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IT Governance

THE WORKPLACE OF TOMORROW

Group 10

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Introduction

The move towards increased team performance, as a business survival strategy, has been the core business focus for many companies because of the ever-increasing competition both on local and global scales. It has clearly made it paramount for companies to increase their awareness of how their teams operate. A growing sensitivity has been noticed among companies and how they try to understand their teams' dynamics. Following this trend there is an active interest in new approaches that promote the continuous improvement of working environments. The latter is crucial for the performance enhancement of employees.

An area that has attracted a lot of attention over the years is the work space. Lots of research has been conducted in order to determine the correlation between the workspace architecture (be it physical or virtual) and the overall employees performance. This focus has been increased with the increasing awareness about the negative effects of occupational sitting "sitting at an office of behind a computer" characterizing most modern work environment. Occupational sitting is the largest contributor to daily sitting time in both developed and developing countries (Jan, Proper, Hitdebrandt, 2007) (Peters, Moore, Xiang et al, 2010) representing another key point to take into consideration when thinking about the work place of the future.

The purpose of this paper is to focus more on touchscreen technologies and to present the relationship between these touch screen technologies in working environments and the aspect of working performance of employees. In other words, we shall investigate the literature to find whether the touch screen technology has the potential to improve the collaboration between workers or working teams and to assist them in establishing the ideal working environment of the future.

1 Touch screen technologies & the working environments

1.1 Project *rooms*

War rooms or Project rooms, can be defined as the ''headquarters'' of working teams, in which they are situated over a portion of time in order to tackle a problem. These rooms are consisted of flipcharts, whiteboards, and screens for teleconferences (etc.). Figure 1 depicts an example of a modern Project room.

Figure 1 Modern War room - Project room

According to Covi et al., (1998) computerized technologies are crucial for the better collaboration between teams because they help them to enhance information sharing and to broaden their spectrum of knowledge. Both of these attributes are essential when it comes to problem solving. The authors also state that Xerox's LiveBoard was an extremely important innovation, because it opened the gates for the touch screen technology in videoconferences. LiveBoard was an interactive wall-sized, touch computer screen which allowed in all team members to interact and adjust it simultaneously by using electronic pens. The whole procedure is automatically saved and it can be accessed in the future by each member. An illustration of the LiveBoard can be seen in Figure 2 from the study of Brotherton et al., (1998).

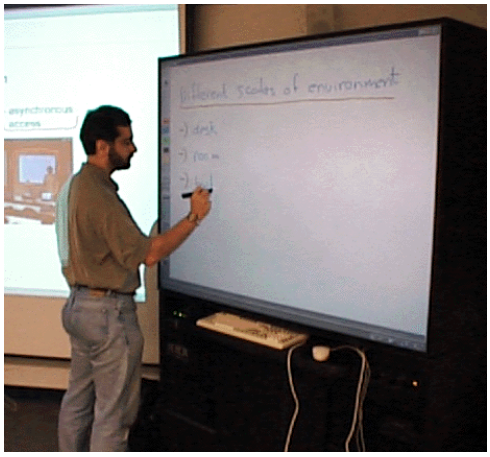

Figure 2 Illustration of Xerox LiveBoard

Figure 3 Continuum Project

To continue, the Electronic Visualisation Laboratory in the University of Illinois at U.S.A., created the Continuum project, a project room which includes plasma touchscreen as a shared flipchart, several cameras for video conferencing and all these mediums are linked through a collaboration platform which facilitates the information sharing and the coordination of several departments which are located in different places (Leigh, J., Johnson, A., Park, K., Nayak, A., Singh, R., Chowdhry, V., & DeFanti, T. A., 2002). According to the authors, the development of the project requires a group of computers to drive the displays and a second group of computers to assist the content sharing services. The Central Coordination Server (CCS) guarantees that the information flows without interruptions and shortcomings. As an outcome, an amplified collaboration environment has been created which could cover sufficiently all the demands of working teams and it will help them to collaborate efficiently in a modern way, throughout the usage of touch screens. Figure 3 depicts the Continuum project in full detail.

1.2 The iRoom

Furthermore, there is a similar project existing that has been carried out in Stanford University in the U.S.A., when several researchers created the *iRoom* a special virtual meeting room which was created for the purpose of virtual meetings and to the improvements of working teams which were performing in different departments (Johanson, B., Fox, A., & Winograd, T., 2002). Specifically, this modern virtual room is constituted from three touch screens which are in the dimensions of a white board along the wall. Secondly, there is a 9 megapixel interactive display with the usage of pens in the front wall. Last but not least, there is a table with a 3' x 4' display which is integrated and it also provides the interaction technology. The room also involves other audio-visual material such as cameras and microphones with a

LAN support for the better collaboration of working teams. According to the authors a major advantage of the *iRoom* is that it facilitates the active participation of all team members throughout the interaction with large, high resolution displays. During a presentation or a brainstorming session, the facilitator is fully concentrated on the content of the board and in the audience. To prevent the usage of a keyboard which might be distractive, there is a technology which allows the immediate interaction through an electronic pen, or with the touch of a finger in the display. A second advantage is that the *iRoom* also includes a ‘‘room controller’’, which involves a small map of the room in terms of the position of lights, devices, and projectors (etc.). It is crucial for the employees to adjust the lighting or the operation of each device by using the ‘‘room controller’’ with their tablets. Several *iRooms* were created since then also in Stanford University and elsewhere, always with the aim of the establishment of a smart workplace for the future. The prototype *iRoom* is depicted in Figure 4.

Figure 4 Prototype iRoom

Figure 5 Multi-touch Collaboration Platform

1.3 Multi-touch platforms

Another study from Alavi et al., (1997) revealed that advanced information technology could have a major positive impact on the students’ performance during their studies. Specifically, the authors conducted a research which involved two American universities and their students in management faculties. The purpose of this research was to create a ‘‘virtual learning space’’ between those universities by consolidating their existing collaboration platforms in order to achieve the maximum amount of knowledge and expertise and translate it into a new M.B.A. course at the information systems field. Each university developed an ‘‘electronic classroom’’ outfitted with a touch screen video wall and several computers for the students and their instructor. The ‘‘electronic classrooms’’ from both of the universities exchanged an enormous amount of knowledge and they retrieved crucial information about their assigned tasks. Characteristically, they succeeded to create a feeling of being in the same classroom for both students and instructors. It is noteworthy that through the usage of touch screen technology, the dynamics of the classroom significantly improved and the learning abilities of students greatly improved. Moreover, the establishment of such a modern virtual classroom could involve outside experts in the knowledge sharing process.

To continue, Dempski and Harvey (2005) in their research developed a collaboration platform which allows multiple employees to interact spontaneously by using gestures and by touching high resolution

screens. The latter contribute in the data visualisation process and they assist working teams to share their knowledge and to create integrated solutions. Their approach focuses on the visualisation of the data, their optimal usage in order to execute the assigned tasks and finally the monitoring of the whole process. The employees use several devices, which are connected to the platform and all their interactions are reflected in a single large virtual display. The platform also allows employees from different department to work on different projects simultaneously at the same screen, by interacting on the display. Afterwards, they can share their different viewpoints and they can combine their complementary solutions at a single one which is complete. Their approach is depicted in Figure 5.

