Disruptive & Cosmetic Technology Management in Education

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Abstract
Considering the user experience in the implementation of any new technology in an educational context requires careful planning and good judgment in order to make it a success. This paper proposes a technology implementation decision matrix which is applicable in all learning contexts and can be used for establishing whether any past, present or future technology should be implemented. Based on a series of pedagogical fundamentals that are core to the construction of the matrix and final decisions made are dependent on how implementers establish their own parameters and limitations. The matrix is meant to be a pedagogical guide reaching a final consensus based on purely educational purposes and interests. While consideration is made for financial elements and others the main design of the matrix is to facilitate a well formulated decision on whether or not educational gains will be made with the new technology under consideration.

Keywords: User Experience, Technology Management, Technology Implementation

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Introduction

The user experience is well developed in the business world but less so in the world of education. Hours of testing and development are spent on refining the best process by large companies like SAP and IBM to provide customers with the best experience that inspires confidence and develops the company brand. These processes are used as a standard when dealing with all clients and these lessons can be learned from these by the development of a quality decision matrix to establish real user needs, to avoid wasteful spending on procurement, and educating staff on strong educational course design criteria in order to facilitate the decision-making process before implementations are made in educational contexts. Considering the user experience and future technologies together will help avoid disruptive technologies impeding learning and implementations from being simply cosmetic in nature. By considering a technology implementation decision matrix we can minimize disruption for end users (learners) and maximize the potential for quality instructional support and engagement. Current and future technologies can be categorized and considered pedagogically before implementing technologies by determining possible gains for the learners and by creating an assistive environment.

Assistive technology (AT) is any device, piece of equipment or system that helps a person with a disability work around challenges so they can learn, communicate or function better. Disruptive technology (DT) disrupts learning or can be used to bring about change. Understanding what these are and how they work is the first step towards finding the right tools for our students and to implement them in our courses. This paper proposes use of a technology implementation decision rubric "Technology Implementation Matrix (TIM)" as a means of guiding facilitators in key components of deciding the tenability of any new technology to be implemented in any educational context in the future. Management of technology includes initial implementation and support to fully maximize the user experience and to make maximum gains from the technology implemented.

In the business world, according to Laugwitz, Held & Schrepp (2008) studies consider: the user experience; software evaluation; user satisfaction; questionnaires; usability assessment; and perceived usability in order to establish effective understanding of the technology in place. This includes the three levels of any design as visceral (look-feel-smell-sound) and evoking immediate and powerful responses, behavioural (perceptions and mood) and reflective (real meaningful association) and culminate in a holistic emotional design (Norman, 1988).

The educational experience has one main end user who is the student themselves. The learning experience is like any other user experience. Students, who are often already immersed in technology and software applications may have expectations upon them to keep up with technological advances, software updates, mobile devices, their online social environment as well as Personal Learning Environment (PLE). While we can consider online the Social Constructivist Learning Environment (SCLE) in courses and student perceptions of the etiquette involved, we must also concede the risk of social destructive behaviour in the same contexts (Sthapornnanon, Sakulbumrungsil, Theeraroungchaisri, & Watcharadamrongkun, 2009). In a 2008 study (Conole, deLaat, Dillon & Darby) reported that "students are immersed in a rich, technology-enhanced learning environment and that they select and appropriate technologies to their own

personal learning needs" as they rightly should. These "millennials" are now our student body, who are absorbing new technology at a faster rate as those of the 1980's when the personal computer was making its mark on the world, and for many, this can be overwhelming.

Positive Gains or Losses Made

Not all technologies or use of technologies is/are necessarily fruitful, and as professionals, we should consider carefully on behalf of students the meaningful gains or losses that can come about through such technologies. According to (Christensen, Horn & Johnson, 2008) "*A disruptive innovation succeeds by focusing on affordability, accessibility, capability and responsiveness. IT can help us move towards a modular, not monolithic batch mode education system and teach students in customized ways*" allowing breakthroughs and breakaways from traditional models that do not fit with new technologies and the progressively developing worlds of ICT and learning. It can be suggested that in many contexts that teachers use computers to make better lesson plans, and communicate more, but often continue to deliver instruction in traditional ways. Christensen, Horn & Johnson (2008) echo this message in saying that "*information technology is being used in limiting ways instead of being used to transform the prevailing instructional practices*". This means that teachers should be at the early adoption stage of technologies and up-to-date on current research in order to function well in this position, which is no easy task.

