Introduction

For the last two decades, researchers and practitioners have been exploring the potential of digital educational technologies in both schools and the workplace. Some of the early research offered fairly mixed results (Clark & Mayer, 2008). Many of these early studies were mainly focused on the usability, efficiency, and reliability of these new learning environments compared to their classroom counterpart (Oncu & Cakir, 2011). The major question investigated in these exploratory experiments was “can we really effectively learn with these technologies?”

Shortly after the turn of the millennium, a series of landmark studies shifted the research perspective about digital educational technology solutions (Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011). One such study was the meta-analysis published by a team of Concordia University researchers (Bernard et al., 2004). This study synthesized the results obtained by 232 studies comparing classroom and online delivery of instructional material. The breakthrough conclusion obtained showed that there was no significant difference on achievement, attitude, and retention measures between learning in the classroom and learning from the technological/distance learning solutions. This type of result redirected the attention of many researchers from “can we learn with these technologies?” to “how can we use and integrate these technologies in education and in the workplace?” (Bernard et al., 2009).

In the following discussion, we will use the term digital learning, referring to the full spectrum of education and training solutions offered in the educational technology and distance education fields. This reflects the current globalization trend in education and training, where associations, educational institutions, and corporations are gradually grouping their educational/training offerings in large-scale online delivery organizations. Some of these ventures will be presented in this chapter.

Acceleration of Digital Learning Ventures

It is also during the first decade of the 21st century that we see a worldwide acceleration in the use of digital learning solutions (ASTD, 2012; UNESCO, 2012). The number of educational institutions using online learning and the number of students taking credited online courses has
steadily grown over the last 9 years—some years reaching double-digit growth (Allen & Seaman, 2011). In a 2011 survey from the Babson Research Group, more than 2,500 United States universities and educational institutions are now offering online courses. They reported more than 6.1 million students taking at least one online class during fall 2010 in the United States; a 10.1% increase over the previous year (Allen & Seaman, 2011).

The credibility of online learning has also continued to increase. In 2011, 67% of academic professionals in the United States rated online education as the same or superior to face-to-face instruction; a slow but steady increase over the previous 8 years (Allen & Seaman, 2011). According to a 2011 review of the digital learning market (Adkins, 2013), until recently, the online learning market was largely composed of corporate ventures and developing economies. This has changed, as the market is now one of rapid adoption in all the buyer segments. The largest growth is in developing economies like India and China, but the demand for specialized skills has also grown significantly in the US, Europe, and India, as shown below:

- In the US, the University of Phoenix has experienced 22.3% growth from 2008 to 2009; 16.8% growth from 2009 to 2010. Over 325,000 students were enrolled in online classes in 2012 (Apollo Group, 2013).
- According to the European Association of Distance Teaching Universities, about 500 European institutions provide short courses or entire programs at a distance. Student enrollment increased by 15%–20% in 2012, making online education a serious educational alternative in Europe.
- The Indira Gandhi National Open University (IGNOU) has dramatically increased enrollment since offering a distance e-learning mode and now serves over 4.2 million students in India and 36 other countries. IGNOU is currently the largest distance education institution in the world.

In his analysis on the worldwide market for self-paced e-learning, Adkins (2013) reported that the countries with the highest growth rates for digital learning were Vietnam, Malaysia, Romania, Azerbaijan, Thailand, Kenya, Slovakia, the Philippines, India, and China. They were all above 30%, which is four times the worldwide aggregate growth rate for online learning adoption. During the same period, there were dozens of countries with growth rates over 15%; they include Indonesia, Nigeria, Qatar, Oman, Poland, Russia, Tunisia, the Czech Republic, Tanzania, Brazil, Columbia, Bolivia, Hungary, Croatia, Bulgaria, Georgia, and Ukraine. Even if there is a worldwide growth in the adoption of digital learning solutions, the growth is more important in regions that do not have a sufficient “brick and mortar” infrastructure to answer their national demand in education (UNESCO, 2012).

In the following sections, we will look at different models of digital learning that are emerging. We will then look at the importance of modeling digital learning solutions to determine how they can better fit the growing needs of this more global and digital world.

