,500 primary schools. Six hundred of them have a board on the individual school level. However, the other 6,900 schools are divided under 1,000 boards. This means a board has several schools under their care, for which they make decisions. The focus groups with the teachers made clear that being part of a foundation influences the way in which they adopt digital education materials. "We cannot decide when we want to buy new hardware, there is a scheme for this and it is purchased centrally", one of the teachers told. Besides that, the software was purchased centrally as well. This means each school that is part of the foundation uses the same digital education materials. However, the teachers did not really see this as a constraint. Other teachers received more freedom to decide which materials they want to use, but did find some constraints in the process: "I feel I want to go on myself and adopt digital education materials, but a foundation is a cumbersome institution. It takes a long time before money is made available and the budget is too low." The focus groups with the teachers made clear that most of the teachers feel they do not receive enough support from their board or the foundation that they are part of. According to the UTAUT model, 'facilitating conditions', which refers to the degree to which an individual feels the organisation supports use of the system, is an important construct in adopting technology (Venkatesh et al., 2003). At the moment, the facilitating conditions that

Venkatesh et al. refer to, are not met in a satisfactory manner. This means teachers receive too little support, which throws up a threshold in the adoption of digital education materials.

YoungCrowds, Zwijsen and DaVinci agreed that school boards should do more to facilitate the adoption of digital education materials. Liesbet van Oosten added: "It is important that school boards get educated in innovation management. Because every type of innovation needs to be managed, and that does not mean you let everybody follow the same course. But you have to take a look at the talents of your team and how you can use them. The adoption of digital education materials has to be a mix of top down and bottom up, it cannot be totally bottom up. Somebody has to say: this is our future and vision, and that is what lacks at many schools." This confirms King's et al. (1994) findings that mobilization is an important factor in the adoption of technology as well. Mobilization refers to encouraging individuals to think in a particular way with respect to an innovation. The adoption of digital education materials is affected by encouraging a positive or negative view (Kling & Iacono, 1988). At the moment, it seems to be the case that school boards do not actively encourage a positive view towards digital education materials. So, the adoption of digital education materials also depends on the digital literacy of the school board and management and their ambitions to realise high digital literacy of their employees.

Finally, Liesbet van Oosten also argues that school boards should give the early adopters more time to reach out to their colleagues and to implement digital education materials in the school. Some of the teachers interviewed, had this feeling as well: "When something does not work for a moment, I have to solve it after school time. I have too little time to work on IT and would appreciate it to have more time", said one of them.

4.6 Mismatch between publishers' products and teachers' wishes

A complaint that was often heard from the teachers, is that there is too little digital material available that is good enough to replace the books: "Digital material is often just a scanned book, so why should I use that, instead of a book? I can always use a book, because it does not have any technical complications. Digital material does not really add something now." That the perceived quality of digital education materials is low, means the performance expectancy is also low. This concept, that is part of Venkatesh's et al. (2003) UTAUT model, refers to the degree to which somebody thinks that using the system will increase his or her job performance. Because teachers have the feeling that the offered digital materials are just scanned books now, they do not feel that using these materials improves their job performance. This identifies a real mismatch: the available materials do not meet the wishes of the teachers and are therefore not widely adopted.

Research by Kennisnet (2015) has shown that thirty per cent of the materials used in class are digital. However, all educational publishers offer a wide range of digital education materials. That means that the problem lies not in the number of material that is available, but in its quality.

Interactivity is one of the strengths of digital education materials, however the current materials make too little use of that feature. "The publishers should provide us with more examples and videos. Now, I often choose to search some videos myself to get the attention of the children. At the moment, it is often the case that I show the same picture on the interactive whiteboard as the children see in their books, that is not useful", said one of the teachers. This is in line with Kennisnet's last report (2015), in which teachers express their displeasure with the available materials. The findings from the current study also confirm that the digital education materials that are available now make too little use of the power digital education materials might have: listening, coming up with solutions, watching, playing, searching, communicating, etcetera. Because the

available materials make little use of these strengths, we mostly see that digital education materials are used as an appliance in addition to printed education materials. This is the first development path that Pennings et al. (2008) distinguished for the use of IT in education. Steps have to be made in terms of available materials to make the step to one of the other two development paths: digital education materials as an appliance that replace printed education materials or digital education materials as an appliance to transform the current education materials into new educational concepts.

