Rationales for Modern ICT Implementation into Schools

A case of tablet PCs

Bachelor's Thesis
Educational Science & Technology

August 2013
P.J. Smits
Educational Science and Technology – University of Twente

Bonhoeffer college

UNIVERSITY OF TWENTE.

Rationales for Modern ICT Implementation into Schools: a case of tablet PCs

Contents

Abstract

In the last few decades, ICT has strongly influenced society as well as education as it has become a ubiquitous part of daily life offering access to a world of knowledge. Schools try to match these changes by incorporating ICT in their education. This study explores a school's rationales for using ICT by means of a case study in which parents, teachers and management involved in a pilot project concerning the implementation of iPads are informed about their motives to use ICT. Interview data were combined with questionnaire data and analysed. Support was found for a *preparative* rationale, a *pedagogical* rationale, a *catalytic* rationale, an *accessibility* rationale, a *motivational* rationale and an *administrative* rationale. In addition, some differences between the stakeholder groups were found, which need to be bridged in order to build a widely supported vision and policy plan on educational ICT use.

Introduction

With the introduction of the iPad in 2010, the concept of modern tablet PCs was redefined to a simpler, touch-enabled and lightweight mobile device (Waters, 2010). These properties, together with its steep learning curve, had drawn the attention of schools as it was possibly the device teachers had been longing for to address the changing needs of 21st century students (Heick, 2012; Manuguerra & Petocz, 2011). Various schools have started pilot projects to explore the educational possibilities of tablet PCs. As with many earlier technological innovations, a great amount of potential was attributed to these devices. On the one hand, it overcomes a number of problems of older technologies such as desktop and laptop computers, such as limited mobility, battery life, boot time and ease of use. On the other hand, it could offer pedagogical advantages like mobile learning (m-learning), media creation, productivity, collaboration and augmented reality (Cochrane, Narayan, & OldField, 2013).

The Bonhoeffer College in Enschede, The Netherlands, is a group of secondary schools that has adopted iPads since September 2011. They started a pilot with about 120 first-year pupils (aged 11 to 13 years), spread over the various schools. This pilot was extended in 2012 with another 400 first-year pupils, completely replacing all paper text books. The school's management had decided to start the pilot, because they regarded the iPad as a promising educational tool. In this pilot the school is trying to further determine the tablet PC's educational possibilities and added value regarding teaching practice, learning outcomes and educational organisation. Moreover, they want to use their experiences in the pilot to develop their school's ICT policy. The school has aimed at fully replacing all text books within five years (Gijzemijter, 2012).

The school's educational ICT policy plan that should guide this educational reform was still largely to be developed. After the second pilot year, the school was interested in mapping out where it came from and what it was aiming for. The latter required an ICT policy with a certain vision. According to the literature, the starting point of the development of a new (technological) plan is at the core: the school's vision on teaching and learning (Fullan, 2007; Vanderlinde et al., 2008). Subsequently, the school can build their ICT policy plan matching their educational philosophies. For this building process, it is essential to engage the entire system of actors and stakeholders (Fullan, 2007; Tondeur, van Keer, van Braak, & Valcke, 2008).

This study aims at aiding this development of an organization-wide shared vision on educational ICT use. Within the organization of a school, various stakeholder groups can be identified. Each group has its own rationales for ICT use in education which should all be incorporated in the school's ICT vision. For this study, three stakeholder groups were selected. Firstly, the management as the gatekeepers of innovation in their school, secondly, the teachers as they determine the success of the innovation and lastly, the parents as their support is also needed for a successful innovation (Fullan, 2007). It is particularly important to examine the differences in opinions of different stakeholders on these rationales. Mapping out these opinions will provide an insight into the differences to be overcome in order to shape a broadly supported ICT policy. By bridging the gaps between the stakeholders' opinions, the school can engage the stakeholders in the change which is essential for success (Donnelly, McGarr, & O'Reilly, 2011; Fullan, 2007).

Theoretical framework

The starting point of this study are the six rationales of schools to adopt information technology (IT) in schools, which were discerned by Hawkridge in 1989. He based his findings on research data from Third-World countries. These rationales determine the focus of the national and school policies on implementing IT in their education, as well as, to a certain extent, their practices (Hawkridge, 1989).

Firstly, he described a *social rationale* which aims at preparing students for their place and functioning in society. His *vocational rationale* also has a preparatory character, but focuses on the professional career and future job of the student. Not only can the purpose of education, but also education itself can be supported by IT. Mainly based on (social) constructivist theories, the *pedagogical rationale* assumes to achieve better learning processes and outcomes using IT. Moreover, Hawkridge argued that IT can act as a catalyst to enable educational innovations or even revolutions in his *catalytic rationale*. A somewhat different rationale is the *IT industry rationale* which presumes a pressure from commercial IT companies upon governments and schools to prescribe and use their hardware and software. Finally, he described the *cost-effectiveness rationale* which implies that the integration of ICT in schools will lead to cost savings in education, for example by possible savings on printing costs and teachers (Hawkridge, 1989).

IT has developed rapidly and its possibilities have been extended dramatically since Hawkridge's study. As in the 80's and 90's IT comprised mainly personal computers (PCs), nowadays this has been extended to many more forms and devices such as laptops, smartphones and tablet PCs. Along with the rise of the internet and related applications this has developed into a more ubiquitous user experience and an *information society* organized accordingly (Westerlund & Kaivo-oja, 2012). ICT[1] not only has had an increasing impact on society, but also on education. Since the industrial age, our society shifted into the information age at the start of the 21st century. Even more recently, scholars are referring to the *network age* (Ham & Cha, 2009; Ward & Parr, 2011), for which education, in turn, should prepare the students. In school visions of this network age, the boundaries of schools as formal learning institutions are fading as home and mobile learning are becoming more socially linked (Ward & Parr, 2011) and learning activities shift from taking place in school buildings to its surroundings and at home, independent of time and place (Felix, de Hond, Verhulp, & de Vries, 2012). Understandably, over the past years, these societal changes of digitalization have increasingly attracted the interest of schools and teachers (Wang, 2008).

