The Diffusionist Model of e-learning Development

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Introduction

For almost two decades research focus in e-learning has been slowly but surely shifting from technology to pedagogy. However, "discourses of e-learning have tended largely to construct the area of study as about the mechanics of its implementation (the appropriate use of technology in education, the effective delivery of educational messages, the efficient systems for materials production and so on)" (Fejes & Nicoll, 2008: 174). In order to reach beyond mechanics of educational process, this paper examines the recent applications of the diffusionist approach to e-learning development (Zemsky & Massy, 2004; Elgort, 2005; Duan et al., 2010; Zhang et al., 2010; Soffer, Nachmias, & Ram, 2010) and analyses its main theoretical and practical consequences.

The diffussionist model of e-learning development

Based on Rogers's theory of diffusion of innovations (1986, 1995), Zemsky and Massy developed the e-learning adoption cycle (2004: 9–12). The cycle statistically distributes populations according to Gauss distribution into the following categories: innovators, early adopters, early majority, late majority and diehards. Figure 1 represents the e-learning adoption cycle according to cumulative percentage of population, while Figure 2 represents the e-learning adoption cycle according to relative percentage of population.

Following fast penetration of broadband Internet in western homes during 1990s, education supported by computers and Internet, commonly known as e-learning, has been rapidly gaining importance in educational praxis. However, using early e-learning tools required advanced command of information and communication technologies. Most educators are not technology experts, and implementation levels of e-learning tools are proportional to educators' ability to utilize them in practice. For this reason, the first phase of diffusion is strongly marked by development of technological solutions viable for wider audiences.

Figure 1: Zemsky and Massy's e-learning adoption cycle according to cumulative percentage of population (based on Zemsky & Massy, 2004: 9).

E-learning adoption cycle starts with *innovators*. Typical innovators were computer experts and enthusiasts who simultaneously developed and used e-learning technologies. The stage of innovators is abundant with fresh ideas and small individual projects with little or no institutional support. Institutional e-learning projects were few, and mostly took place within technical schools and research institutes. Following the lack of institutional opportunities, most innovators adopted lone ranger approach (Anderson & Elloumi, 2004: 346). Community of e-learning practitioners was in its infancy, and research results were (if at all) published on the fringes of conferences and journals oriented to traditional research areas. Consequently, the

Figure 2: Zemsky and Massy's e-learning adoption cycle according to relative percentage of population (based on Rogers, 1995: 262).

stage of innovators is marked by significant overlapping between e-learning development projects. For instance, during early 1990s almost every progressive educational institution had been developing own virtual learning environment. For all those reasons, early e-learning research was often overly focused to technologies (Jensen, 1994; Bates, 2000).

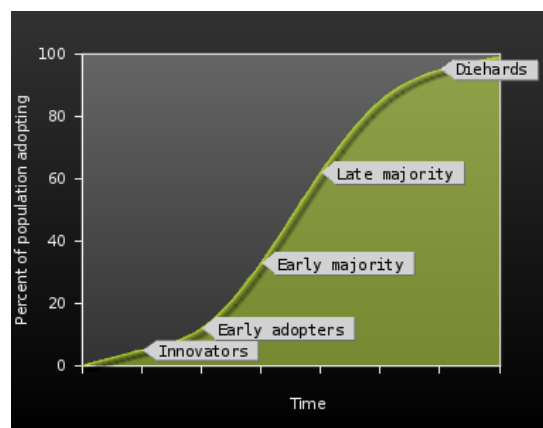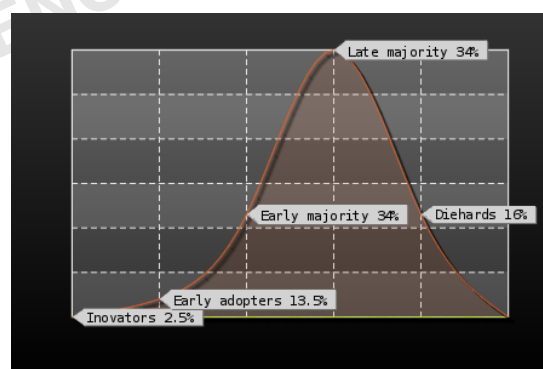Moving on to the stage of *early adopters*, population of e-learning practitioners slowly

shifts from technology experts towards teaching staff with special interest in information and communication technologies. E-learning development is still strongly technologically oriented. However, specialist licensed and open source e-learning tools strongly enter technology markets. Classroom implementations increase in size and scope. Research focus slowly shifts towards pedagogies (Laurillard, 2008; Prensky, 2001; Bates, 2000), thus creating a gap between technology-oriented and pedagogy-oriented practitioners (Zemsky & Massy, 2004). Development and maintenance of e-learning is still dominated by lone ranger approach. However, there is an increasing number of larger collaborative projects between individuals and institutions specialized in diverse fields from pedagogy to technology.