The business models used by traditional publishers also seem to form a barrier for a good collaboration between publishers and teachers. The smaller publishers agree that traditional publishers stuck to their traditional business models too long. René Visser says: “Publishers do not really dare to move beyond their traditional business model and change it. That means they use intermediate forms, like a scanned book where you can click on some things, so that they can still sell their original books.”

Although several publishers agree on this, there are different perceptions of what the concept of digitalisation actually means as well. Liesbet van Oosten, for example, has a different point of view:

“Almost all publishers have got the feeling that they are very busy with digitalisation, because they are creating apps and games. But that is what they already did, but in a digital way. I think that is old-fashioned. It is not the way we should look at innovation and digitalisation.”

(Liesbet van Oosten, DaVinci)

Besides the different views on what digitalisation actually means, an important mismatch lies in the question who needs to initiate 'the revolution'. Some publishers, like Jos Cöp, are awaiting demand from the teachers:

“Digitalisation of education does not depend on enough materials being available or not. Because if we do not have enough materials available, schools will not come to use us anymore and buy our products. For us, we have to do the right things at the right time. If all schools come to us and ask for digital education materials, they will get them. But that question from the schools really has to be there, it has to be clear what they want.”

(Jos Cöp, Zwijsen)

But on the other hand, teachers are waiting for the publishers to take the next step: “We already have so much to do, it is undoable for us to write an exact plan about which digital materials we want and then ask the publishers to create it for us. It is their task to ask us what we want, we are their clients.”

Other publishers agree with the teachers that it is their task to ask what the teachers want:

“For us, the most important starting point is our target group: what do children want? From there on, we develop our materials together with both the children and the teachers. We always start from the desires of the children and teachers. If everybody is satisfied with the available material, we are not going to try and make something better. But that is often not the case. So, when we create something, we do a focus group with five teachers from different schools and test new materials at three schools, before we release them. It is a

long and labor-intensive process, but it results in something the teachers really have a need for.”

(Lian van de Wiel, Blink)

Jos Cöp also argues that there is more material available than teachers are aware of:

“I think many teachers even do not know these systems and know how many material there is available. Because the materials we have developed, are much more than just a scanned book. Seven out of ten euros we invest goes to developing digital materials, so it is a pity to hear that teachers think there is too little material available. I can show them it actually is available, so maybe they just do not search good enough.”

(Jos Cöp, Zwijsen)

René Visser encounters this problem of not being found, because their materials are offered apart from the methods they are developed for: “We have materials here for geography, history and more for all classes of primary school. We already have it here, but not everybody has found us yet.” Some of the teachers also argued they make a conscious choice for the bigger publishers, because they have been using their traditional materials for years: “We already have so little computer time available, so it is the easiest to use materials from publishers we are already familiar with.” However, this might result in teachers not always using the best materials available. A better collaboration between publishers, which is elaborated on in paragraph 4.7, could be part of the solution for this problem.

Besides that, all publishers agree that digital education materials should be a means and not a goal in itself. Jos Cöp: “If I was a teacher, I would make the step to digital materials very soon.

But if a teacher thinks he can better use books and paper, he has to do so. The most important thing is that children learn from it.” Lian van de Wiel adds to that:

“It depends on the philosophy of your school. Do you really want to use digital materials to improve education and let each child work on its own level? Then you lose the process of working on something together as a group, so maybe you want to choose for a mix. There are many types of schools, many philosophies and possibilities.”

(Lian van de Wiel, Blink)

Liesbet van Oosten continues: “Some books are really good and well written, but you need some extras, like videos and visuals to make it interesting for children. The real world and the digital can support each other.”

4.7 Mismatch between the publishers

Too little collaboration between publishers has been a huge problem in the past, but there have been interesting developments on this side in recent years. ‘Basispoort’ has been introduced, a platform on which several publishers have put their digital education materials, so that teachers can access them more easily. Teachers tend to be quite positive about this development: “Two years ago they have introduced Basispoort and I think that works quite well.” Other teachers were positive about the introduction of ‘Basispoort’ as well, but had some doubts as well:

“Basispoort is a good initiative, but we want everything on the same platform. Now there are some other alternatives where other publishers put their digital materials together, but

that does not work. So, if you develop such a platform, you have to work together. The larger publishers do so, but the smaller publishers cannot get in between them.”

