

# Indicators for Measuring the Success of Video Usage in Public Services: The Case of Education

*Completed Research Paper*

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## Abstract

Despite the fact that governments continue to push the use of Information and Communication Technology (ICT) in public service provision, their adoption rate has not always been as high as expected. In this research, we focus on indicators that could lead to the adoption of video-to-video communication in education. With this aim we organized three focus groups with teachers from Ireland and Greece and one interview with the principal head teacher from an Irish primary school with the aim of understanding the most important criteria necessary for the adoption of video-to-video communication for collaborative education in primary and secondary schools. The paper presents the technical (network and application) and user (user experience and pedagogical) criteria that were identified through these focus groups.

## Keywords

Public services, education, video to video communication, adoption, collaborative learning

## Introduction

The use of Information and Communication Technology (ICT) in public services provisioning has seen a rapid increase in the last few years. Despite the promised benefits and high-level expectations regarding their adoption, some of the provided services have failed to meet initial expectations (Cordella and Contini, 2012; Ferro and Molinari, 2010; Hofmann, Räckers, and Becker, 2012; Norris and Reddick, 2013). Different factors have been reported in the literature to explain low adoption rates and the lack of involvement of the relevant stakeholders from the inception stages of projects is cited as one of the key factors for citizens reticence in using ICT services (Goel, Dwivedi and Sherry, 2012; Currie, 2012). In this research we are assessing what factors key stakeholders perceive as important to adopt video-to-video communication in the context of primary and secondary education.

Although the use of video-to-video communication in educational settings is not necessarily new, it is not widely used. Several factors have been identified that impede this communication such as (a) technical problems because of which in the educational context “it becomes an almost impossible goal” for teachers to follow best pedagogical practices (Burns, 2002), or could lead to losing children’s (Molnar, El-Haddadeh and Hackney, 2013; Papadopoulos and Voulagri, 2013; Payne et al., 2006) and teachers (Papadopoulos and Voulagri, 2013) interest and participation; and (b) lack of good infrastructure to deliver high quality video, without delays, necessary to see the details in certain taught procedures (Celikkan et al., 2013; Papadopoulos and Voulagri, 2013; Wise et al., 2013) that could lead to negatively affecting learning or intelligibility (Ghinea and Chen, 2008; Hooper et al., 2007; Laouénan and Stacey, 1999; Yang and Chen, 2007; Tran et al., 2013). Studies have also shown that although technology integration is considered essential in educational context (Blin and Munro, 2008; Mahdizadeh, Biemans and Mulder, 2008) teacher engagement is problematic (Ertmer et al., 2012). The aim of this study is to

determine if there are any other indicators that teachers view as critical for them to use this type of communication for collaborative activities between schools. To this extent, this study extends the work done in Molnar, El-Haddadeh and Hackney (2013) when determining the criteria viewed as important from the point of view of the principal of the school. In this study, we add the results obtained from three focus groups: one with Irish primary school teachers and another two with teachers from two Greek schools: one primary and one secondary and an interview with the principal (head) teacher from an Irish primary school. This data will allow presenting a more comprehensive view of the important criteria to be considered when deploying video-to-video technology in a primary and secondary educational setting.

To realize this research aim, this article is structured as follows. The next section presents previous work on the usage of video communication in educational settings and collaborative learning. The following section presents the research context in which this study took place. After this we present the focus group and interview set up, criteria obtained as a result of the study, followed by a discussion on the findings. The paper concludes by outlining the key findings, potential theoretical and practical implications for this research, presenting the limitations and pointing out future research directions.