Because these developments of ICT, society and education, a literature review (Smits, 2013) was conducted to determine the current relevance of Hawkridge's rationales as well as to explore potential new rationales that can be identified. This study showed very limited support for the IT industry and cost-effectiveness rationales in literature. However, the other four rationales proved to be quite relevant at this moment. Mainly due to the emergence of the Internet, the increased usability of ICT applications and the overall permeation ICT in everyday life of society (Ward & Parr, 2011), some additional rationales can be added. Firstly, the *accessibility rationale*, aiming at equal and easy access to education. On the one hand, there is the equity in the sense of unbound access to education and knowledge, without time or place restrictions. On the other hand, there is equality in the sense of equalizing chances to participate in society for both disadvantaged and gifted people. The *motivational rationale* is another perspective that was not mentioned by Hawkridge. However, literature suggest that it might be a valid rationale for schools to adopt ICT. Motivation by ICT use can have various causes. Not only are the students, especially the younger generation, attracted by ICT itself, ICT can also foster more engaged learning activities. Moreover, using the current ICT devices in the classroom also reflects the students' own living environment outside school. The last additional rationale is the *administrative rationale*, which encompasses the use of ICT in schools for executing managing, administrative, planning and monitoring tasks more efficiently. This rationale is not directly linked to schools' main directive to prepare their students, but rather related to organizational processes supporting this task.

---

[1] Because of the increasing emphasis on communication through technology and the ever growing role of communication in all of the mentioned rationales, in this paper, the term *information and communications technology* (ICT) will be used rather than *information technology* (IT).

However, for the current efficiency of schools, the student monitoring systems are practically indispensable (Smits, 2013).

Because of the growing pervasiveness of ICT in society and education as well as the increasing possibilities of ICT devices and applications, it is getting harder to clearly discern the different rationales. As scholars indicate, "*…these rationales are clearly intertwined*" (Aesaert, Vanderlinde, Tondeur, & Braak, 2013, p. 144) and "*these […] rationales are not mutually exclusive [..., but rather] mutually reinforcing*" (Kozma, 2008, p. 1089). For example, both the social and vocational rationales are covered by the concepts of *21st century skills, ICT literacy* and *lifelong learning.* 21st century skills encompass amongst others collaboration, social and cultural skills, citizenship, creativity, problem-solving, and entrepreneurship (Voogt & Roblin, 2012). Moreover, *ICT literacy* or *digital literacy* is appointed as one of the eight key skills essential for lifelong learning by the European Parliament as this enables learners to adapt to the changing information society (Aesaert et al., 2013). Karagiorgi (2011) even depicts ICT literacy as the third most important skill, next to text literacy and numeracy, to prepare for working and life in a knowledge-based society. *Lifelong learning* skills in the essence of acquiring necessary skills and knowledge is also increasingly important to the work force (Plomp, Pelgrum, & Law, 2007). This depicts its grown significance exceeding the border between the social and vocational rationales. Moreover, Tondeur, Van Braak and Valcke (2007) notice a convergence between the social and vocational rationale. They underline the great importance of these rationales in current curriculum developments. Due to this growing convergence of the social and vocational rationales, it can be suggested that they may be considered as one *preparative rationale*: using ICT to prepare students for their future life by equipping them with the required (ICT) skills.

Another example of intertwined rationales is the *ubiquitous learning* aspect of both the pedagogical and accessibility rationales. On the one hand, ubiquitous access to instruction and learning materials through ICT not only enriches the curriculum, as the pedagogical rationale assumes (Hawkridge, 1990), as an on-demand learner-centred assistant. On the other hand, ubiquitous access to instruction has practical advantages for unbinding learners from distance and time barriers. However, these advantages also imply classroom management issues as teachers now must be able to cope with students in various locations and differing progresses (Peng, Su, Chou, & Tsai, 2009). However, a clear distinction still can be made between these two rationales.

To summarize, for this study, the following six concise rationales were identified:

1. The **preparative rationale**:
   using ICT to equip students with required skills for their future social and vocational functioning;
2. The **pedagogical rationale**:
   using ICT to improve student learning, understanding and retention;
3. The **catalytic rationale**:
   using ICT to enable and stimulate educational change;
4. The **accessibility rationale**:
   using ICT to equalize access to education unbound of time and location from the needs of every student;
5. The **motivational rationale**:
   using ICT to motivate students to engage in learning activities;
6. The **administrative rationale**:
   using ICT to monitor students and manage educational organizational processes and components.

Integrating ICT in education is not an automatic guarantee for success and improvement. It requires curricular change, which is in turn a complex process and dependent on various variables (Voogt & Pelgrum, 2005). One of the important variables is the school's shared ICT policy plan. In this plan a vision is created and supported by the entire school (e.g., teachers, ICT coordinators, staff and management alike) (de Koster et al., 2009; Vanderlinde, van Braak, & Dexter, 2012). That is why it is essential to examine how this vision is expressed in the school's curriculum.

To help analysing a school's curriculum, Van den Akker (2003) suggests a distinction between five curricular levels: *supra* (international), *macro* (national), *meso* (school), *micro* (classroom) and *nano* (individual). Each level can be related, to a certain extent, to the various rationales. For this study, the latter three are most relevant. Table 1 provides an overview of the mentioned rationales and the curricular levels at which they are mainly manifested according to literature. Two marks (crosses) imply a greater influence. An empty cell does not imply that there is no influence at all, but that the influence is expected to be limited to a rather small extent.