(Teacher, 25 years old)

Branding seems to be a problem for the smaller publishers. Because they are not well-known and do not have a long history of publishing educational materials, it is hard for them to get a share in the market:

“YoungCrowds is not a strong brand, so we are not the sender of the digital education materials we produce. For example the Metropole Orchestra offers materials, in cooperation with us. We are the facilitators. Before we started YoungCrowds, we published ‘Kidsweek’, a newspaper for children. We delivered a box to several schools, so they could hand it out together with ‘Okkie’ and ‘TapToe’, some other children’s magazines. But the boxes were not even opened, because ‘who the hell was Kidsweek’, they had no idea. If you have an A brand to collaborate with, you get access to schools. If they hear ‘Anne Frank foundation’, they immediately want to have it, that is not the case for YoungCrowds.”

(Roland Pelle, YoungCrowds)

To overcome this problem, smaller publishers try to distinguish themselves from the bigger publishers by using different distribution channels:

“If you look at how the bigger publishers sell their products, you find out that you cannot even buy a method directly from Malmberg. It always goes through intermediary

organisations and that is not the way we want to do it. It means you literally raise a threshold between yourself and the customer.”

(Liesbet van Oosten, DaVinci)

However, if publishers collaborate more, they can profit from each other’s ‘tricks’ and knowledge. Klasse TV sees huge opportunities here:

“We develop videos that match, for example, with the methods of Noordhoff. But if a school buys a method from Noordhoff, they do not see the videos we have developed for this method and they have to buy an apart subscription. It completely stands apart from each other and that is a pity. Publishers should profit from each other’s ‘tricks’ and knowledge. By collaborating, we can integrate text and video and make better education materials.”

(René Visser, KlasseTV)

This makes clear that although Basispoort has been introduced, there still are some constraints in the collaboration between publishers. For Basispoort as well, there are some constraints as well.

“For several reasons we have decided we want to join Basispoort. All Dutch primary schools use it and Basispoort really wants smaller publishers to join as well, so that all materials are in the same environment. Some schools have got IT-service providers that makes sure that once you access the school network, you automatically have access to all products you have a license for in Basispoort. In that way, the collaboration between

publishers has improved. We want to join as well, but we are not sure yet whether we can afford it.”

(Martijn Wabeke, Kwintessens)

Zwijssen, the biggest of the publishers interviewed, was very positive about the introduction of Basispoort:

“Basispoort ensures you only have to create one account per child and then you are done. I can imagine it is really annoying for schools to have many different systems and applications to work with. There still is a world to win and we can still make it simpler, but Basispoort has been an enormous step forward. We really need to collaborate as much as possible. Otherwise, schools will force it and stop buying our products. He who pays the piper calls the tune.”

(Jos Cöp, Zwijssen)

4.8 Mismatch between the governmental policy and development of education

The last theme that was identified through the thematic analysis was only mentioned by three publishers, but is still considered relevant. Lian van de Wiel mentioned: “A disadvantage of digital education materials is that the VAT for those materials is twenty-one percent, while it is only six percent for books. We mostly create digital materials, so that is a huge disadvantage and in my opinion one of the facts that withholds teachers from choosing for digital materials.”

Besides the huge difference in VAT between books and digital materials, Roland Pelle sees some other problems for the government:

“The government is unreliable and will stay unreliable in this. In the past, we used to have governments with a vision. I expect the government to have a vision on where we will be in twenty-five years. But prime minister Rutte is only focused on short term, just four years. Shell has hired futurologists and twenty years ago they have predicted what is happening now with the refugees on the European borders. The government needs some visionaries.”

(Roland Pelle, YoungCrowds)

YoungCrowds also criticises the tests, inspection and measuring instruments the government uses to guarantee the quality of education:

“Schools are too focused now to get a good score on the tests that the government takes. For example, we released the materials with the Metropole Orchestra and somebody from the government took a look at it, to see if the ten key competences were met. But he did not even take a look at the materials we created and already said what was missing. You get a human rating, that is not a problem, but you will not get any innovation in that way.”

(Rolland Pelle, YoungCrowds)

They also criticise ‘Onderwijs 2032’ (Education 2032), a governmental plan that has to improve the quality and reform education in the next sixteen years:

“That plan is useless, because so much will change during those years. Occupations people will have in ten years are not even invented now. However, the government can

help by bringing tablets to the classrooms. Everybody in Turkey has got a tablet, because the government distributed them. The only thing you have to focus on then is: what do you want to do with them and how are you going to use them?"