The stage of *early majority* strongly reinforces the set trends. The gap between technology and pedagogy becomes wider. Specialist software companies and open source projects rapidly grow in number and size; consequently, most educational institutions cease own production of e-learning tools and switch to products available in the market (Jensen, 1994). Teachers and institutions rapidly embrace e-learning: near the end of the phase of early majority, total penetration of e-learning in traditional educational systems reaches 50%. E-learning development is mostly based on large collaborative projects. Consequently, scope and extent of the supporting activities exponentially increase. In order to fulfill the growing demands for labour, educational institutions open new positions such as e-learning managers, administrators of e-learning systems etc (Anderson & Elloumi, 2004). The new positions require specialist skills and knowledge: in order to satisfy the increasing demand for experts, educational institutions introduce appropriate degrees (The University of Edinburgh, 2011; Fielding Graduate University, 2011).

In the stage of *late majority* over 80 per cent of educational institutions support some form of e-learning. This stage further develops trends started within the stage of early majority, and does not bring significant conceptual changes. Finally, *diehards* refuse to accept e-learning, or accept merely the basic requirements for maintaining their positions.

Theoretical issues

When applied to e-learning, the diffussionist model is overly simplified in several important ways. Firstly, the diffusionist model was originally developed for analyzing introduction of relatively simple agricultural techniques into farming (Rogers, 1986: 117). In terms of technology, pedagogy and social impacts, however, e-learning is much more complex than any agricultural technique. For this reason, it is questionable whether the diffusionist model can be generalized from smaller sets of technologies to the whole discipline. Secondly, people and institutions may belong to different categories in the context of two or more innovations. For instance, an innovator who took up using e-mails decades ago might be diehard in the context of virtual learning environments. A univer-

sity's physics department may have introduced e-learning decades ago, while its philosophy department might still struggle with introducing e-mail communication between staff and students. Thirdly, the diffusionist model does not recognize the objective obstacles to adoption of e-learning such as the Digital Divide. For instance, only 10.9 per cent of African population has broadband Internet access (Internetworldstats, 2011). Schools and teachers in those areas are not diehards because they do not want e-learning—simply, its development is constricted by the lack of the essential infrastructure.

The diffussionist model classifies past and present events. However, it is unable to predict whether yesterday's and today's trends will remain for the future. For one reason or another, people may simply quit e-learning. More importantly, it is impossible to predict the viable extent of e-learning applications. For now, some elements of developing skills such as painting, dancing or playing music are simply not suitable for Internet delivery (Laurillard, 2008; Racic, Jandric & Vucina, 2011). Using the current information and communication technologies and pedagogical approaches, e-learning adoption will never reach one hundred per cent.

Information and communication technologies constantly evolve. Today's computers bear little resemblance to dishwasher-sized machines of the 1970s or simple home entertainment tools of the 1980s. However, such mutations are not included in the diffussionist model. History of e-learning technologies provides many examples where more advanced technologies, such as virtual learning environments, disrupted development of less advanced technologies such as CD-ROM based courses (Bates, 2000). However, the diffussionist model does not include disruptive technologies within an adoption cycle. In his later works Rogers tried to resolve the first problem by describing technology development using several diffusion curves, and the latter by connecting several successive adoption curves (Rogers, 1986: 116–125). Such remedies improve accuracy of the diffussionist model. Theoretical issues, however, remain unchanged. The last but not the least, the very concept of diffusion implies penetration of one medium into another. Therefore, the main prerequisite for diffusion is the ability to make a clear distinction between the two (Encyclopadia Britannica, 2011). In order to explore this conclusion deeper, let us try to distinguish between traditional education and e-learning by analyzing the following examples:

> A teacher from a developed western country, regular user of information and communication technologies, joins a humanitarian organization and starts teaching in a remote Third World village. The village does not have electricity and water infrastructure; inhabitants have never seen a computer. Teaching and learning takes place under a tree, and the most advanced technology used in instruction is blackboard and chalk. However, our teacher prepared for the job at an online school, using the most advanced information and communication technologies. Is this traditional education or e-learning?

> In the classroom, math teacher uses only blackboard and chalk. However, he or she regularly uses exercises and assessment questions downloaded from a specialized Internet portal for math teachers. Is this traditional education or e-learning?
>
> In Europe, Bologna declaration has formally equalized formal and informal education. Depending on context, formal education might have been acquired without using technologies; however, informal education of the vast majority of European citizens has at least partially been acquired by using information and communication technologies. Is this traditional education or e-learning?

In order to illustrate our point we have deliberately chosen borderline examples. However, the drawn conclusions can be confidently generalized to all education. Human beings are deeply rooted in their habitus (Bourdieu, 2007: 72–73), and habitus of the network society is dialectically intertwined with information and communication technologies (Castells, 2003; van Dijk, 1999). Unless we are dealing with a strictly pre-technological community, it is impossible to make a clear distinction between traditional and technology-supported education. In the network society almost all information and communication technologies are educational, and all education is at least indirectly based on information and communication technologies. In its very basis, therefore, the diffusionist model does not correspond to the reality.