The school's management, at meso level, can be expected to be rather focussed on administrative rationale as school leaders are required to account for the school's efficiency and organization of change (Fullan, 2007; Odhiambo & Hii, 2012; Tondeur, Devos, Van Houtte, van Braak, & Valcke, 2009). However, they should also be concerned with the core purpose of the school (preparing students for their future), the pedagogies involved in this process (Vanderlinde, Dexter, & van Braak, 2011) and possibly the urge to reform their education aided or inspired by technological affordances. At the micro level, the teacher might be expected to be most concerned with changes to his pedagogical practices as these are his core business (Donnelly et al., 2011). Moreover, at classroom level, the teachers are the ones who can decide to deploy for example distance education tools fitted to their educational style or to match the classroom ICT use to address the students' motivation. The nano level is described as the personal teacher-student interaction (van den Akker, 2003). However, it can be discussed that the parent can be indirectly representing this level as he tends to be focussed on the educational activities related to his own child, rather than classroom or school level concerns (Fullan, 2007). In this respect, the parent might be inclined to value the needs of his child mostly. These needs are addressed in the greatest extent by the pedagogical rationale (e.g., differentiated learning) and motivational rationale.

Table 1
Expected influence of the rationales on the curricular levels.

Rationale	Meso *school*	Micro *classroom*	Nano *individual*
Preparative	×	×	×
Pedagogical	×	× ×	× ×
Catalytic	×	×	
Accessibility		×	×
Motivational		×	× ×
Administrative	× ×	×	

Based these premises, it can be expected that the focus of the school's management at the meso level will differ from that of the teachers at the micro level. However, because the influence of rationales of higher levels also influence lower levels, similarities amongst the levels may also be expected. Management will not only be affected by its own policy, but also by national policy. Moreover, the teacher's vision on ICT use will be influenced by national policy, mediated by the management (Law, Lee, & Chan, 2010).

Research question

This study aims to identify a school's rationales for implementing ICT in their education with their recently started tablet PC pilot as a leading example. These rationales reflect the possible expectations for implementing ICT in education the stakeholders might have. This puts forward the following main research question:

What rationales do principals, teachers and parents of the Bonhoeffer College in Enschede have to implement ICT in their education?

In order to analyse the possible gaps between the stakeholder groups' opinions, the first sub question is *"what are the similarities and differences between the rationales for ICT use in education between the stakeholder groups?"* Lastly, a second sub question can be added to verify the validity of the newly added rationales in a practice case: *"to what extent do the accessibility, motivational and administrative rationale prove to be valid?"*

Method

Research design

This research is designed according to Yin's embedded single case study design (Yin, 2003). It is a mainly qualitative study aimed at examining a certain decision, in this case the rationales for the implementation of iPads at the Bonhoeffer College. The qualitative data are backed by quantitative data. The case of the iPad pilot consisted of three units of analysis: management, teachers and parents. A qualitative study design was chosen in order to be able to deepen out the motives of the various stakeholders. As Yin (2003), Cohen, Manion and Morrison (2011) and Baarda, De Goede and Teunissen (2009) indicate, a case study has no clear distinction between the examined event and the context. This also applies to this study where the implementation of tablet PC's was part of general curriculum innovation and educational developments in using ICT. In order to create a picture as complete as possible, data from different levels have been collected. The data came from a document analysis, interviews and questionnaires.

Respondents

This study was aimed at management, teachers and parents as stakeholder groups in the implementation of ICT and specifically tablet-PCs at the Bonhoeffer College in Enschede, The Netherlands. The management represented the curricular meso level, the teachers represented the micro level and the parents indirectly represented the nano level. The students themselves are not part of the scope of this study. This is partly because it was assumed that the young targeted group would not have a clear vision of ICT use in education and partly to keep this study manageable. From the management, the current and former chairmen of the central directorate were invited for the study. Both of them were the original initiators of the iPad pilot project.

At three schools that participated in the iPad pilot for the second year, the team leader was asked to select one teacher with a rather positive attitude towards using ICT, one teacher who has a rather negative attitude towards using ICT and one teacher that has a neutral point of view in this regard. Moreover, the teachers were selected across various subjects. Table 2 gives an overview of the participating teachers.

Table 2

Participating teachers

Teacher #	Attitude towards ICT use	Subjects taught
1	Positive	mathematics
2	Neutral	physical education
3	Negative	mathematics
4	Positive	geography, history
5	Neutral	biology, health
6	Negative	Dutch, English
7	Positive	history, social studies
8	Neutral	mathematics, English, philosophy of life
9	Negative	Dutch, physical education

All parents of the roughly 400 first year students from the iPad pilot classes were invited to fill out a questionnaire, which was distributed by the team leaders. The 23 parents that participated represented 6% of the total parent population. The participating parents were all parents from lower secondary professional education (vmbo) students. 74% of the participating parents was aged between 35 and 45 years and 26% was aged between 46 and 55 years. Also, 74% of the parents had a Dutch nationality, whereas 13% had a Turkish nationality and 13 % had other nationalities.

Instruments

For this study a questionnaire and an interview were employed. In this section both instruments will be described.[2]

Questionnaire

The questionnaire was aimed at determining the importance of the rationales as perceived by the stakeholders. Therefore a list of 25 main reasons for adopting ICT in education was constructed using the SITES questionnaires (2006), and Twining's dICTatEd rationales (2007). These questions were translated into Dutch and adjusted for each target group. The reasons were also supplemented with findings from the literature review (Smits, 2013). These reasons were then combined to form scales corresponding to the first five rationales. At the moment of constructing the questionnaire, the literature review was not completed. Therefore, the administrative scale was initially not included in the questionnaire. All reasons were rated by the respondents on a four point scale. This even number of points forced the respondents to make a choice between important and not important reasons. The scale was divided in the following options: *completely not important, barely important, reasonably important* and *very important*. The ratings were scored from 1 till 4 respectively. In addition, the respondents were asked to rank their five most important reasons from 1 (most important) to 5 (fifth most important). Table 3 provides an overview of the reasons used in the questionnaire.

The questionnaire was answered by teachers and management during the interviews. The parents were invited to fill out the questionnaire on paper or online. For the parents, the questionnaire was reformulated to accommodate the understanding of less educated and foreign parents. Also, this questionnaire was tested by a primary school teacher who deals a lot with foreign parents.