(Roland Pelle, YoungsCrowds)

Liesbet van Oosten agrees that the government should do more to make the adoption of digital education materials easier: "Not all the innovation can be bottom up, the government needs to do more and help schools develop a vision."

Chapter 5 Conclusion and implications

Through interviews and focus groups with publishers and primary schools teachers, an answer to two research questions has been sought, namely:

RQ1: What are the expectations and perceptions of primary school teachers on the adoption of digital education materials?

RQ2: What are the expectations and perceptions of publishers on the adoption of digital education materials?

The results that were retrieved from the interviews and focus groups were discussed in chapter 4, based on seven themes that were identified during the coding process. In this chapter, a conclusion will be drawn out of the results that were discussed in chapter 4 and implications of this study will be revealed.

5.1 Conclusion

Many studies on the adoption of digital education materials have been done in the past. However, models on the adoption of digital technologies, like TAM (Davis et al. 1989) only explain a limited portion of the variance. Therefore, it was necessary to take a step back and look at the adoption of digital technologies from a more holistic perspective. Besides that, never before a comparison between the perceptions of teachers and the perceptions of publishers was made, thereby making this study unique in the research domain.

The interviews and focus groups showed that there not only seems to be a mismatch between the teachers and the publishers, but also among publishers. Publishers turned out to have

different views on the future of digital education materials. These differences make the collaboration between publishers more difficult, which raises a threshold for teachers to adopt digital education materials, because they have to choose between different platforms and types of opportunities. Publishers should discuss with each other which course they want to follow and make sure that they are all on the same line. This will improve the quality of digital education materials and their accessibility, because they are adjusted to each other in the platforms they use and how they are shaped.

However, deciding which course should be followed, is not something the publishers could do alone. The results from this study have shown that most of the teachers are still dealing with problems that have been identified as barriers in the adoption of technology years ago. Teachers are still facing problems with facilitating conditions for example, which has been identified as an important factor by Venkatesh et al. in 2003. Besides that, teachers are also still dealing with a low performance expectancy, a factor that was identified by Venkatesh et al. as well. Over these years, the factors identified by researchers like Venkatesh et al., have stayed relevant. At the same time, this means little improvement has been made in the collaboration between publishers and teachers.

To take away the low expectations that teachers now have of digital education materials, publishers should ask the teachers about their wishes and needs and publish the material they ask for. They are the clients, so they should have the right to decide.

At the same time, school boards have to make sure that basic requirements like enough digital devices and a stable network are provided. This would take away the barrier of facilitating conditions, that teachers are still facing. However it is not only the school boards that have to be supportive. The Dutch government can also play an important role in this. By bringing the VAT for

digital materials on the same level as the VAT for printed materials, a huge part of the financial barriers would be taken away.

If all parties involved will stay in a continuous conversation, many of the problems that are encountered nowadays could be solved in a few years. It would be interesting to then repeat this research, and see if the factors that influence the adoption of technology that were identified by Venkatesh et al. and other researchers, are still relevant then.

5.2 Implications

The findings of this study have clear implications for the stakeholders in digital education material. This study has made clear that a good conversation between all actors involved is necessary to positively affect the adoption of digital education materials. The main actors involved in this case are the teachers and the publishers. It would be recommendable for publishers to engage more with the teachers and create new materials together with those teachers, so that they are precisely connected to the wishes and needs that teachers have. If all publishers would do that, all publishers and teachers are thinking along the same lines, which would erase one of the barriers in the adoption of digital education materials.

However, not only a dialogue between teachers and publishers is important, publishers should have more of a dialogue with each other as well. A better collaboration between publishers eases the use of digital education materials for teachers, because they can find all materials at one place. A better collaboration between publishers will thus ease the adoption of digital education materials for teachers as well. This means publishers might have to leave their traditional business models and should think less in terms of competition and rivalry. Their own profit should not outweigh the quality of education. Some publishers stated that: "Digital education materials should

never be a goal on their own, they should be a means to give children the best education possible.” This can also be viewed from the perspective of publishers’ profits: it should never be the goal to make as much profit from digital education materials as possible, they still should be a means to give children the best education possible.

To help publishers focus less on profits, or to make it easier for them to make profit without having to increase the costs for teachers and schools, the government should take action. There are several ways in which the government could offer support. For example by bringing the VAT for digital materials on the same level as the VAT for printed materials, or by giving schools subsidies to buy more tablets or computers.