Practical applications

Let us examine correspondence between the found theoretical restrictions to the diffusionist model of e-learning development and its practical applications using few examples. Duan et al. successfully utilize an innovation adoption perspective in order to examine Chinese students' intention of taking up e-learning degrees at UK institutions (2010). Similarly, Zhang et al. investigate "people's perceptions and attitudes toward adopting e-learning to explore the key factors affecting the e-learning adoption behavior in China. Based on Rogers' innovation adoption theory", they identify 33 factors of the perceived innovative attributes of e-learning and analyze them using advances statistical methods (2010). Finally, Soffer, Nachmias and Ram look deeper into the past and explore "long-term web-supported learning diffusion among lecturers at Tel Aviv University (TAU), from an organizational point of view" within the period of eight years (2010).

Let us take a closer look into the research foci of these studies. Duan et al. focus to the very specific group of Chinese students who consider taking up e-learning programmes provided by UK universities. Zhang et al. horizontally investigate 33 factors relevant for adoption of e-learning here and now, but do not provide any insight into the temporal dimension. On the opposite side of the spectrum, Soffer, Nachmias and Ram investigate

few factors relevant for adoption of e-learning through the period of eight years. In these contexts, theoretical restrictions of the diffusionist model of e-learning development do not significantly influence the final results. For this reason, we may conclude that the diffusionist model of e-learning development offers decent results within the framework of focused, practical studies.

Looking the other way around, it is easy to show that applying the diffusionist model of e-learning development to more complex problems, or large populations, or periods of time would inevitably increase the influence theoretical inconsistencies to research results. For instance, it is reasonable to expect that students who seriously consider taking up an expensive overseas e-learning degree possess computer access. For this reason, Duan et al. could use the diffusionist model of e-learning development which ignores the Digital Divide without significant impact to results of their research (2010). In the context of a less focused study oriented towards general population, however, the Digital Divide is an essential parameter which significantly influences research results (Van Dijk & Hacker, 2003: 315). On such basis, we may conclude that accuracy of the diffusionist model of e-learning development decreases in inverse proportion with problem complexity.

The diffusionist model is theoretically unable to predict the future. However, education is traditionally inert. Excluding the impacts of natural disasters, political coups and similar events beyond human reach, it is highly unlikely that any educational system would significantly change its way of functioning within the course of few months or sometimes even years (Bourdieu & Passeron, 1994: 54). Therefore, as can easily be seen from Soffer, Nachmias and Ram's analysis of eight years of e-learning at Tel Aviv University (2010), the diffusionist model enables pretty sound short and middle term educated guesses despite its theoretical inability to read future. For this reason, it is instrumental in making strategic and managerial decisions (Zemsky and Massy, 2004; Bates, 2000).

Essentially the same argument can be applied to the theoretical restrictions arising from the fact that the diffusionist model of e-learning development does not include evolution of information and communication technologies and, more specifically, disruptive technologies. Information and communication technologies do not evolve overnight; even strong disruptive technologies need few years for a complete market takeover. For instance, although virtual learning environments powered by broadband Internet have disrupted adoption curve of CD-ROM based courses almost a decade ago (Anderson & Elloumi, 2004), such courses can still be found on the fringes of contemporary educational practice (Racic, Jandric & Vucina, 2011). Although accuracy of the diffusionist model of e-learning development decreases in inverse proportion with time-scale, there is a fairly long 'safe period' where the diffusionist model of e-learning development provides accurate results.

The final theoretical restriction of the diffusionist model of e-learning development, derived from the lack of clear theoretical distinction between traditional and technology-

supported education, is an in-built feature of the diffusionist model. For this reason, it can be amended only by introducing significant changes into basic assumptions of the diffusionist model of e-learning development or by creating a new, different model.

Conclusion

The diffusionist model of e-learning development is instrumental in describing small scale and time restricted phenomena such as implementation of e-learning to educational institutions. Although the diffusionist model theoretically does not allow predictions, it helps creating accurate small and middle scale educated guesses. For this reason, the diffusionist model achieves reasonable success in the contexts of various practical small scale studies of e-learning development.

Theoretical and practical restrictions arising from the diffussionist model of e-learning development indicate two different directions for further research. The first direction, tacitly accepted in research papers used in this article, is to try and improve the existing model. Based on theoretical assumptions of the model, this research direction can provide valuable practical insight but can never completely correspond to the reality. The second option is to look into a completely different direction, and either alter the main assumptions of the diffusionist model or create a completely new, more successful model. This research direction is a true journey into the unknown, and its results are fully unpredictable.

Educational praxis equally consists of small practical improvements in our daily activities and grand theoretical achievements. For this reason, the diffusionist model of e-learning development should simultaneously be applied to various practical problems within the limits caused by its theoretical inconsistencies and constantly challenged in the quest for a more sophisticated replacement.

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