---

[2] The exact used questionnaires can be requested from the researcher.

Table 3

Reasons for using ICT in education with corresponding rationales

Reason	Rationale
1. To prepare students for their future functioning in society.	Preparative
2. To prepare students for their future job / occupation.	
3. To teach students the value of computers (appreciation).	
4. To teach students to cooperate.	
5. To teach students to communicate.	
6. To teach students to use ICT responsibly and know the risks.	
7. To teach students to find and evaluate information.	
8. To strengthen students' problem solving skills.	
9. To offer students' insights and skills in the possibilities of ICT applications.	
10. To interest / motivate students for a future job in the ICT industry.	
11. To support the students' learning process.	Pedagogical
12. To engage students in their learning process.	
13. To adapt / differentiate the education to fit the students' needs.	
14. To offer authentic learning environments.	
15. To monitor the students' learning progress.	
16. To involve parents in the students' learning process.	
17. To reform the school's education.	Catalytic
18. To express the educational vision.	
19. To help realise a planned educational reform.	
20. To make education accessible for students with learning problems.	Accessibility
21. To reduce inequalities in opportunities between students and groups.	
22. To realize distance education.	
23. To realize education unbound of school hours.	
24. To motivate / inspire students to learn.	Motivational
25. To align education to the living environment and interest of the students.	

The reliability of the underlying constructs was assessed with SPSS. The Cronbach's alpha for the preparative construct was α = 0.73, for the pedagogical construct α = 0.79, for the catalytic construct α = 0.67, for the accessibility construct α = 0.62 and for the motivational construct α = 0.65. For the preparative and pedagogical constructs, this implies a respectable internal consistency. For the other constructs the internal consistency is acceptable (DeVellis, 2003). No great differences in the Cronbach's alphas would be attained by deleting items.

Interview

To explore the opinions of teachers and management, an interview was employed. These interviews were semi structured, guided by the questionnaire. The interviews were tested beforehand with a manager and teacher from another school in the west of The Netherlands. This allowed for some uncertainties and ambiguities to be prevented. The interviews were recorded and written out. A codebook has been developed to reflect the characteristic elements of the rationales for ICT use in education based on the literature study. The coding was done using the qualitative data analysis software Atlas.ti by the researcher. Also, one teacher interview and one management interview were coded by a second independent coder. The inter-rater reliability was calculated with Fleiss' kappa (Fleiss, 1971) and scored κ = .80, which testifies of a substantial agreement according to Landis and Koch (1977).

Procedure

The instruments were constructed using the findings from the literature and previous questionnaires. The interviews were conducted during two months. During the second month, the parent questionnaires were distributed and collected. This was followed by a transcription of the interviews. After this, the data was analysed and a reported in this scientific article.

Data analysis

The data from the questionnaires were entered in and analysed with the statistical analysis software package IBM SPSS Statistics 21. Because of the limited number of respondents, no statistical tests were applied, but merely descriptive statistics (means and standard deviations) were used. The coding and analysis of the transcribed interviews was done with support of the qualitative data analysis software Atlas.ti 7.

Results

The results of this study are presented per rationale for the qualitative data from the interviews[3]. This is followed by the quantitative data from the questionnaire.

Interviews

Preparative rationale

In the interviews, many teachers as well as the management indicated the use of ICT in education is essential or even inevitable in order to prepare students for their future. They all strongly believed that ICT will be an increasing part of the future. As they indicated:

> *"I think that we can no longer go around using ICT. It is the communication and work tool of the future. Therefore, you have a lot to do with it." – Teacher 5*

> *"It would be mad if schools would not use ICT. There, where you prepare children for their future in society." – Manager 2*

As part of preparing students for their future, mainly the teachers put an emphasis on teaching students to use ICT responsibly. In this respect, many teachers mentioned the risks of ICT, like fraud and bullying. Another evident purpose of ICT use, according to the teachers, was teaching students the skills of collecting and evaluating information. In this context, they referred to media awareness (Dutch: *mediawijsheid)* and the ability to assess the trustworthiness of sources and information.

> *"Where do you get your information, how do you know whether to trust it? They [students] look up everything on the internet these days." – Teacher 9*

The respondents showed little support for the use of ICT to equip students with cooperation and communication skills. The management explained that they did not expect that ICT would foster these skills. The teachers concurred with the management on this point. They often designated computers as individualistic, especially the 1-on-1 devices such as tablet PCs. Also, they believed that these skills had better be learned in an off-line environment. This indicates that these specific aspects of the preparative rationale, in contrast to the other aspects, were not supported by the participating teachers and managers.

---

[3] For this research report, the respondents' quotes were freely translated from Dutch into English.

Pedagogical rationale

Related to the pedagogical rationale, teachers and management both underline the pedagogical and didactic advantages of ICT use to support the learning process.

> *"I think students can develop themselves better thanks to ICT." – Teacher 8*

In line with the response related to the previous rationale, the respondents also acknowledge the added value of the access to information via the internet for the pedagogical practices. Students need to use and develop their research skills to be able to acquire the relevant information, e.g. to prepare for class. Many teachers added that they regularly challenge their students to find information.

> *"When they start asking questions themselves and think about it themselves, they much more start looking for the right answer themselves, instead of serving them cut-and-dried answers as a teacher." – Teacher 4*

Both managers denominated the easy and direct access to information and knowledge from all over the world as one of the main reasons for starting the iPad pilot.

Other benefits of ICT use in education repeatedly stated by both teachers and management were the activating teaching methods, enabled by videos, animations, visualizations, models and simulations. These were related to authentic learning environments and attributed to helping the student better understand the subject matter. Also, analysing recordings of their own performances was mentioned by some teachers as an example.