The main implication of this study seems to be that more conversation and collaboration between the different actors involved in the adoption of digital technologies in primary education is needed. This conversation and collaboration might not only be a dialogue between the separate actors, but also a dialogue among them or a conversation with all actors involved. This would positively affect the adoption of digital education materials.

However, it must be considered that, according to Hynes and Rommes (2006), adopting a digital technology has to be seen as a non-linear process. It has to be seen as a continuous interplay between the technology and its users, in which both the technology and its users change (Mansell & Silverstone, 1996). Therefore, constant collaboration between the actors involved is needed, because technologies will keep changing constantly as well.

Chapter 6 Limitations and future research

The research conducted for this master thesis was constrained by several factors. First of all, it was very hard to find enough teachers to participate in the focus groups. Therefore, the sample was not very diverse. All teachers were teaching in a city, which might be different from teaching in a small village. Therefore, it is recommendable that teachers from villages will be interviewed in future research as well. As research by Van Kruistem and Steensel (2016) has shown, there are huge differences between families and between different areas within a country. It is likely that there not only will be huge differences within a country, but also between several countries. Therefore, it would be useful to conduct the same research in several countries, to see whether there are differences between them. This might also result in interesting insights on how they can learn from each other.

Besides that, most of the teachers that participated in the focus groups were relatively digitally savvy themselves. This selection bias resulted in a third person effect (Davison, 1983), teachers did not see their own digital skills as a problem for the adoption of digital education materials, but did see the skills of their colleagues as a problem. Because the teachers that participated were relatively digitally savvy themselves, two of the four moderators from Venkatesh's et al. (2003) UTAUT model were hard to investigate. No conclusions can be drawn about the moderating role of experience with similar systems and the voluntariness of use, because all participants were relatively experienced and used digital education materials voluntary. In the future, it might be interesting to interview teachers that have difficulty with using digital tools themselves, to see if they encounter different problems.

The teachers that were interviewed during this study all used digital education materials in an average quantity. However, it would also have been interesting to interview teachers from

schools on both extremes: teachers that do not use digital education materials at all and teachers that use digital education materials almost all the time (iPad schools for example). It is likely that teachers from both these groups will encounter different problems than the teachers that are average in their use of digital education materials. For example, barriers like a bad network and too little digital devices do not apply to teachers working at iPad schools, so it would be interesting to see if they encounter other problems or if they do not agree there is a mismatch at all. Research conducted in New Zealand (Henderson & Yeo, 2012), for example, showed that teachers had to deal with issues like the novelty effect, which means they had to explain the children that the iPad was a tool to help them learn and not something to be played with. However, as stated above, it is likely that there are differences in the adoption of technologies between several countries. Therefore it would be useful to let Dutch iPad schools participate in such a study as well. As well as it would be useful to interview teachers who teach at schools that do not use digital education materials at all. During the respondents seeking process for the current study, some of these schools came across. For this study, it was decided to only focus on schools that use digital education materials for a part of the time. However, for future research it would be interesting to give teachers that do not use digital education materials at all a chance to have their say. Mouisset-Lacan (2012) claims that one of their reasons for this decision might be their worries about the interpersonal relations and peer relationships that might be destroyed by the startling inroads of technologies into classrooms. It would be interesting and relevant to see if these findings would be confirmed in the Netherlands.

Another limitation of this research is that several big publishers (e.g. Malmberg, Noordhoff, ThiemeMeulenhoff) were not able to participate in this research for several reasons. Therefore, important information could be missed. Due to a lack of time, it was impossible to wait until these

publishers had time to participate as well. However, for future research it would be better if these publishers could be taken into account as well. Besides that, it would be interesting to also take into account parties like Squala and Ambrasoft and creators of other commercial applications. These parties are not publishers, however they develop platforms and apps for primary school children to practice sums and spelling for example.

Besides that, during the study, more actors in the adoption of digital education materials were encountered, namely the school boards, the intermediary parties that promote collaboration between publishers and the governments. The school boards play a role in the adoption process, because they are responsible for buying new software and hardware and for schooling their teachers on how to use this software and hardware. Therefore, it would be interesting to ask several school boards about their vision on digital education materials in future research. It would also be interesting to ask representatives of intermediary parties, such as Basispoort, about their opinion. They could be a key player in the collaboration between publishers, which is one of the constraints in the adoption of digital education materials at the moment. And third, the government was mentioned as an actor that plays a role in the adoption of digital education materials. For future research, it is recommendable to ask government representatives for their opinion on the adoption on digital education materials as well.