Këpuska et al., (2008) in their research introduced the Ubiquitous Collaboration platform (uC). This platform is extremely useful for workers or working teams which are scattered geographically and they interact from different places. By doing so, uC provides a multimodal team interaction interface carried out throughout a re-adjustable open architecture. According to the authors, the platform provides two main features. Firstly, uC platform aims to link the physical and virtual worlds by collecting real-time data. It is noteworthy to mention that it can integrate all the specialized knowledge of employees even in the situations that they are individualized by time and space. Moreover, it will collect real time data which are entrenched in the tangible world and it will provide users with the ability to observe all the group members while they chat in the same time, or ask each other questions in a different time. This feature is crucial, because it creates an enormous amount of information which can be used in order to achieve an optimal solution when it comes to tackle complex problems. More complex problems require collective decisions, which can be facilitated by uC platform. Secondly, the platform provides an open architecture which is constituted of five levels. To begin with, there is the input layer which is composed of microphones, sensors, cameras and touch screens. All the aforementioned mediums help people to exchange knowledge and to gather information. The next level is the process and storage level, which gathers all the input and it works it out (e.g. voice signals are transcribed, video conferences are analyzed etc.). To continue, there is the visualization level, which permits the user to adjust the display window according to his or her needs by drag and drop or pull and down menu selections. Next is the analysis level which is responsible for the thorough analysis of the data by using configurable analysis tools and methods. Last but not least, the decision level proposes a work plan for an optimal solution, which is based on its present configuration status. The proposed architecture plan is depicted in Figure 6.

Except the studies that discuss the collaboration improvement in a virtual working environment, there are also several researches that examine whether the collaboration between students can be improved within virtual classrooms.

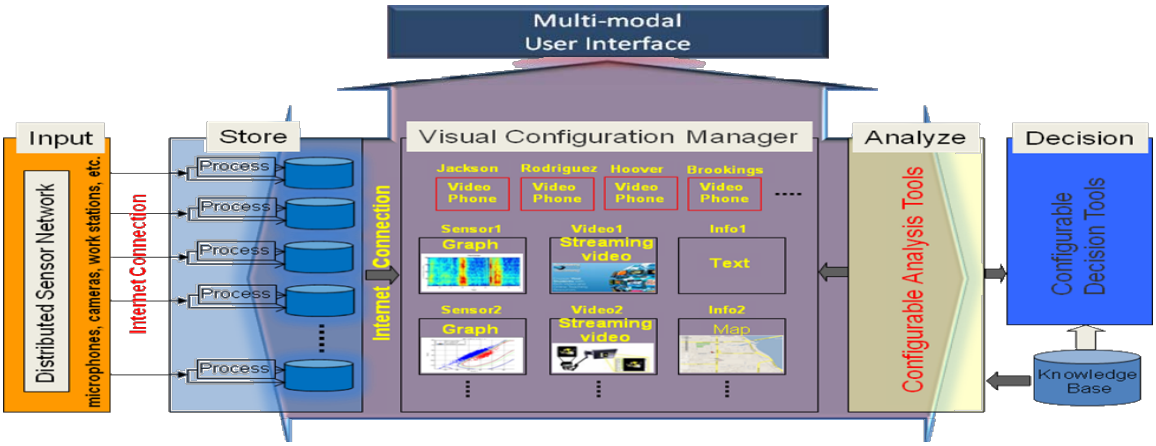

Figure 6: uC proposed architecture

Higgins et al., (2011) in their study introduce a framework concerning the usage of touch screen technology in classroom tables in order to create an interactive environment which enhances learning. The authors state that collaborative activities have a major importance in the pedagogic methods and combined with new technology, they could enhance shared knowledge, which is beneficial for students. Higgins et al., (2009) developed SynergyNet, a project which can be characterized as the ‘‘*classroom of the future*’’ because it involves students and the orchestrator (professor) in the learning process in a more efficient and interesting way. There are several multi-touch tables which are used from the students and an angled multi-touch table which is used from the professor, in a fully networked environment. The professor can control the student tables in terms of content and he or she can monitor the problem solving process by students' side. The teacher can also provide feedback or lead the process according to his or her method. On the other hand, students throughout their tables can share their knowledge with other student groups and seek for feedback from the teacher when they face problems or have inquiries. The main aim of SynergyNet is that it enhances the collaboration within student groups (intra-group) and the interplay between student groups (inter-group). The authors also express a limitation of their project concerning the compatibility between the several technologies that could be used and the assigned tasks that need to be executed. Therefore, the variation in the existing technologies and the wide range of assigned tasks could be difficult to be matched properly.

In recent years touch screen technology has grown up and it has spread everywhere, particularly for the easiness of use and the lack of need of an additional input device.

Touch screen interfaces are more intuitive and permit management of various types of software in an efficient and easy way. Among the various field in which we can apply this technology, there are meeting rooms, based on remote connections to consent information sharing and virtual meeting.

When Clarke Stevens and Anne P. McClard conducted their research, (Clarke Stevens, Anne P.McClard, 2000) in the state of art in remote communications for collaborative workspaces it was determined that there were no devices in which writing surface was the viewing surface for all users. Besides, it was necessity to develop a system with lower use of bandwidth than previous ones. They invented a new collaborative workspace system which allows to create, display and share handwritten information (like text and images) in real time (Figure 9) between one sender and one or more receivers. The system can be

implemented with a cable television network, telephone network, fiber optic cable or a communication network preferably. The main components of the system are: the network infrastructure, touch screens, stylus. The application uses specific protocols to establish remotely if the stylus is touching the screen (sender) or if there is a connection request (receivers), and thus to choose the correct action.

Code Space (Andrew Bragdon , Rob DeLine , Ken Hinckley , Meredith Ringel Morris, 2011) is a hybrid system developed by Microsoft to manage developers meeting (or workers in general) ensuring a democratic approach to all participants. The system is based on touch screens and Microsoft Kinect, thus it put touch screen and air gesture technologies together. An hardware configuration can be composed by a big PanelWork 42" screen with two-touch infrared-based input, the Microsoft Kinect and two mobile devices, for example Samsung SGH-i917.

The design of the system followed various principles in order to follow customer needs (e.g. to avoid large and unusual gesture that can distract). The system is very versatile because it is compatible with all touch devices, then any device bring by users can be used (laptop, smartphone). Users can also manipulate objects and move them in own screen with the use of arms and hands, using particular postures and precise techniques to avoid accidental activation.

They can also continuously send objects to the shared screen (Figures 7 and 8), but all objects will be grouped in a package that needed to be approved by the presenter, to avoid confusion and a "too-open" approach.

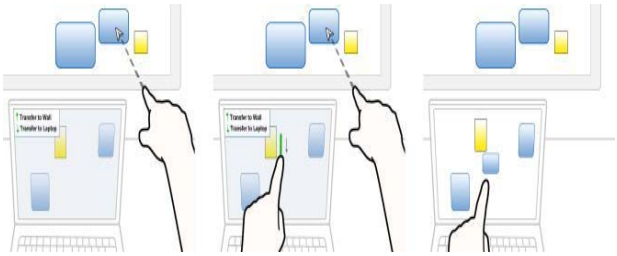

Figure 7: Pulling content from a shared display to a touch screen laptop displays, depth cameras, mobile devices and cross-devices interaction

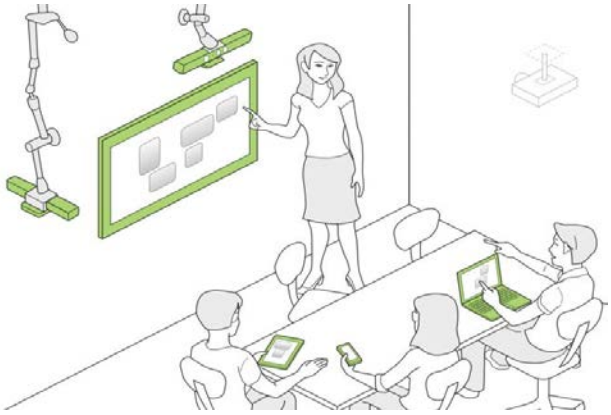

Figure 8: Code Space meetings including shared multi-touch

Code space includes many workflow templates, based on the concept of buckets, to support the usual activity of users. Each workflow template provides the user with different visual arrangements of buckets, such as Venn Diagrams or Sequence Diagrams.