> *"ICT makes everything clearer, I think. It allows for better insights, rather dry theoretical matters." – Teacher 4*

> *"I try to make it attractive by making them do things themselves, finding things out and let them watch films and animations. [...] They can go anywhere, illuminate the subject from differing angles, so the learning environment is no longer the classroom and the teacher, but rather the whole world." – Teacher 5*

Although teachers did not consider ICT as a tool to teach cooperation skills, some did mention the possibilities to cooperate, as ICT offers more possibilities for attractive group assignments, in relation to the support of the learning process. Manager 1 also noted that, against his expectations, cooperative learning was most successful at the lowest educational levels in the iPad pilot.

Management as well as teachers saw the possibilities of ICT for differentiated or learner-centred learning. Although they admit that most current ICT applications do not offer this to its full extent yet, they believed that this would be the case in the near future. Every student would then be served according to their personal learning tempo, qualities and progress with limited interference of the teacher.

> *"As school, we would have a subscription for all content which then is tailored to the student." – Manager 1*

Lastly, related to using ICT to support the learning process, both teachers and managers mention the significance of engaging parents in the learning process. Not only by sharing test marks via an online parent portal, but also by sharing homework plans and extra exercise materials. Some teachers indicated that the weaker students already do practice online exercises at home with their parents.

> *"Parents should always be involved in education, that is, they have a right to information, they should be able to help their children at home, have access to the portals containing homework, study planners and grades, etcetera." – Manager 1*

Catalytic rationale

In light of using education to foster educational change, most teachers and managers regarded ICT as both a cause of innovation and as a tool to support innovation. Although, more teachers would have rather seen ICT as a supportive tool regarding innovations. Within the catalytic rationale, the respondents related the innovative power of ICT mainly to its new possibilities and facilities.

> *"I notice I can offer my students a lot more possibilities by opening a digital world for them to get to work with." – Teacher 7*

The management started the pilot to explore the possibilities of the iPad and whether teachers and students would be able to make use of these opportunities. Moreover, they believed it could overcome a lot of practical issues of former devices like laptops and PC rooms in schools.

> *"I was wondering whether the iPad would be a good tool for education."*
> *– Manager 2.*

Not everyone was convinced of it merits, but about half of the teachers, mainly the teachers with a positive attitude towards ICT, acknowledged the advantages of educational innovations and improvements due to ICT.

> *"Yes, but that does not necessarily have to be a bad thing, I think. If you have been teaching in the same way for thirty years, you are not doing well. You should then be forced to change your practice." – Teacher 4*

According to some, another force of educational innovation by ICT, was the need to fit the societal developments as a school.

Accessibility rationale

Most teachers and managers explicitly reported that they did not find it desirable to use ICT to enable distance education or education outside of school hours. This was mainly attributed to the fact that they believed that students at these ages need the social contact, structure and regularity a school offers. One manager added:

> *"You must remember that students do not go to school to learn, but to meet each other. That they have to learn something is a kind of minor detail. […] but they also have a need for structure. Very important: order and regularity as something to hold on." – Manager 1*

However, the teachers did see the possibilities for distance education and education outside school hours for students with illnesses or other limitations. Also they said that ICT could help students with lagging performance or disabilities.

> *"I have a student who creates everything on his laptop and then sends to me. He cannot write." – Teacher 6*

Another teacher even depicts this as the most valid reason for using ICT.

Motivational rationale

Using ICT to motivate students was a reason that nearly all respondents could attribute to. They indicate that using ICT itself as well as ICT's characteristics such as visual appeal and gaming components are a great cause of motivation for most students. Some said that part of this motivation will decrease when the novelty has worn off.

> *"In 1983, we got the first 15 computers in the classroom […] and suddenly the students were motivated to learn. I saw how students were hanging on my lips and were challenged to explore things." – Manager 1*

> *"It seems that badges/challenges are actually going to make it entirely. Gaming works well, that is all emerging." – Teacher 7*

Another motivator for students was reported to be the possibility to engage the students in their learning process. ICT was said to enable more interactive learning environments with discussions and student input rather than consumptive behaviour.

Lastly, both teachers and managers indicated that it is important to fit education to the living environment of the students and their daily ICT use outside school.

> *"For students, the digital and physical world are one. For current teachers, these are separate worlds." – Teacher 7*

Administrative rationale

Not mentioned by management, but by teachers, was the use of ICT for the purpose of their student administration. They mentioned registration of grades, absence, learning progress, homework checks and planning.

> *"I use ICT for reporting, administration, planning, etcetera. […] you can handle these things instantly at any given moment." – Teacher 2*

Teachers also mentioned the automated process of grades that they have entered in the student management system being presented to the parents through the online parent portal. However, they think that not every parent is evenly aware of the information about their child.
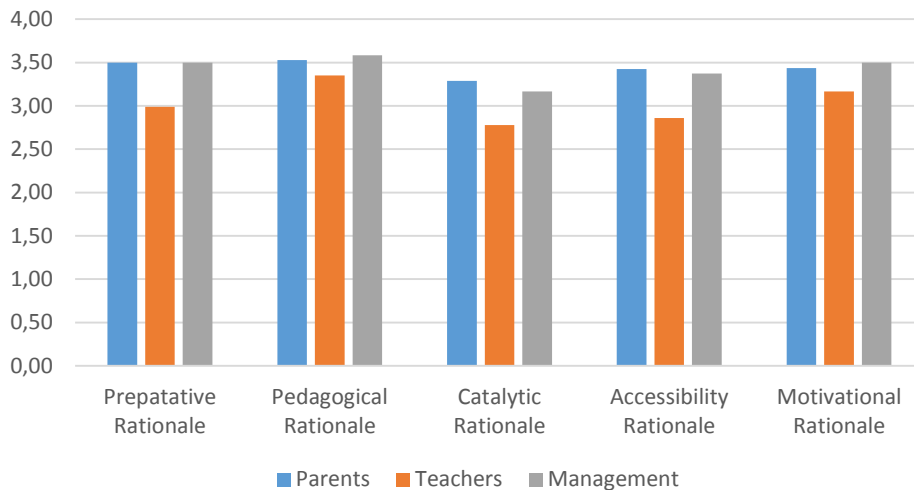
Questionnaires

In this section, the results from the questionnaires will be presented. Firstly, the mean ratings and standard deviations of the rationales are portrayed per stakeholder groups in table 4. Figure 1 provides a clear visual representation of the means per stakeholder groups. For these representations, the ratings of the reasons were added up for each rationale and divided by the number of reasons per rationale.