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Appendix A Topic list for the focus groups with the teachers

First of all, I would like to thank you for participating. Before we start, I want to emphasize that there are no wrong answers, the more information you give me, the better. The purpose of this study is to get insights from both teachers and publishers on the implementation of digital education materials in primary education. All information will be processed confidentially. I want to ask your permission for participating in this research and I also want to ask your permission to use a voice recorder. Now, I first want to give you the possibility to introduce yourselves. I would like to know:

What is your age?

How long have you been working as a teacher?

Which grade do you teach?

The reason for doing this research is that there still seems to be a mismatch between what you, the teachers, expect from digital education methods, and what the publishers deliver. Therefore, I will get into a conversation with both teachers and publishers to see whether there are differences in their expectations.

Use of digital education materials

What is the role of digital education materials in your teaching?

How often do you use digital education materials?

- How long have you been using digital education materials?

- Do you want to use them more often?

Which digital education materials do you use?

- Tablets, computers, etc.?

Why do you use them?

- Additional to printed materials?
- Replacement of printed materials?

For which subjects do you use them?

- Why do you use them for these subjects?

Quality

How do you perceive the quality of the digital education materials available?

- Compared to printed education materials?
- Has the quality, in your opinion, increased over the years?

What would you like to change / what recommendations do you have for publishers?

Personal characteristics

How do you rate your own digital skills?

- How long have you been using digital devices?

How easy do you think digital education materials are to use?

How useful do you think digital education materials are?

Institutional characteristics

Are you satisfied with the number of computers and network at this school?

Does the school provide you with any digital skills trainings?

- Do you appreciate these trainings / would you appreciate getting these trainings?

What does the school director think of digital education materials / how does the board influence the use of digital education methods?

Appendix B Topic list for the interviews with the publishers

First of all, I would like to thank you for participating. Before we start, I want to emphasize that there are no wrong answers, the more information you give me, the better. The purpose of this study is to get insights from both teachers and publishers on the implementation of digital education materials in primary education. All information will be processed confidentially. I want to ask your permission for participating in this research and I also want to ask your permission to use a voice recorder. I first want to give you the possibility to introduce yourself. Can you please tell me something about yourself and your job at [name of publisher]?

General information

Which materials do you publish and how are they designed?

- To which extent are these materials digitally published?
- Do schools have an option to choose between digital or printed materials?

Problems teachers encounter

Teachers often have difficulty with creating and managing the accounts of their pupils, how do you try to anticipate on that problem?

Some teachers see their colleagues have difficulties with using digital materials. How do you respond to this?

- Do you think it is the task of the publisher to make digital materials easier to use for teachers, or do you think it is the task of the school management to educate their teachers how to use digital materials?

Some teachers also complained that the digital materials available are just a scanned version of the printed book. To which extent is this true?

Another problem teachers encounter is that there are too little digital devices available. How do you respond to that and how do you think this will change in the (nearby) future?

Teachers also find digital materials relatively expensive compared to printed materials. How do these prices compare?

Other questions

Do you do research yourself on how teachers evaluate your (digital) materials?

- If so, how do you process the results of this research?

More and more free apps are available and new parties are developing digital materials as well. To which extent do you see them as a threat and how do you handle this?

Final questions

What is the main thing that you and your employer want to focus on to improve digital materials in the next few years?

What is, in your opinion, the main thing that has to change to make it possible to use more digital materials in primary school?

Appendix C Overview of respondents

Teacher	Grade	Age	Gender
Teacher 1	5	48	Male
Teacher 2	6	61	Male
Teacher 3	5	29	Female
Teacher 4	6	35	Female
Teacher 5	4	37	Female
Teacher 6	7	57	Male
Teacher 7	1-2	27	Female
Teacher 8	3-4	27	Female
Teacher 9	6-7	25	Female
Teacher 10	all grades	48	Female
Teacher 11	7	30	Male
Teacher 12	all grades	28	Male
Teacher 13	5-6	62	Male
Teacher 14	all grades	40	Female
Teacher 15	1-2	37	Female

Respondent	Publisher
Martijn Wabeke	Kwintessens
Jos Cöp	Swijzen
Lian van de Wiel	Blink
René Visser	KlasseTV
Liesbet van Oosten	DaVinci
René de Wild	Instruct
Roland Pelle	YoungCrowds