Another field of interest in the use of touch screen is education. SmartTech (www.smarttech.com) produces a set of interactive Ultra HD screens. These boards are compatible with Windows and Mac and are provided with Smart Notebook Collaborative Learning Software that includes a lot of useful tools for education, such as mathematics support, 3D interactive tools, Ink Editing, collaborations and sharing of questions with students through an interface with mobile devices.

For example, students can write on the board analytic geometry equations with a pen and get the corresponding graph, or to modify the graph to get real-time editing of the equation.

Another software of interest is Smart Amp which allows students to co-create content on a digital screen with their devices, enabling contribution and collaboration. Teachers can watch collaborations of each student to the common workspace and guide them to improve learning. Thus, with these systems students and teachers are able to capture ideas and notes, to save and share them everywhere and all the time.

Smart Technologies makes products also for enterprises, a particularly interesting example is the Smart Room System for Microsoft Lync (Figure 10).

Figure 9: Smart Room System for MS Lync

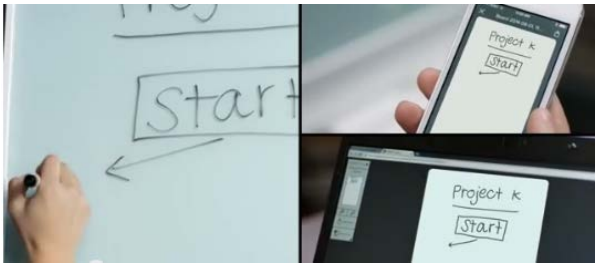

Figure 10: Real Time information sharing

This system facilitates an interactive sharing with an HD LCD display, enhanced audio and panoramic video. The display supports dual touch and inking capabilities onto applications such as Adobe Acrobat and Microsoft Excel. Integration with Microsoft Project, Microsoft Office, AutoCad is supported as well as custom solutions according to the field of interest. Finally, the system is composed also by an Administrative Console that permits switch between presenters, change the configuration of data and video and move between presentation and whiteboard contents.Touch screen technology can be used also in the computer animation field, to help artists and scientist to combine their work in a quick and efficient way. Tagtool (Thomas Pintaric, Markus Dorninger, Mathis Csisinko, Josef Dorninger, Ferdinand Pilz, Matthias Fritz, and Martin Norden, 2012) is a collaborative system designed for artists to support painting and animation team work. It uses tablet computer connected via wireless. Users can paint simultaneously exploiting multi-touch screens, the system will show the work of all on the presentation space, with a hierarchical grouping of graphic layers.

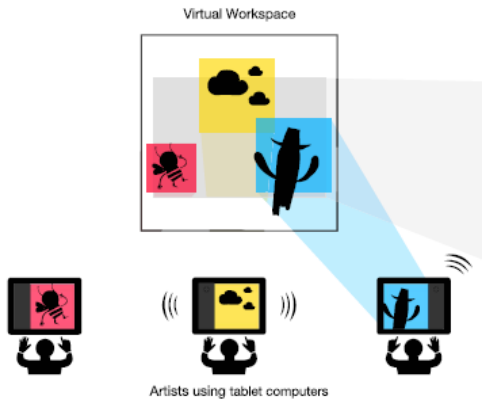

Figure 11: Artists use tablet computers and share their work in the virtual workspace

As all kinds of technologies, touch screen technology is not perfect. Thus, some problems due to hand direct manipulation could arise, e.g. the user's finger, hand and arm can obscure part of the screen. Second, the human finger as a pointing device has very low "resolution". It is difficult to point at targets that are smaller than the finger width. These problems led researchers to develop new techniques allowing users to point at single pixels without zooming, in order to maintain the complete view of the area of interest. Performance, error rate, base techniques have been taken into account to the design of two new methods for designing interaction tools allowing pixel level pointing in a fast and efficient manner.

Based on Take-Off and Cross-Lever techniques, (Pär-Anders Albinsson, Shumin Zhai, 2003), developed two new methods of high precision touch screen pointing. The first is Cross-Keys technique (Figure 12) that allows the users to select small targets with low error rate. It is based on a discrete movement that appears to make exact adjustments easy. On the negative side, to repeatedly tap on the handle, which moved with the crosshair, makes parallax and calibration problems more critical, particularly when the targets are on the outer sides of screen.

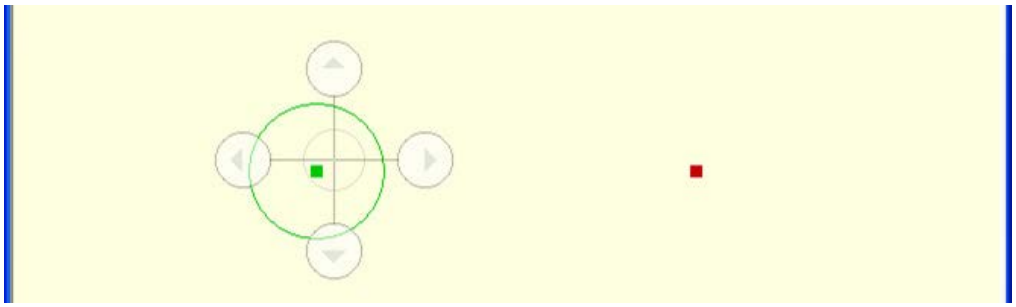

Figure 12: Cross-Keys

The second one is Precision-Handle technique that performed with satisfactory speed and accuracy for both small and larger targets, thanks to the precision leverage effect. Some of these new techniques can be further modified without losing their basic characteristics.

The experimental results demonstrate that these instruments are not universally superior or inferior to one another. Thus, practical applications should provide a set of tools appropriate to its target and a mechanism to switching of these tools.

2 Summary of literature review and key issues of research

To set the borders of our research and to narrow down our problem, the aforementioned literature can be summarized in three major points, which will also be the focus of our case study. The first point is the electronic collaborative technology itself. In the previous section, we gathered sources about used collaborative technologies (e.g. Xerox LiveBoard). From the literature search we performed, we found out that these technologies started and were adopted from American universities. Our aim is to investigate if TU/e which holds a great reputation among other technical universities in terms of innovation and high standards of education, is aware of or uses these technologies, which focuses on making the courses more interesting and interactive. According to Covi et al., (1998) their full deployment will also help students to increase their problem-solving abilities. The second point is the existence or not of modern digital project rooms in TU/e. As derived from the literature, we found out that modern project rooms like iRoom or Continuum, were also created in American universities. Therefore, we will try to search if the university has already adopted this technology and if it has already created a modern digitalized project room which can connect different working teams in separate departments, by eliminating the physical distance between them (Johanson, B., Fox, A., & Winograd, T., 2002). Last but not least, we will try to find out if the university is aware or uses multi-touch collaborative technologies or smart technologies like SmartTech which produces interactive HD screens which are compatible with Windows, Mac and other collaborative learning software. These three points will be the key issues and they serve as a basis for our study. In the next section, our methodology will be thoroughly discussed.