Parents and management show similar ratings. A slight preference on the pedagogical rationale over the other rationales can be seen for all groups. The catalytic rationale is rated lowest for all groups. The greatest difference between the groups can be seen in the preparative and accessibility rationales.

Table 4

Mean ratings and standard deviations per rationale by stakeholder group

Rationale	Parents			Teachers			Management		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Preparative	23	3.50	.30	9	2.99	.35	2	3.50	.42
Pedagogical	23	3.53	.45	9	3.35	.52	2	3.58	.35
Catalytic	23	3.29	.61	9	2.78	.58	2	3.17	.71
Accessibility	23	3.42	.54	9	2.86	.47	2	3.38	.53
Motivational	23	3.43	.55	9	3.17	.50	2	3.50	.71

Figure 1

Chart showing the mean ratings per rationale by stakeholder group

In the second part of the questionnaire the respondents were asked to create a top-5 ranking of the 25 reasons. For the analysis, the most important reason was scored 5 points up to the fifth most important which was scored 1 point. These scores were used to determine the highest ranked rationales per stakeholder group. The results are displayed in table 5.

Table 5

Top 5 ranked reasons with corresponding rationales by stakeholder group

#	Parents		Teachers		Management	
	Reason	Rationale	Reason	Rationale	Reason	Rationale
1	1	Preparative	11	Pedagogical	11	Pedagogical
2	6	Preparative	7	Preparative	13	Pedagogical
3	2	Preparative	1	Preparative	1	Preparative
4	21	Accessibility	15	Pedagogical	23	Accessibility
5	5	Preparative	13	Pedagogical	7	Preparative

This table shows a greater difference between the groups. The parents' rankings show a great emphasis on the preparative rationale, whereas teachers and management also highly ranked the pedagogical reasons. Both parents and management also have a reason from the accessibility rationale in their highest rankings. The motivational and catalytic rationales were ranked lower by all groups.

Discussion

Based on the input of management, parents and teachers, this study was aimed to support the development of a shared vision amongst various stakeholders by providing a coherent structure and clearly defined terminology (Twining, 2007). Such a widely supported vision, tuned to the character of the school, is essential for a successful educational innovation (de Koster et al., 2009; Tondeur, Braak, & Vanderlinde, 2008). To do so, this study tried to explore the various opinions from three stakeholder groups (parents, teachers and management) regarding rationales for ICT use in education.

Firstly, the results will be discussed to regarding the first sub question, *what are the similarities and differences between the rationales for ICT use in education between the stakeholder groups?*

Both the quantitative and the qualitative data show a general tendency towards the pedagogical rationale as the most important for management and teachers. In this rationale, the stronger emphasis was placed on the support of the learning process by engaging students, offering learner-centred education and using animations and visualizations. This is in line with the literature which states a trend from a social (preparative) rationale towards a pedagogical rationale as the prominent rationale for schools to use ICT (Tondeur et al., 2007; Voogt, 2008). In contrast, the ranking data from the questionnaire suggest a slight tendency towards the preparative rationale as the parents' most important rationale. This can be caused to the fact that parents often tend to compare the education of their child to their own education (Fullan, 2007). Which, traditionally, was more centred at preparative rationales. Educational science, however, has developed in the meantime.

Next to the pedagogical rationale, teachers also highly valued the preparative rationale. However, they emphasized that communication and cooperation skills are not skills that are likely to be learned using ICT. This is also the case for the management. It should be noted however, that the respondents did indicate the value of communicating and cooperating through ICT, but rather as a tool aiding the learning process, thus supporting the pedagogical rationale. The fact that the preparative rationale scored highly with all stakeholders might also be due to its close relation to the general purpose of education: preparing students for their future. A difference within the preparative rationale between teachers and management is that teachers indicated that learning to collect and evaluate information is an important reason to use ICT, whereas management rather attributed the access to information as a great tool to support the learning process in the pedagogical rationale. This draws a different view than that was drawn in the theoretical framework. However, it is in concordance with Voogt's finding that science teachers, although from one school grade higher, perceive a large impact on students' information handling skills by using ICT (Voogt, 2009).

The motivational rationale might be indicated as the third most important rationale by the stakeholders. Voogt also found that ICT was perceived by teachers to have a relatively high impact on learning motivation (Voogt, 2009). All respondents acknowledge the attractive qualities of ICT for students, encompassing learning with ICT itself as well as aligning school ICT use with ICT use at home. Some teachers even indicated using ICT as motivating for themselves. Within this rationale no great differences were found, indicating that the visions regarding this rationale of the stakeholder groups are aligned.

The accessibility rationale appeared to be only partly supported in practice by the stakeholders. This was mainly caused by the fact that the aspects of distance learning and learning outside school hours were regarded as unsuitable for the targeted students in secondary school (especially at vmbo level) by management and teachers. These students supposedly have the need for structure and regularity. However, the part of this rationale concerning equality for disadvantaged students is supported by all target groups, mainly parents. The latter finding is also in accordance with Fullan's finding of parents

being mainly concerned with the advantages for their own child (Fullan, 2007). Interestingly, the teacher who held the most negative attitude towards ICT, indicated that using ICT in respect of the accessibility rationale, was the only valid reason for using ICT in his teaching practice.

Concerning the catalytic rationale, differences can be seen between the stakeholder groups. Management considered ICT more as a cause of educational reform rather than a tool for realising planned innovation. In contrast, most teachers regarded ICT as a tool for educational innovations whilst acknowledging ICT developments as a source of new possibilities enabling educational innovations. It can be reasoned that teachers consider this rationale least favourable. They are the key stakeholders to actually need to cope with the practical changing use of ICT, sometimes leading to conflicting interests (Donnelly et al., 2011; Voogt, 2008).