## Video Usage in Education

Advances in telecommunications and multimedia encoding have made video-to-video communication possible. One of the public services in which this has seen an increased usage is education (Lawson et al., 2010). Initially, video-to-video communication has been used as a distance learning form characterized through its ability to provide simultaneously communications between students and teachers regardless of their location (Lawson et al., 2010, Offir and Lev, 1999). The usage of video-to-video communication has been seen as a means of increasing the students enrolled (Cochrane, 1996; Knipe and Lee, 2002), time and travel cost savings for both students and teachers (Lawson et al., 2010; Nilsen, Almas and Krumsvik, 2013), and as a cost-effective means of reaching students that otherwise would not have access to the same learning prospects (Bates, 2005). Video-to-video communication has also shown to increase the teachers experience by allowing teaching and learning to take place even when a physical meeting is not possible (Dal Bello et al. 2007). It has been also shown to enhance language learning (Reed and Akers, 2013; Yamada, 2009), improve student satisfaction with online courses (Lakhal, Khechine and Pascot, 2013; Schubert-Irastorza and Fabry; 2011) and promote collaborative activities (Lawson et al., 2010; Wright and Cordeaux, 1996; Smyth, 2005). Collaborative learning improves learning achievements and learner experience (Gokhale, 1995; Johnson and Johnson, 1986; Lawson et al., 2010; Smyth, 2005; Zha and Ottendorfer, 2011) and has been identified as a necessary and integral part of the knowledge creation (Scardamalia and Bereiter, 1996).

Research on the usage of video communication in educational settings has highlighted several challenges, especially related to the “inflexible reliance on technology” when there is no obvious fall back solutions in case the technology fails (Gillies, 2008). Most of the studies reported on the consequences a bad infrastructure has on learning especially in situations where it is necessary to see a high level of details and the video quality is affected (Celikkan et al., 2013; Papadopoulos and Voulagri, 2013; Wise et al., 2013). Application failures and connectivity issues have been reported to negatively influence the students and teachers willingness to continue using video communication (Molnar, El-Haddadeh and Hackney, 2013; Papadopoulos and Voulagri, 2013; Payne et al., 2006). Moreover, as social interaction is an important component in supporting learning (Bates, 2005), doubts have been expressed on whether the same interaction that exists in a face to face setting could be replicated in an online learning environment when just video communication is used (Gillies, 2008).

However, video allows students to communicate with experts from different locations (Papadopoulos and Voulagri, 2013) or students from different places, and it has the potential to improve cultural awareness, understanding and respect towards people coming from different backgrounds (Lee and Hutton, 2007; Molnar, El-Haddadeh and Hackney, 2013). Despite its potential, video-to-video communication is still at an early stage and it does not always receive positive feedback from users (Lawson et al., 2010) leading to a pressing need to improve the student experience (Selwyn, 2011) and teacher engagement with technology (Ertmer et al., 2012). Therefore, determining what would make the teachers use or not use this type of communication and eliminating or at least alleviating the problems has the potential to increase system adoption. This paper outlines the findings from three focus groups conducted with Irish primary school teachers, Greek primary school teachers and Greek high school teachers and one interview with the

principal teacher from an Irish primary school to examine the potential impact of V2V communication in an educational setting.

## **Study**

The aim of this study is to determine the key performance indicators for successful adoption of video services in primary and secondary education from the teachers' perspective. It provides data from three focus groups and one interview with teachers from two different countries teaching at two different school levels, primary and secondary. The interview was organised with the principal teacher from an Irish primary school (hereafter referred to as PT). The three focus groups were organised as following: a focus group organised with Irish primary school teachers (hereafter referred to as IP), one focus group with Greek primary school teachers (hereafter referred to as GP) and another one with Greek secondary school teachers (hereafter referred to as GS). The focus groups were recorded and transcribed and then the transcripts were analysed. From the Irish primary school three teachers participated in the focus group, all males. All teachers had more than two years' experience (one had between two and five years' experience, another between five and ten and another more than ten years' experience). The secondary school teachers in Greece all had over ten years' experience and they were all females while the primary school teachers in Greece were all males with over three years' experience.

## **Methodology**

As the nature of this research is exploratory a qualitative research approach was deemed most suitable. Qualitative research methods have the potential to provide insightful views and provide details on what motivates the participants thinking (Creswell 2008, Ruyter and Scholl 1998). In this study focus groups and semi-structured interviews were used as they are known to help in examining an exploratory research domain (Harding 2013, Yin 2003).

Therefore, a semi-structured interview with the head teacher of an Irish primary school (in October 2012), a focus group with Irish school teachers (in February 2013) and two focus groups with Greek school teachers (in May 2013) were conducted at the premises of the involved schools. Permission for these focus groups was obtained through completing the necessary ethical approval procedures in the schools as well as from the affiliated institutions of the authors in the UK and Ireland. The actual interactions between the authors and the interviewees and focus group participants began in May 2012 where preliminary information was gathered through face to face project meetings, emails, telephone conversations and routine video conferences. This process progressed in parallel to literature reviews and desk research that was conducted to formulate the conceptual background to the research and to identify key performance indicators for the successful implementation and use of video technology in educational scenarios.