3 Case study

3.1 Methodology

The summarized literature review was reviewed and based on the feedback received a direction for further research has been set. Since we opted for a case study, a tailor made questionnaire has been elaborated in order to probe the client (TU/e) and get more acquainted with the client's problems/challenges. The interview was semi-structured with open questions. Specifically, we formulated our questionnaire based on the three major points which were pointed out from literature and on our own reasoning. To begin with, the existence of past electronic collaborative products like Xerox LiveBoard which led to further develop similar computerized products nowadays, as Covi et al., (1998) and Brotherton et al., (1998) stated, triggered us to formulate the following question:

- *Has the university ever considered to use electronic collaborative technology like (Xerox LiveBoard)?*

Furthermore, the discovery of modern project rooms like iRoom or Continuum in scientific sources, which were created from universities of technology in USA, stimulated us to investigate if TU/e plans to implement a similar project in order to enhance collaboration within different departments, or between different working teams as Johanson et al., (2002) advocated in their study. Therefore, the next question was formulated:

- *Have you ever considered to develop a modern project room like iRoom or Continuum?*
    - *If yes, why is not implemented yet?*

- *If not, why? Because of cost issues? Or because it is not necessary?*

Depending on the answer that we will get, we will proceed accordingly. For instance, if the university has already adopted a similar technology, we will suggest improvements. In case that they have not implemented it yet, we will try to find the possible causes, the possible obstacles that the employees and students might face and some remedies to cure these problems. To proceed, we will investigate if the university has considered to implement multi-touch collaborative technologies, which will be the foundation of a digital classroom. Alavi et al., (1997) revealed that the creation of a virtual learning environment, greatly enhanced students' performance in two American universities. Each of the universities developed a virtual classroom and they offered courses in their students from distance. Thus, the following question came to our thoughts:

- *Multi-touch collaborative platforms have been used in American universities. They create a feeling of an electronic classroom and they can enhance the communication between different departments or universities. Would you think that this technology would be implemented here and Delft for example?*

If the university has already implemented this technology and it has formulated a strong partnership with other universities we will give suggestions for improvement. On the contrary, if the university has not considered to use this technology, we could give additional arguments about the benefits of this technology and furthermore, to point out the best platforms/products which suit the university. If the technology has been adopted and it is in the initial stages of development, we will point out potential problems that may occur, which will impede the smooth adoption from the employees and students. We will also give some remedies for these problems. Since the implementation of these technologies requires a powerful network system (Sams, Wesson & Vogts, 2011), we would also like to find out if the university's network is able to support the implementation of these technologies, without any disruptions during the collaboration, or technical flaws. Therefore, the next question follows:

- *Is the network system of the TU/e able to support the video stream of the live collaboration when providing a live course?*

In case that the answer is negative, several arguments will be given for the necessity of a powerful network system in the university and how it will be correlated with these technologies. We will also like to indicate the technical requirements of these technologies, in order to assist the university to meet them adequately. Since the university has a direct link with several companies and enterprises (e.g. strong partnerships with ASML, Oce etc.), we are likely to investigate if TU/e has ever been approached from a provider of this kind of technology. Thus, our thoughts will be transformed into the following question:

- *Have you ever been approached by a company offering this kind of technology? (e.g. Samsung)*

In case that the answer is positive, we are aiming to point out potential problems that might occur during the implementation of such a technology, for instance, the behavioral change from employees who need to adopt the new technology smoothly. If the answer is negative, we will try to argue and explain why big companies have never tried to approach a popular technical university in order to sell their services. Moreover, we are aiming to find out if lecturers and students are aware of the existence of these

technologies. In other words, we will try to investigate if there are any courses available in TU/e which are carried out by using electronic collaborative technologies. Therefore, the next question is formulated:

- *Is there a relevant course about this kind of technologies in TU/e? (touch screen technology-collaboration platforms)*

Depending on the answer, there are two options. A positive answer could stimulate us to deepen our study towards the impact that an alternative education method which combines several learning mediums (electronic teaching and virtual collaboration), could have in the students' performance. We could also focus in the possible problems that might impede the proper implementation of these courses from students' and employees' side. A negative answer could possibly lead us to investigate the causes about the absence of such a course. To conclude, the final question is about the testing phase of these projects. According to Van Strien (1997), the evaluation phase is crucial in order to assess the proposed solution. Therefore, we would like to find out how TU/e tests these projects and what their testing strategy is. Thus, the following question is formulated:

- *For this kind of projects, do you start with a pilot project and then move to full deployment?*
  - *If Yes: How long does the pilot phase last?*
  - *If not, why?*

To tackle this question properly, we could probably give some suggestions for a proper testing strategy.

During the interview, the client was given the time to freely answer the questions. However the interviewer could interrupt when needed if the client misunderstood the direction/meaning of the question. This was done for quality insurance purposes. The whole interview was taped with the clients' permission obtained beforehand. The list of questions as well as the full transcript of the interview can be both found in respectively appendices I and II. After the transcription of the interview, a thematic analysis was conducted. According to Howitt and Cramer (2007) this process has several steps. Specifically, the whole transcription was transformed into codes which capture the main essence of each piece of text. By combining the aforementioned codes, several themes are derived, which summarize and reflect the major points of the interview. The result of thematic analysis is illustrated in Appendix III. In doing so, the major points of the interview are the following ones:

a) TU/e has the apparatus and the equipment but their lecture rooms are not interconnected;

b) Resistance of change from the lecturers/teachers during the implementation of a new technology, which is a behavioral aspect;

c) TU/e has doubts about the testing strategy, in other words they are not sure if they will use a pilot or a large scale testing project; and

d) They try to implement blended learning method, but they still are in the beginning of the process with pilot programs between teachers and students.

Since the timeframe of the course is tight and we are only three people in the team, we decided to focus in the issues b) and d). Furthermore, the selected topics are more close to our background. Therefore, we will try to address those issues by finding articles about **resistance to change** by teachers and **blended**

learning. Our aim is to clearly define those two terms at first. Second, we focus to illustrate explicitly the obstacles that resistance to change might raise when a new technology is implemented and what are the possible remedies for this important behavioural issue. Finally, we will present successful examples of Blended Learning and its positive impact on students and employees. This could serve as suggestion to implement Blended Learning in TUe.

3.1 Results

The purpose of this chapter is to present and discuss the results of the interview. The next table presents the codes that were created from the interview transcription and their combination into themes. These themes summarize adequately the interview and there will be our foundation for the additional literature review.