Personnel Disruption Management

Managing disruption is an important part of improving the learning experience and maximizing the impact on users (students). Disruption comes in multiple forms and below are many of the main characteristics of how they manifest themselves. Disruptive Learning Behaviours & Climate (DLBC) factors to consider are as follows: repetition or duplication, poor positioning (barriers/screens/classmates/boards/ blocking /etc.), poor sound quality (audibility, clarity, muffling/crackling, etc.), poor air quality and condition (dry eyes, humidity/moisture, heat/cold, etc.), materials (forgotten/lost/damaged/deformations/OS, etc.), Lighting (glare/reflections/contrast, etc.), and teacher disruption (confidence/updates/health issues, etc.).

Neutrally, "Learners can command an increasing range of mobile technologies that have the potential to support learning anytime anywhere, but also to disrupt the carefully managed environment of the classroom" (Sharples, 2002). With this in mind, educators must plan to provide the best environment possible for student success meaning the provision of: fast & simple technology, adaption/differentiation, barrier removal, clarity of instruction, student-centeredness when possible, progress measurement, creativity and quality content.

Our technology must be accessible and fast. We must define clear learning objectives for each pilot and get feedback at intervals. Interact as much as possible with teams and students. One could suggest that the most common and important technologies in educational technology management are the use of new technologies, which can have a disruptive effect if not well selected or well managed. Including, but not limited to: well formatted e-books with adjustable font sizes, areas for students to

write notes, well selected images (non-linguistic representations), adaptive software and hardware, interactive whiteboards, projectors and mixed, augmented and virtual reality hardware and software.

Understanding the users' own limitations and the limitations of each technology within reason gives us a much better understanding and grounded knowledge of what is possible now, and how we can expand on what we have available at any given moment before, during and after the implementation of any new technology. Pedagogically, each situational context can in theory be expanded on. However, there are questions to be asked of the tools and technology under such consideration. Questions like: Which tools do you think will be effective in addressing the student's specific needs? What strengths does the student have that can help them use this tool? Do you see a need for tools to be used in different settings? (Home, school, social settings, etc.) How easy is this tool to learn and to use? How reliable is it? What kind of technical support or replacement policy can you or the manufacturer provide?

Managing these responses must also fall under the remit of the personnel responsible for the implementation of the new technology in any educational context. Partnered with this are questions to be asked of the institution. Whomever is responsible for the financial responsibility and the support services needed must also consider: which tools do we think will be manageable? Which specific needs can we support? What training do the students need to help them use this tool? Do we see a need for tools to be used in our specific context? (classroom, library, on & off campus, social settings, etc.) How easy is this tool to learn and to implement? How reliable is it? What kind of technical support or replacement policy can our institution or the manufacturers provide?

These questions are all pedagogically based but they have a requirement of working technology knowledge as well as ability to manage financial requirements and logistics involved with maintaining the technologies which are set-up.

Technology Implementation Decision Matrix Development

If we begin with the premise that implementation of any new technology is primarily pedagogically guided and not financially or other, we can more purely make decisions based on the pedagogical context with which the implementation should occur and best serve the students who will benefit from the gains made by using any such technology. A need for really substantial and meaningful gains must be the primary driver in decision making any new technology to avoid obvious disruption and to improve the user (student) experience.

By using the Gallagher 8 x 5 Technology Implementation Matrix – show in table 1 – we can best decide, in any context, whether there are significant gains to be made by implementing any new technology. This decision matrix is based on the teachers' level of capability to implement as well as expertise which may be required during the process.

Table 1. Gallagher 8 x 5 Technology Implementation Matrix (Pilot)