Yin (2003) states that interviews do not necessarily need to be structured so that questions are asked in a specific order and in this research we used an interview protocol in which we determine specific themes to be explored based on the literature review. Before the focus group, the participants were given a consent form to read through regarding ethical considerations and their rights to withdraw from the study anytime without any prior notice or explanation. The focus groups and the interview were audio recorded with the consent of participants as this allowed an easier analysis of the information. The data analysis was done by transcribing the information onto a document and later analyzing the document using a thematic analysis process (Boyatzis 1998) using both an inductive and deducting approach, where emerging issues were linked to the criteria identified through literature and documenting any new issues and assigning labels to these.

## **Results**

The data was analysed and the key performance indicators obtained covered two main themes covering technical and user related criteria. The user related ones were further divided into criteria that are considered to affect teachers' adoption and criteria considered to affect the students' adoption of video communication in educational settings.

## Technical Criteria

Technical criteria refer to difficulties that appear either due to data communication and networking issues or at the application level when transmitting and using video services. It also focuses on technical aspects of the application. All focus group participants and the PT mentioned that having a stable and reliable network and application is important in the adoption of video-to-video communication.

All focus group participants also highlighted the importance of video quality to ensure teachers and users engaged with the technology. The video stream has to be “*constant and not break*” (IP) which is considered to be a “*key aspect for this project*”. All the focus groups and the interview participants explained that this is due to the fact that students are exposed to high quality video (for example in games) and they expect the same quality when they are in a school setting. The IT presented an example of a project which has failed because of the transmission delay and synchronization problems between audio and video, and how much this negatively influences the outcome of different projects. The IT explained that there are students who after a few seconds of delay do not pay attention anymore to the class and the teacher is discouraged from trying again. Video delay was also mentioned by the GP and GS.

On the other hand, the PT highlighted the need for security when using V2V services by stressing that “*security is an issue for the parents because they want to know that their children are safe when they go online*”. In the context of video, “*we will need to ensure that children only interact with their teachers or with each other and are not exposed to any other users without prior consent from parents.*”

## User Criteria

The teachers of the two groups have highlighted several important user related criteria that affect both them and the students. Therefore this section divides the results into criteria that may influence the teachers’ use of video-to-video communication and criteria that may influence student use. The criteria highlighted below refer both to the user (teacher/student) experience but also to the pedagogical gains as a result of using this application.

### *Criteria that may influence Teachers’ use of V2V for Education*

All the focus groups outlined that V2V will help improve teachers’ knowledge/skills by having the opportunity to learn from teachers from other classes and schools and allowing them to exchange different educational methods. For example, one of the GP participants mentioned: “*we will have the opportunity to learn [...] learn about different educational methods they use and explain our methods of teaching*”.

### *Criteria that influence Students’ use of V2V for Education*

The PT highlighted that although the means of communication is different the expectations from the face-to-face courses remain: “*the standard expectations that we have when we teach any subject to the kids are still there*” (PT) and to those new expectations can be added. It is expected that by interacting with students from other counties within a country as well as between different countries, the students’ knowledge of geography will increase (IP). The importance of improving the students learning as a result of using the application was especially highlighted by Irish teachers saying that “*it would have to be beneficial for children from a knowledge point of view*” because initially they will be enthusiastic and they will enjoy the application but on the long term, the knowledge gain is important. Overall, all the participants in the interview and focus group agree about the importance of having the student knowledge improved as a result of using the video-to-video application.

In addition, it is expected that it will “*enhance self-confidence*” (IP), students’ presentation and communication skills (IP, GP) will improve: “*I think the standard of presentation will improve, as well as their social skills and emotional development*” (PT), “*to expand, to develop vocabulary, to use words that they would not normally use*” as they would need to explain and communicate with other students. Furthermore, as the students will interact with other students from different schools it is expected that they will get more engaged with the subject (IP, GS) and will put more effort into preparing the presentations “*I think the standard of presentation will improve. I think the standard of effort that goes in preparation will also improve*” (PT).