# Codes	Themes
#1 They have a similar technology but it is not the same (classrooms are not interconnected)	***Theme 1***: TU/e has the apparatus and the equipment but their lecture rooms are not interconnected.
#2 They have the apparatus but the outcome is unpredictable, due to the requirement of behavioural change **#3** Non-existence of digital classrooms at this moment (objective for the future)	***Theme 2***: They currently don't have digital classrooms, but it will be their objective in the future. Resistance of change might be a great obstacle for the correct implementation of such an innovative technology.
#4 They bought a LMS which will be used next year **#5** The method of blending learning just started to implemented	***Theme 3***: They try to implement blended learning method, but they still are in the beginning of the process with pilot programs between teachers and students.
#6 Testing depends on the number of teachers who perceive change as positive and necessary.	***Theme 4***: TU/e has doubts about the testing strategy, in other words they are not sure if they will use a pilot or a large scale testing project

Table 1: Codes and Themes of the Interview

As it can be seen from the Table 1, four themes occurred from the combination of the codes. It is noteworthy that themes 2 and 3 are a result of the combination of codes (#2,#3) and (#4,#5) respectively. By taking into consideration the short timeframe, we considered to focus in theme 2 and theme 3, to investigate them thoroughly and to give proper arguments for their confrontation.

TU/e has bought a new LMS which will be used in the next academic year, and a small part of it will be the implementation of digital classrooms, we decided to focus on problems which might occur in the beginning of this phase. As derived from the interview, the university already has the apparatus and the technology to implement the LMS and to create digital classrooms, but this step requires a significant behavioural change from employees' and students' side. The outcome of such a venture is unpredictable, because there is a huge amount of uncertainty about the perceptions of employees and students. Therefore, our next step is to gather sources about the obstacles which prevent people to change their behaviour and about the possible remedies to tackle them. In doing so, we will try to assist TU/e to apply

successfully this new technology.

Since TU/e just tried to experience blended learning method, we will focus our efforts to give a proper definition of blended learning, how it can be properly applied and to give also some successful examples of its implementation. Furthermore, we will also try to present some limitations of this method and its weaknesses.

To do so, an additional literature review will be carried out and its findings for tackling these two issues will be presented in the next chapter.

3.2 Blended learning

The spread of technology and Internet around the world has brought to changing our everyday life, from the way in which we wake up to the way in which we pay a bill. An interesting development has also been detected in learning methods, which now are able to deal with these technology.

At first, we may naturally think to apply technology in this field to expand distant education, and to provide students with complete online courses in order to remove the need to visit physical classes, infrastructure requirements, etc.

Sikora and Carrol (2002) reported however that students tend to be less satisfied with totally online courses when compared to traditional ones. Fully online courses also experienced higher attrition rates. (Carr, 2000) and Hara and Kling (2001) found that these courses caused some feelings of isolation, anxiety, frustration due also to the perceived lack of clear feedback and instructions from the instructor that led to stress conditions for online students.

For these reasons, the introduction of technology in learning methods has to follow a step-by-step process and it is preferable to mix it with traditional methods. One way to achieve this objective is the Blended Learning and it will be the topic of our investigation.

Blended Learning, that is the subject we decided to investigate, has many definitions in literature and yet no single accepted definition. Jeff Pankin, John Roberts, Mike Savio – July 2012 define blended learning as structured opportunities to learn, which use more than one learning or training method, inside or outside the classroom.

This definition includes different learning or **instructional methods** (lecture, discussion, guided practice, reading, games, case study, simulation), different **delivery methods** (live classroom or computer mediated), different **scheduling** (synchronous or asynchronous) and different **levels of guidance** (individual, instructor or expert led, or group/social learning).

(Rovai and Jordan, 2004) stated that blended learning is a hybrid of classroom and online learning that includes some of the conveniences of online courses without the complete loss of face-to-face contact.

Garrison and Kanuka (2003) stated that it is not clear as to how much, or how little online learning is inherent to blended learning. However, the blended learning is the effective integration of the two main components (face-to-face and Internet technology).

Rovai and Jordan analyzed exactly the sense of community linked with blended learning. They pursued a

test with 68 graduate students enrolled in a Master's degree. They took three types of courses: traditional, fully online and blended. To measure learning and correctness the Classroom Community Scale (CSS) was used. There were 20 questions with a five-point scale of potential responses in order to evaluate the quality of the course. Obviously, participants were unaware of their final course grades when they completed the CSS. Students who followed came from different genders, ethnicities, and religions. All student comments regarding the blended course were positive, in the beginning they were not sure they could handle technology aspects and independent learning, or had doubts about communication issues with colleagues. Students liked the extra time to process information that allowed them to deeply understand lesson and thus to promote critical thinking skills, in addition to be able to take in following lessons. They also appreciated face-to-face weekend classes, necessary for a good sense of community and a feedback from peers and instructors. In addition, fully online courses showed some student-professor misunderstandings, due to the reduced sociality in text-based discussion. There was no trace of these misunderstandings in blended courses.

The university must provide a whole new environment revisiting the role of professors that needed to be changed several times in order to meet exactly the new learning paradigm.

Barr and Tagg (1995) argued that the new educational paradigm has to create environments that brings students to discover and construct knowledge by themselves. Blended Learning does that.

Regarding the administration and development of blended learning, according to Garrison and Kanuka (2004), they must follow the following categories: policy, planning, resources, scheduling and support, thus taking into account cost identification, human resources, infrastructure, and technical issues. A student service support center should be provided to help students with technology access. Marshall McLuhan said that it is not enough to deliver old content in a new medium, but we must seriously reflect on how to design and delivery higher education.

Ginns and Ellis (2007) managed a study to underline the relations between student perceptions of the e-Learning environment and student grades. Students from two years of a five year undergraduate degree completed questionnaires used to evaluate the quality of learning and to understand their perceptions on the whole blended learning system. A large number of "negative" answers was detected. The questions focused on various fields of learning, such as interaction, e-Learning material quality, clarification of goals.

Value scales showed that students' grades were positively correlated with perceptions of Good e-Teaching and a deep approach to learning. Students vary in their perceptions of the blended learning environment, especially correlational and cluster analyses revealed there were reliable associations between these indicators of the e-Learning component of the student experience of the course, and indicators of the quality of the whole of the course, as students' approaches to learning and also final grade of the course.

Another recent research (Vesisenaho, Valtonen, Kukkonen, Havu-Nuutinen, Hartikainen, Kärkkäinen, 2010) considered mobile technologies and social software as tools for building flexible learning environments to foster students' collaborative learning. The idea was that ICT provide several possibilities for developing teaching and learning also outside of traditional computer laboratories.

They stressed two blended learning case studies using mini laptop computers and social software that is a software that allows social construction of meaning and new way for collaboration (Dron, 2007). Social software allows to students to produce materials during the face-to-face session and capture their interpretations, ideas, way of thinking, etc. This knowledge is available after the class allowing discussion and further learning and as materials to identify cognitive conflicts with their peers. This approach is called Blended Learning 2.0.

Student's opinions of the two cases were analyzed using both qualitative and quantitative methods. In the first experiment, they used "open" interviews after the course. In the second case an online Likert-type scaled questionnaire was used. The first case tested the idea of constructing shared lecture notes using mini laptop computers and social media. The teachers can also see how their explanations reflects in students' notes and whether there is a need for changing teaching style.

Students (belonging to Net Generation, Tapscott, 2001) were happy with the idea of sharing their lecture notes with their peers. Results showed that students took different categories of notes, but the most important aspect was that not all students took notes, the main reason of that was the microblog software to writing notes, because it does not allow to write notes together with PowerPoint slides.

In the second case mini laptop computers were used with semi-structured wiki-environments (set-up by teachers) to model natural phenomena in a biology community. These tools provided also a system to share their understanding and to be creative in representing their own environment.

Questionnaire showed good results: according to students, technology was fun, motivating and meaningful for learning and the tools of the experiment helped to understand. Thus, students thought that this way of using mobile technologies and social software seems plausible.