Although the administrative rationale was not employed in the questionnaire, it may be expected that, as parents are not concerned with the school's administrative businesses, they would not be inclined to value this rationale highly. In contrast, some of the teachers did explicitly add administrative motives for using ICT in education in addition to the proposed rationales. However, in contrast to the expectations from the theoretical framework, the results seem to indicate a stronger attribution to this rationale amongst teachers compared to management. Possibly, management expected that the administrative concerns are to be dealt with by supporting administrative staff.

The second sub question, *to what extent do the accessibility, motivational and administrative rationale prove to be valid?* can be answered by a second look at the results and discussion sections. All three of them seem to have had some sort of support by the respondents. The motivational rationale was most clearly supported. Due to the nature and needs of the students in puberty, only part of the accessibility rationale was supported by the stakeholders. The administrative rationale was mainly supported by teachers.

Limitations

Some limitations of this study can be identified. Firstly, the lack of qualitative data from the parents can be considered a shortcoming. These data might be able to shed a light on the underlying motives of the parents. Moreover, the parents with higher educational levels should have been included. Secondly, because of the fact that the number of respondents was relatively low, the results can merely give a suggestion of reality. It should also be noted, that all participating parents had their children in lower secondary professional education (vmbo). Results might have been different when parents from children spread over all educational levels were included.

Conclusion

This study aimed to identify a school's rationales for implementing ICT in education with a special focus on their recent tablet PC adoption. The results from this exploration can be used to start the debate for creating a shared school-wide vision and policy plan on ICT use (Vanderlinde et al., 2008). For this purpose, a set of six rationales was used as a starting point. This set encompassed a *preparative* rationale, a *pedagogical* rationale, a *catalytic* rationale, an *accessibility* rationale, a *motivational* rationale and an *administrative* rationale. These rationales are closely interrelated and intertwined.

These rationales were validated by a case study of a secondary Dutch school in which tablet PC's were getting introduced. A selection of parents, teachers and management have answered a questionnaire to determine their motives for using education in ICT. In addition, the teachers and management were interviewed to further investigate their motives. These qualitative and quantitative data were analysed to answer the research question "*What are the rationales for using ICT in education according to the stakeholders?*" The data suggest evidence for every theoretical rationale. The strongest support was

found for the pedagogical rationale, closely followed by the preparative rationale. The management and teachers were most supportive of the pedagogical rationale, in contrast to the parents who were tending towards the preparative rationale.

The differences in opinions on ICT use in education between the stakeholder groups are important to be acknowledge and bridged. The school management is responsible to lead and to support the process of change by fostering collaboration and engagement amongst all stakeholder groups (Fullan, 2007; Odhiambo & Hii, 2012; Tondeur et al., 2009). Moreover, the parents and teachers should acknowledge each other as collaborative and complimentary partners in the education of the children (Fullan, 2007).

References

Aesaert, K., Vanderlinde, R., Tondeur, J., & Braak, J. (2013). The content of educational technology curricula: a cross-curricular state of the art. *Educational Technology Research and Development*, *61*(1), 131–151. doi:10.1007/s11423-012-9279-9

Baarda, D. Ben, de Goede, M. P. M., & Teunissen, J. (2009). *Basisboek kwalitatief onderzoek*. Groningen: Noordhoff Uitgevers.

Cochrane, T., Narayan, V., & OldField, J. (2013). iPadagogy: appropriating the iPad within pedagogical contexts. *International Journal of Mobile Learning and Organisation*, *7*(1), 48–65. doi:10.1504/IJMLO.2013.051573

Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education* (7th ed.). New York: Routledge.

De Koster, S., Kuiper, E., Volman, M., Tanis, M., Kral, M., de Vries, B., … Kok, R. (2009). *Eerst onderwijsvisie, dan techniek*. *Kennisnet Onderzoeksreeks ICT in het onderwijs* (Vol. 20). Zoetermeer: Kennisnet.

DeVellis, R. F. (2003). *Scale Development: Theory and Applications* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Donnelly, D., McGarr, O., & O'Reilly, J. (2011). A framework for teachers' integration of ICT into their classroom practice. *Computers & Education*, *57*(2), 1469–1483. doi:10.1016/j.compedu.2011.02.014

Felix, I., de Hond, M., Verhulp, E., & de Vries, L. (2012). Schoolmodel Steve JobsSchool. O4NT.nl - Onderwijs voor een Nieuwe Tijd. Retrieved from http://o4nt.nl/documenten/

Fleiss, J. L. (1971). Measuring nominal scale agreement among many raters. *Psychological Bulletin*, *76*(5), 378–382. doi:10.1037/h0031619

Fullan, M. (2007). *The New Meaning of Educational Change* (4th ed.). New York, NY: Teachers College Press.

Gijzemijter, M. (2012). Educatie: De iPad als leermiddel. *iPad Magazine*, (4), 136–141.

Ham, S.-H., & Cha, Y.-K. (2009). Positioning Education in the Information Society: The Transnational Diffusion of the Information and Communication Technology Curriculum. *Comparative Education Review*, *53*(4), 535–557. doi:10.1086/603584

Hawkridge, D. (1989). Machine-Mediated Learning in Third-World Schools? *Machine-Mediated Learning*, *3*(4), 319–328.

Hawkridge, D. (1990). Who needs computers in schools, and why? *Computers & Education*, *15*(1-3), 1–6. doi:10.1016/0360-1315(90)90121-M

Heick, T. (2012). The brief history of the iPad in education. *Edudemic*, *1*(1), 5–10.