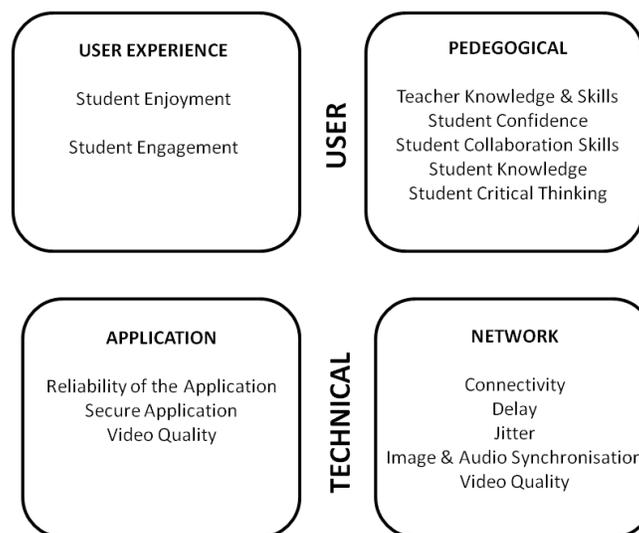
## Summary

Figure 1 summarizes the key indicators found as a result of this study. The technical indicators are grouped under network and application and the user related indicators under user experience and pedagogical. Concerning the network, the teachers expect to have a reliable and stable connectivity, with no delay or jitter to affect the synchronization between the audio and image or the overall video quality. The application is expected to allow for high quality video to be delivered, to be secure and not allow communication with unknown parties but also to be reliable and user friendly. The teachers who participated in the study expect that the students will enjoy and engage more in these kinds of activities as opposed to the ones happening in a “traditional” classroom. As this is an educational application, several pedagogical indicators were identified: improvement in the teachers’ knowledge and /or skills as a result of interacting with the technology and being exposed to other teaching styles, increase in student confidence as a result of being exposed to different learning styles and interacting with students from different schools, increase in student ability to collaborate with others, increase in student knowledge regarding the taught subject and an increase in student critical thinking and presentation skills compared with the same activity happening in a classroom setting.

This study has highlighted several new indicators that were not presented in the previous studies. Except for the student knowledge most of the pedagogical indicators were not present. This may be due to the fact that some of the indicators may be specific to the context of this research. Moreover, the indicators obtained in our previous study (Molnar, El-Haddadeh and Hackney, 2013) have been confirmed and several new ones have been added.

## Study Contributions and Concluding Comments

This article presents how video communications is used to connect different schools for the purpose of education in the context of the European Commission funded LiveCity project. The research presented in this paper aims to determine performance indicators necessary for video communication in educational settings. With this aim three focus groups were performed with teachers from Irish and Greek schools. The data was analysed and the key performance indicators obtained were grouped into technical (network and application) and user (user experience and pedagogical) related themes. The user related ones were further divided into criteria that are considered to affect teacher’s adoption and criteria considered to affect the student’s adoption of video communication in educational settings. The technical criteria refer to parameters that are considered important from the network and the application point of view. The user criteria were related both to the teachers and the students as the users of the application. Figure 1 outlines the main criteria that were identified as important for using video for collaborative education in a primary school setting



**Figure 1:** Indicators for Video to Video Communication for Collaborative Educational Activities

## ***Practical and Theoretical Implications of the Study***

This study offers several practical and theoretical implications. The study adds to the body of knowledge by providing a number of criteria that need to be considered when deploying educational services that make use of video communications. The results can be used by policy and decision makers, content and service providers to improve the likelihood of video-to-video communications being adopted in an educational context.

## ***Limitations***

There are several limitations that are worth noting. The empirical findings were from teachers based on their previous experience with other video communication services and it is important to note that their prior experience with V2V in education is limited to applications such as Skype. We assess the criteria with teachers from two different countries and at two different educational levels. Although the findings in all interviews are similar, further research would be needed to see if they apply to other educational contexts involving different student demographics.

## ***Future Work***

This study is part of an ongoing research effort in the LiveCity project that aims to provide high definition video to various public services including education (Weerakkody et al., 2013). The educational service using V2V technology is currently being piloted in Ireland and Greece. The results of the pilot should determine the relevance of the above indicators and whether or not others have to be included. Afterwards the service will be used on a larger scale and the indicators obtained will be further refined. In doing so, the authors hope to provide a complete taxonomy of key performance indicators necessary for the adoption of video communication in public services in the context of education.

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