Macquarie University has recently introduced the iLearn blended learning environment, incorporating system as Moodle and Echo360. They are going to build a Learning Innovation Centre including a community of practice to work on new approaches to learning and teaching, including the involvement of students. They also suggest to use a game-based learning to give a fun component to teaching.

Another very interesting study was done by Enriquez. That study focused on how Tablet PCs and wireless technology can be used during classroom instruction to create an Interactive Learning Network (ILN) that is designed to enhance the instructor’s ability to solicit active participation from all students, to give immediate feedback, and to understand how these technologies can enhance student learning in an interactive model. In addition, a software application called NetSupport School was used, to permit various level of interactions between the instructor and the students during lectures. Students participating in these lessons have no prior experience with Tablet PCs. Two case studies were done: in both of them two courses were compared, one that used the ILN model and the other one used traditional model. For each case study, scores of the two groups of students on identical homework sets, quizzes and final examination were compared using statistical parameters. About first case study, statistical significant differences were detected in Homework grades and even better results for the final exam were obtained. Also students’ opinions about NetSupport School and Tablet PC use were positive and considered helpful in understanding the teachings. The same student even expressed that they wanted to continue using them

in other courses.

In the second case study results were statistically significant for Quiz and Final Exam. Time spent on assignment in blended courses was greater than in traditional courses.

3.3 Resistance to change

One of the problems that TU/e faces which might hamper the successful implementation of a modern digital lecture room is that lecturers may be reluctant to change their traditional lecturing style towards a modern one. The purpose of this chapter is threefold. First of all, a definition of ‘‘resistance to change’’, will be given by using scientific sources. Secondly, we have to dive in the literature in order to investigate and describe explicitly the roots of this potential problem. Last but not least, we have to make suggestions to the client (i.e. TU/e), which will tackle the problem efficiently, if it occurs. Appendix IV gives a brief overview of the potential obstacles and remedies concerning the ‘‘resistance to change’’ issue.

There are several studies which examined this term and the reasons behind this problem. According to Van den Heuvel (2009), resistance to change can be defined as an affective, perceivable and behavioral reaction which focuses in retaining the current situation with the expectation of stopping, deferring or reshaping the suggested change. To continue, there are several obstacles which impede professors/lecturers to adopt easier the integration between classical lecturing (i.e. physical presence) and technology. These obstacles will be discussed in the next sub-chapter.

3.3.1 Obstacles to change

According to Greenberg and Baron (2000) framework, one of the most popular obstacles towards individual and organizational change is the deficiency from employees’ side (i.e. professors) to conceive and admit the need for change. The authors also confirm Van den Heuvel’s terminology, by explaining that teachers’ priority is to retain their status quo, than accepting change, except those rare occasions that they appreciate and understand the need for change in their schools. A second obstacle which hampers teachers to change their practices is habit. More specifically, teachers are immersed in routine and they might be unlikely to evolve and craft new skills and competences, because it is effortless for them to carry on teaching similarly. Teachers are also be affected by their previous experiences in the past. For instance, if they tried to change their lecturing style by adopting new kinds of technology and this trial ended to a failure, they will be severely discouraged to attempt changing in the future. Therefore, a major obstacle which hampers changing behavior will occur. According to Fullan (2001), teachers have a feeling of security and self-confidence when they perform in habitual ways, because the traditional way of lecturing is familiar to them. Therefore, they might be resistant to change and adopt a new way of teaching, due to the fear of unknown and by involving to a learning process with definitions (i.e. technology), or technical mediums (i.e. touch screen technology), which are not familiar with. They probably will feel insecure and unsure about their abilities. According to Goleman et al., (2002), in the worst scenario that lecturers will feel insecure about their abilities and the environment itself, they will be fully unwilling to espouse new practices and therefore, they will stick to their old habits without showing any spirit to adopt new changes. Moreover, expected changes might form a threat for teachers and they may feel intimidated in several ways. First of all, there is a possibility that their admission for change may be perceived and translated as a lack in their scientific and teaching competences, which may lead to a

false perception that they are not capable to accomplish this change successfully. Last but not least, Robbins (2000) also state that prospect changes concerning people involved in traditional decision-making authorities, might be perceived as threats to their power relationships. Therefore, they may be reluctant to change because of their false perception that they status quo will be damaged. Possible remedies for these barriers will be discussed in the following sub-chapter.

3.3.2 Suggestions for tackling the problem

The purpose of this chapter is to give suggestions which tackle the resistance to change problem from teachers' side. To begin with, change preparedness for professors can be facilitated from the dean or the boarding committee of the university. First of all, according to Calabrese (2002) the prospect change will have more chances to be successful, when principals see themselves as a part of the whole change and not only their subordinates. As Dotlich & Cairo (2002) and Duke (2004) state, they firstly have to be convinced for the importance of change and they have to be eager to exhibit their own weaknesses in order to participate actively in the whole learning process. In doing so, they should not be afraid of taking risks in learning and experiencing new behaviors. According to Duke (2004), principals have to be optimistic and determined when they encourage their subordinates to seek challenges and to support them when they reveal a risk-taking behavior, which is crucial for the successful result of the intervention. Principals could also play a major role in convincing teachers to accept change, by shaping a culture which promotes shared decision-making in universities. Marzano et al., (2005) advocate that involving all active stakeholders (e.g. lecturers, students etc.) in creating a shared vision and objectives for fulfilling this vision, will greatly enhance their motivation. All the stakeholders will realize that their actions are meaningful and they will contribute as much as possible in order to overcome this challenge of change. Furthermore, by entrusting teachers to participate actively in the decision making, it will keep them engaged throughout this process and it will nurture the climate for job crafting which can be defined as the actions that employees need to perform in order to redesign, improve and refine their job. According to Bakker and Demerouti (2007), job crafting engages employees by making them to seek resources and challenges. They see challenges as tools which will help them to improve their daily job, and not as threats. Zimmerman (2006) suggests that the rewarding of constructive behaviors would be important to prevent teachers from resisting a beneficial change. Specifically, the active participation from stakeholders (e.g. teachers, staff, students etc.) have to be acknowledged and rewarded. Stakeholders' involvement is crucial for the result of the potential change, because except their fruitful cooperation, they are also responsible for giving feedback and identifying problems in this process of change. Last but not least, Marzano et al., (2005) suggest that is preferable for principals to break up long term goals into milestones, in order to help teachers to have a better focus in those objectives and to be less resistant to achieve them. According to the authors it is vital for principals to set clear and feasible short-term goals which will be achieved along the way of the process. After the successful implementation of this change, both principals and subordinates could celebrate those ''victories'', which would be definitely positive for their motivation and their moral.

Conclusion

Our final recommendation to TU/e is a framework which is derived from literature and it was adjusted in order to fit in the client's needs. This framework integrates knowledge management with the recommendations suggested in the XX chapter within a blended learning environment. First of all, we have to define knowledge management (KM). There are several definitions for the latter, but in a school setting, KM can be defined as the procedure when knowledge is shared among learners and when the knowledge is created through technology. Within the borders of technology, learners have to organize and internalize explicit knowledge into tacit knowledge at first, and thereafter, to convert this tacit knowledge to explicit by interacting with other peers in different ''ecological systems'' (Yeh et al., 2011).

According to Schmidt (2005) knowledge management system and e-learning both aim to nurture learning within organizations and universities. The core difference between those two terms is that KM assumes that knowledge can be actively created or exchanged, whereas e-learning assumes that learning needs to be improved through coaching and guidance. The author states that those two terms are complementary and they will produce the desired effect only if they are implemented through a blended learning approach.