Karagiorgi, Y. (2011). Locating ICT for primary education in a reformed Greek-Cypriot national curriculum: A documentary analysis approach. *Education and Information Technologies*, *18*(1), 47–68. doi:10.1007/s10639-011-9170-z

Kozma, R. B. (2008). Comparative Analysis of Policies for ICT in Education. In J. Voogt & G. Knezek (Eds.), *International Handbook of Information Technology in Primary and Secondary Education* (pp. 1083–1096). New York: Springer US. doi:10.1007/978-0-387-73315-9_68

Landis, J. R., & Koch, G. G. (1977). The Measurement of Observer Agreement for Categorical Data. *Biometrics*, *33*(1), 159–174. Retrieved from http://www.jstor.org/stable/2529310

Law, N., Lee, M. W., & Chan, a. (2010). Policy impacts on pedagogical practice and ICT use: an exploration of the results from SITES 2006. *Journal of Computer Assisted Learning*, *26*(6), 465–477. doi:10.1111/j.1365-2729.2010.00378.x

Manuguerra, M., & Petocz, P. (2011). Promoting Student Engagement by Integrating New Technology into Tertiary Education: The Role of the iPad. *Asian Social Science*, *7*(11), 61–65. doi:10.5539/ass.v7n11p61

Odhiambo, G., & Hii, a. (2012). Key Stakeholders' Perceptions of Effective School Leadership. *Educational Management Administration & Leadership*, *40*(2), 232–247. doi:10.1177/1741143211432412

Peng, H., Su, Y., Chou, C., & Tsai, C. (2009). Ubiquitous knowledge construction: mobile learning re-defined and a conceptual framework. *Innovations in Education and Teaching International*, *46*(2), 171–183. doi:10.1080/14703290902843828

Plomp, T., Pelgrum, W. J., & Law, N. (2007). SITES2006–International comparative survey of pedagogical practices and ICT in education. *Education and Information Technologies*, *12*(2), 83–92. doi:10.1007/s10639-007-9029-5

Smits, P. J. (2013). *Rationales for Modern ICT Implementation into Schools: A case of tablet PCs.* (Unpublished literature review). Universiteit Twente, Enschede.

Tondeur, J., Braak, J. Van, & Vanderlinde, R. (2008). Wat zegt het beleid van de school over het ICT-gebruik in de klas? *School & Begeleiding. Vaktijdschrift voor onderwijsadviseurs*, *14*, 1–11. Retrieved from http://mweb.bicat.com/blob/TONWZHB9999.pdf

Tondeur, J., Devos, G., Van Houtte, M., van Braak, J., & Valcke, M. (2009). Understanding structural and cultural school characteristics in relation to educational change: the case of ICT integration. *Educational Studies*, *35*(2), 223–235. doi:10.1080/03055690902804349

Tondeur, J., van Braak, J., & Valcke, M. (2007). Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology*, *38*(6), 962–976. doi:10.1111/j.1467-8535.2006.00680.x

Tondeur, J., van Keer, H., van Braak, J., & Valcke, M. (2008). ICT integration in the classroom: Challenging the potential of a school policy. *Computers & Education*, *51*(1), 212–223. doi:10.1016/j.compedu.2007.05.003

Twining, P. (2007). Discussing ICT, aspirations and targets for Education: international perspectives. *International Journal of Knowledge and Learning*, *3*(2/3), 154–170. doi:10.1504/IJKL.2007.015549

Van den Akker, J. J. H. (2003). Curriculum perspectives: an introduction. In J. J. H. van den Akker, W. A. J. M. Kuiper, & U. Hameyer (Eds.), *Curriculum landscapes and trends* (pp. 1–10). Dordrecht: Kluwer Academic Publishers.

Vanderlinde, R., Braak, J. Van, Windt, V. De, Tondeur, J., Hermans, R., & Sinnaeve, I. (2008). Technology Curriculum and Planning for Technology in Schools: The Flemish case. *TechTrends*, *52*(2), 23–26. doi:10.1007/s11528-008-0131-3

Vanderlinde, R., Dexter, S., & van Braak, J. (2011). School-based ICT policy plans in primary education: Elements, typologies and underlying processes. *British Journal of Educational Technology*, *43*(3), 505–519. doi:10.1111/j.1467-8535.2011.01191.x

Vanderlinde, R., van Braak, J., & Dexter, S. (2012). ICT policy planning in a context of curriculum reform: Disentanglement of ICT policy domains and artifacts. *Computers & Education*, *58*(4), 1339–1350. doi:10.1016/j.compedu.2011.12.007

Voogt, J. (2008). IT and curriculum processes: Dilemmas and challenges. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in Primary and Secondary Education* (pp. 117–132). New York: Springer US. doi:10.1007/978-0-387-73315-9_7

Voogt, J. (2009). How different are ICT-supported pedagogical practices from extensive and non-extensive ICT-using science teachers? *Education and Information Technologies*, *14*(4), 325–343. doi:10.1007/s10639-009-9092-1

Voogt, J., & Pelgrum, H. (2005). Ict and curriculum change, *1*(October), 157–175.

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21 century competences: Implications for national curriculum policies. *Journal of Curriculum Studies*, *44*(3), 299–321. doi:10.1080/00220272.2012.668938

Wang, Q. (2008). A generic model for guiding the integration of ICT into teaching and learning. *Innovations in Education and Teaching International*, *45*(4), 411–419. doi:10.1080/14703290802377307

Ward, L., & Parr, J. M. (2011). Digitalising our schools : Clarity and coherence in policy. *Australasian Journal of Educational Technology*, *27*(2), 326–342.

Waters, J. K. (2010). Enter the iPad (or not?). *T.H.E. journal*, *37*(6), 38–45. Retrieved from http://thejournal.com/articles/2010/06/01/enter-the-ipad-or-not.aspx

Westerlund, L., & Kaivo-oja, J. (2012). Digital Evolution – From Information Society to Ubiquitous Society. In T. Kuosa & L. Westerlund (Eds.), *Service Design: On the Evolution of Design Expertise* (pp. 137–154). Viljandi, Estonia: Lahti University of Applied Sciences.

Yin, R. K. (2003). *Case Study Research: Design and Methods*. Thousand Oaks, CA: Sage Publications.