Table 1

Teacher Level Matrix			Gallagher 8 x 5 Technology Decision Matrix			
Assistive elements	**-2**	**-1**	**0**	**1**	**2**	Score
Implementation will address a specific issue in carrying out the teaching	creates new problems	unnecessary level of complexity	nil effect	should help	solves issue	
This technology will speed the process of understanding	total interuption	will slow down	no gain	some increase	much faster	
This technology will facilitate the understanding	creates new problems	including technology explanation here may confuse	neutral	aids in understanding by exemplar	confirms the concept clearly	
Students will learn ICT skills during the process	not yet ready	some skills must be taught to complete	application of old skills exercised	new skills introduced	new skills learned	
Skills necessary will be transferable skills	non-transferable	task specific only	unknown at this time	usable in other areas	blends learning beautifully	
This technology will generate multiple opportunities in the future	non-transferable	task specific only	no increase	yes	required for next stage of learning	
Teacher preparedness/support level	likely teacher stress	I am novice at this technology and am not ready to teach with it	I have some experience and fair level of knowledge but with some gaps or wekanesses	Generally strong experience and knowledge but have some reservations	I am highly experience with very good knowledge/skills to teach with this technology	
There is enough technology for all students to engage equally	enough to introduce it only	shortage of technology	shared equipment	full coverage	excess available	
					Overall Score	

Discussion

Rogers' (1962) Diffusion of Innovations theory explains how, why and at what rate new ideas and technology spread (Rogers, 2003). Roger's four main elements which influence the spread of any new idea are: the innovation itself, communication channels, time and a social system. Now by studying the five stages in the decision innovation process – Knowledge/Persuasion/Decision (Reject/Accept), Implementation/Confirmation – we can strongly accept that implementation is the second to last step in the process and that knowledge, being the primary stage, must be obtained before progression can be made in any field. Based on this premise, the development of a reliable decision matrix to ascertain this knowledge must be key and prior to decision time in order to weigh the advantages/disadvantages of adopting any innovation. As decision time is the most difficult stage at which to acquire empirical evidence it would therefore be most prudent to ascertain as much evidence as possible in the earliest possible stages. Again, this shows a real need for a legitimate collection of evidence/knowledge in order to enable a quality assured best practice approach to implementing new technologies. Generally shown in findings by Smith (2014) of the Pew Research Center "The American public anticipates that the coming half-century will be a period of profound scientific change, as inventions that were once confined to the realm of science fiction come into common usage". As one might expect "some Americans are also inclined to let others take the first step when it comes to trying out some potential new technologies that might emerge relatively soon" Smith (2014). This shows a general consensus of late adoption in what could be considered a fear of technology due to the rate of development but his report also states that "Some 59% are optimistic that coming technological and scientific changes will make life in the future better, while 30% think these changes will lead to a future in which people are worse off than they are today", which seems to dispel this theory. Clearly, there is apprehension on any new technology and opinion polls only provide perceptions and circumstantial evidence that is professionally unreliable, other than it includes the social dynamic of which, in an educational setting, will be composed of educated

individuals with hopefully a better understanding of evidentiary decision-making than members of the general public of whom this survey was conducted with.

Eight Fundamentals

This matrix proposes that there are eight fundamental elements that must be considered in order to have an effective implementation of any new technology and believe that this list should not be shortened without having some adverse effect on the success of the implementation.

1. Implementation will address at least one specific issue in carrying out the teaching.
2. The technology will speed the process of understanding for students.
3. The technology will facilitate the understanding.
4. Students will learn ICT skills during the process.
5. Skills necessary will be transferable skills.
6. The technology will generate multiple opportunities in the future.
7. An appropriate level of teacher preparedness and student support.
8. Effective rollout and coverage – scaling up/down.

Conclusions

There is often not a need for a new technology, rather, there are marked gains to be had or ancillary advantages which can be beneficial to the learning experience, either directly or indirectly. As we move forward with technology there will be many future technologies for which we cannot know now on how they should be adopted, but we can be sure of the sound pedagogical reasoning in selecting any new technology based on the one factor which is least likely to change, which is the human condition. Based on the needs of learners and the learning experience we must prepare for providing quality assured learning experiences and environments with the end-user in mind.

While there is no specific developed scale at this time for any final judgment on whether a new technology should be implemented, extensive research must be done to establish further clarification of the specifics in exact numerical value of a recommendable level. However, the matrix as it stands now is meant to be a guide to be used in all situations and for the implementers to establish their own situation most closely and for them to establish their own parameters and judgments as whether or not to go ahead and implement the new technology. Most situations are different and contextual limitations and customized needs make establishing tight parameters a fruitless task. The matrix is intended as a meaningful guide to be used by anyone in any context without complex measurements and still be able to use their best judgment to come to their own individual decision. Follow on research is recommended to establish multiple implementation results and preliminary decisions in order to establish if indeed the eight fundamentals need to be reduced or expanded.

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