Furthermore, Shoham and Perry (2009) in their study proposed a model to Israeli universities to adopt changes within technology faster and in a more smooth way, with less reluctance from employees' and students' side. The authors stated that this model could assist in the direction of modifying the university from a ''knowledge institute'' to a ''learning institute''. Their model is called KM-M-CM which stands as Knowledge Management as a Mechanism for Change Management. The authors managed to prove that the proper structure and exchange of knowledge acts as mechanism which strives to mitigate employees' behavior about change.

By integrating those two complementary insights, the following framework is created (Figure 13) which might be useful to TU/e towards the creation of the workspace of tomorrow. As we see the first two shapes (rectangles in the left and in the middle), depict the KM system of the university. The structured knowledge which is created in the university has to be exchanged among the different departments without any problems. The continuous exchange of information will lead to a further elaboration of the existing theories, frameworks and finally new knowledge will be created. To continue, the creation of knowledge will be a mechanism which will ignite change. Towards this direction, the recommendations which were suggested previously in this paper, have to be taken into consideration and they have to be implemented, in order to make stakeholders less reluctant and more receptive to change. This whole procedure has to be implemented in the environment of blended learning, because the knowledge creation and exchange can be enhanced both with physical teaching and online interaction.

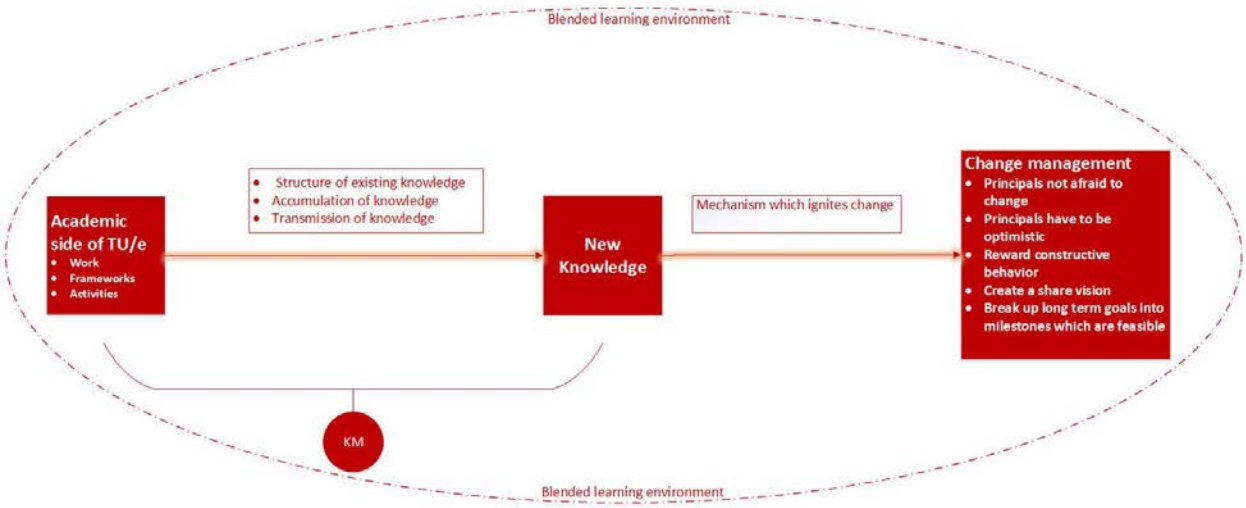

Figure 13: Proposed Framework for TU/e

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Blended Learning at MIT - Jeff Pankin, John Roberts, Mike Savio – July 2012

Appendix I: Questionnaire for the interview

1. Have you ever considered to use electronic collaborative technology like (Xerox LiveBoard?)
2. Have you ever considered to develop a modern project room like iRoom or Continuum?
   - If yes, why is not implemented yet?
   - If not, why? Because of cost issues? Or because it is not necessary?
3. Multi-touch collaborative platforms have been used in American universities. They create a feeling of an electronic classroom and they can enhance the communication between different departments or universities. They have been used in situations when 2 universities wanted to provide a common course to their students. Both electronic classrooms exchanged a huge amount of info. Would you think that this technology would be implemented here and Delft for example?
4. Is the network system of the TU/e able to support the video stream of the live collaboration when providing a live course?
5. Have you ever been approached by a company offering this kind of technology (e.g. Samsung etc.)
6. Is there a relevant course about this kind of technologies in TU/e (touch screen technology-collaboration platforms)
7. For this kind of projects, do you start with a pilot project and then move to full deployment?
   - If Yes: How long does the pilot phase last?
   - If not, why?

Appendix II: Transcript of the client interview (13/05/15)

G: George (Interviewer) - FG: Mr. Fred Gaasendam (Client)

G: First question is about Xerox Liveboard and similar products. Do you have here something similar?

FG: I know Xerox, can you shortly describe what it does?

G: It was like a big screen, in which people can write with pencil, pen and it enhances collaboration, it came with many functions as well.

FG: We have some lecture boards, but what we have Smart Boards (Luca comment: probably it is the same technology we described in the paper) that are used from some lecturers, but not from all of them. So they use these Smart Boards, which are kind of digital chart boards and they are mainly been used for presentations because they are interactive. So we do have the technology and the apparatus, but it is not widely spread in the university. So I do not think we use it, I do not know, yes it is touch screen, so what you see in the university is...I guess there are a lot of smart boards and there are unique for one lecture room, to use in these lectures rooms, but what we do not do in this moment is to inter-connect them. So maybe it is possible but we do not have the technology. We have that smart boards and what happen is that the lecturer speaks to students with the aid of a smart board but these are not smart boards interconnected in different rooms.

G: They don't exchange information you mean?

FG: No, not at this moment. Maybe it is possible, but you at first must have the concept to work in this way and then you use the apparatus and the boards but there is no concept available that we like to work in this way. It is still replacement of the old chart boards. It is technology, it is digital, but we do not use it in another way.

G: Do you mean it has to be combined with behavioral change, right?

FG: Yes, it is correct.

G: The second question is about, iRoom, Continuum etc. (there is a small intro about these projects)

FG: Digital classrooms? (G: Yes, exactly) We don't have this at this moment. What we do have a video college room where lecturers can take their own of web-lectures for instance, but that is a small part of what you mean. I have seen a kind of room like this at University in Twente some months ago, and they have such a room, where they experiment with all kinds of interaction between rooms, who have digital screens working in a lecture room in groups and then combine what they have done on a big screen upfront in the lecture room, so Twente does have it but we don't.

G: Why in your opinion TU/e does not have use it now or...they do not considered it? Because of cost issues? Because of another type of issues?

FG: No what we are planning to do is...because for instance we are going to buy a Learning Management System and I think we are going to start in September of this year. We have a Project Manager appointed who is making an inventory of what lecturers want and part of this digital classrooms are gone to be realized in the LMS. And what we are going to do is I think we will have it in this December - January

2016. We are going to introduce it in the university in September, so with next college year we will have a LMS and from that point on you can see the people are going to experiment with this kind of techniques.

G: So it is in your future plans?

FG: Yes, it is.

G: The next question is about the network system. Is it able to support this kind of technologies?

FG: Yes without doubt, it is all glass fiber. We have up to 100 Megabits, no more very much more, this comes for all universities in Netherlands. We have SURF, which is an organization for all universities, and they provide a very high speed network all through the Netherlands, so we have connections with other universities very fast also here in the campus a very fast network, no problem.

G: 4th question, have you ever been approached by a company for this kind of technology? For instance Samsung.

FG: No, we haven't from Samsung but with other companies. We have been approached from other companies who are trying to offer all concept of learning but this is on the behavioral side, from that point on you can change your technology but we didn't have companies who said you can introduce smart boards, we already have it. We are not waiting for companies to give us this kind of apparatus, we already have it. So NO, there are no companies who are providing that kind of stuff, not at this moment, maybe this is changing because when we have LMS we are ready for next step.

G: It will broaden your horizon

FG: Yes, it is correct.

G: 5th question. Are there courses about this kind of technology?

FG: Well, there are courses for students who experiment with all this type of different ways of lecturing. We also have a department within the TU/e student office. This department is called AIDU support and they provide lecturers with tools on blended learning. Blended learning is not a concept, blended stands for that is a traditional way of lecturing and mix of digital learning. What they are doing right now is we have some experiments pilots going on where teachers are practicing with this blend of digital and classical learning. So we have a department that is working with that and there are also some classes which are experimenting with tools such as professional skills. We have some pilot software, Facebook-like software where students can interchange experience about professional skills etc. etc. so what you see is more and more on the experiment basis and piloting teachers and students are using more software and network software but it is still in the beginning.

G: Have you tested somehow the results of this new learning process and validate some results?

FG: No, not much at this moment. We have our executive boards has...there has been a plan on pilot learning which is approved by executive boards. We are taking steps to working it out so it is still in the beginning so we don't have results yet. But I think we have interviewed on teachers who are working with this blend of learning and we have some use cases made out of it. They had a description of some lessons

they were making in a blended form and we interviewed them and wrote down what we can learn from this. We have some used cases at this point, 6 or 7 I guess and we have described how blending learning in these lessons took place, how it worked. It has just been written and it was concluded in March, so it is very fresh at this moment, but we are working on it.

G: Last question is, for this kind of projects, do you start with a pilot project and then you move to full deployment?

FG: Yes, well it depends on your strategy because when a teacher wants to change his class, his lecture, then of course he can do it in a kind of pilot form. When 10 or 20 teachers want to change, then it is bigger, then you have to buy a bigger system and then must be done in a more structured way, not in a form of pilot. So when we are doing that, this is the case for instance with the LMS. But also with the digital testing system which we are going to buy next year. Then it becomes bigger and then we take a method base to a PM way of working, to do in a more structured way for all lecturers in the university.

G: For this kind of technology, touch screen technology in collaboration, you will do it in a mixed strategy, right?

FG: Well, if you would want to roll this for the whole university we will do it in a form of a project, we have an information manager for high education. We will do it in structured way involving as many people as possible then we buy a system that can roll out for the whole university. Of course if you want to test whether is useful for university then you will do it in a pilot. Depends on what questions is from teachers.

G: And how they perceive it, right?

FG: Yes. Sometimes let's not start a big project like this, it is first tested out, let some lectures practice with it, sharing experience with all of us and if they say we want this, then we make a big project.

G: Do you also involve students in this process?

FG: Of course. First about LMS, we have a steering group, in the steering group there are people from education from the bachelor and we have some groups around it made out of lecturers AND students. We see them as expert groups. Every time we are progressing in functionality, we think this university needs this functionality and we think it is going to be the system and to test it, with students and with lecturers. When they say I don't think you are right, we start over again but most of the time they say: well, you are right but you should look at this, at this and this so we involve them, which is the only way to know that you are really buying something that it is going to be used.

Appendix III: Data extracted from interview

Number (#) of answers in the interview	Data extracted - Quotes	Codes
#2	*''I guess there are a lot of smart boards and there are unique for one lecture room, to use in these lectures rooms, but what we do not do in this moment is to inter-connect them''*	They have a similar technology but it is not the same (classrooms are not interconnected)
#3 & #4	*FG: No, not at this moment. Maybe it is possible, but you at first must have the concept to work in this way and then you use the apparatus and the boards but there is no concept available that we like to work in this way. It is still replacement of the old chart boards. It is technology, it is digital, but we do not use it in another way.* ***G: Do you mean it has to be combined with behavioural change, right? FG: Yes, it is correct***	They have the apparatus but the outcome is unpredictable, due to the requirement of behavioural change
#5 & #6 & #7	*''Digital classrooms? (G: Yes, exactly) We don't have this at this moment.* ***What we do have a video college room where lecturers can take their own of web-lectures for instance, but that is a small part of what you mean.''*** *We have a Project Manager appointed who is making an inventory of what lecturers want and* ***part of this digital classrooms are gone to be realized in the LMS. G: So it is in your future plans? FG: Yes, it is.***	Non-existence of digital classrooms and objective for the future
#6	*''And what we are going to do is I think we will have it in this December - January 2016. We are going to introduce it in the university in September, so with next college year we will have a LMS and from that point on you can see the people are going to experiment with this kind of techniques.''*	They bought a LMS which will be used next year
#11	*''****Blended learning is not a concept, blended stands for that is a traditional way of lecturing and mix of digital learning. What they are doing right now is we have some experiments pilots going on where teachers are practicing with this blend of digital and classical learning.*** *So we have a department that is working with that and there are also some classes which are experimenting with tools such as professional skills.''*	The method of blending learning just started to implemented
#13	*''****Yes, well it depends on your strategy because when a teacher wants to change his class, his lecture, then of course he can do it in a kind of pilot form. When 10 or 20 teachers want to change, then it is bigger, then you have to buy a bigger system and then must be done in a more structured way, not in a form of pilot****. So when we are doing that, this is the case for instance with the LMS. But also with the digital testing system which we are going to buy next year.''*	Testing depends on the number of teachers who perceive change as positive and necessary.

Appendix IV: Overview of obstacles/remedies for resistance to "change problem"

Category	No.	Description
1. Obstacles to change	1	Deficiency from employees' side to conceive the importance of change.
	2	Teachers are immersed into habitual acts, which prevent them from trying to acquire new skills, because it is easier.
	3	Teachers are affected from past experiences. In case they tried to adopt changes in their teaching style in the past and they failed, it will greatly affect their future endeavors'
	4	Insecure environment combined with a potential lack of faith in their expertise will make them reluctant to change and they will stick in their old habits.
	5	Potential changes might be perceived as threats for teachers, because they might be translated as a lack in their scientific and teaching competences, which may lead to a false perception that they are not capable to accomplish this change successfully.
	6	People involved in traditional decision making processes might falsely translate the need of change, into a potential loss of their status quo and their power relationship.
2. Suggestions for tackling the problem	7	Principals have to see themselves as a part of the learning process and they have not be afraid of revealing their weaknesses, in order to convince their subordinates.
	8	Principals have to be optimistic and supportive towards their subordinates by encouraging them to take risks and to be not negatively prejudiced towards change.
	9	Creating a shared vision with clear goals, by involving all stakeholders actively to the change process.
	10	Recognizing and rewarding constructing behaviors from stakeholders who make constructing comments, give feedback and diffuse their knowledge.
	11	Break up long-term goals of change into milestones in order to be clear and explicit to the teachers. Feasible short-term goals are easier to achieve and it will greatly motivate people to see change as a tool for improvement and not as a threat. Celebrate success with staff and subordinates.