### A New Generation of Digital Learning Solutions

Even before the information revolution, scholars voiced their concerns about the limitation of the existing education model. Visionary thinkers like Clark Kerr (2001), former president of the UC system, foresaw the need for educational institutions to outgrow their physical and geographical boundaries. He coined the concept of “multiversity” to describe an educational world where universities collaborate across geographical borders. While Kerr’s (2001) insights focused on American universities, the concept of multiversity is currently being used to transform individual universities as well as national educational systems (Fallis, 2007).
In the last decade, there has been a proliferation of new education and training models that have been supported by online and digital technologies (Faviero, 2012). Here are a few of the key models that have appeared:

a) **Large-scale distance education institutions.** From the beginning, distance education targeted niche needs from the geographically disperse to the highly specialized. In the last decade, distance education has gone beyond this niche mission to reach a mainstream status. In the developed countries, distance education institutions like the UK’s Open University (250,000 students) or the University of Phoenix (225,000 students) in the United States have steadily grown to surpass the enrollments of their brick-and-mortar equivalent. In developing countries, distance education institutions have grown to become a significant method of delivering education to the general population. In India, the Indira Gandhi National Open University is the host to more than 4.2 million students. Currently, China is home to more than 70 different online colleges and universities with a few already showing enrollments of over a million students. These numbers are likely to grow in the coming years in order to meet the demand for skilled labor in China (ICEF, 2012). In the Middle East, there is a recent resurgence of distance education. Organizations such as the Arab Open University (AOU) have already more than 22,000 students in seven countries, where more than 50% of students are women.

b) **Open educational resources (OER) centers** are structured banks of online educational resources. Early attempts were around the concept of digital repositories (like Merlot and OER Commons) and allowed content developers to share the educational resources they created (Atkins, Brown, & Hammond, 2007). In 2006, the Khan Academy appeared as a tutoring tool for students and soon became an educational revolution (Kronholz, 2012). The Khan Academy provides structured instructional videos and tests to K-12 students, teachers, and schools systems. The emergence of such approaches has allowed educators and researchers to experiment with different types of delivery methods and test new models such as flipping the class. The flipped classroom approach proposes the use of technology to deliver instruction inside and outside the classroom. Because lectures can be done online, the teachers have more time to engage, interact, and provide feedback to students.

c) **Association of postsecondary institutions** is another interesting model to provide common online services, leveraging their common intellectual capital. Generally based around Clark Kerr’s (2001) concept of “multiversity,” these new online institutions offer a joint online marketing and delivery to institutions they represent. Many of these offer free access to their course material, but may require fees when students need some type of recognized accreditation (Faviero, 2012). Here are three examples of this model:

I. **Coursera** was created in 2012 by Stanford professors Andrew Ng and Daphne Koller and is probably the best known of these solutions. Coursera is a for-profit organization mostly financed by venture capital, which offers courses from 33 universities, including Stanford, Princeton, and Caltech, but also includes partners in Canada, Scotland, India, and Switzerland (Faviero, 2012). Coursera mainly uses video lectures produced by university professors, interactive exercises, quizzes, and essays to reinforce course content. As of January of 2013, it was offering 213 university-level courses to over 1.9 million students from 196 countries (Coursera, 2013).

II. **Udacity** was founded in 2011 by Stanford researchers David Stavens, Mike Sokolsky, and Google’s Sebastian Thrun. Initially financed by Thrun and other venture capital firms, Udacity primarily offers courses in science and information technology (Faviero,
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Claude Martel  

2012). With less than a year of operation, over 400,000 students have taken courses on this online platform. Reaching out to the information technology community, Udacity also offers computer science course in collaboration with major organizations like Google, Microsoft, Autodesk, Nvidia, and Wolfram Research (“Udacity,” n.d., para. 6)

III. **EdX** is a nonprofit venture spearheaded by the Massachusetts Institute of Technology and Harvard University; each committing over $30 million to the project. Since May 2012, EdX offers free online university-level courses to a worldwide audience. The project grew out of the MITx initiative of MIT President Rafael Reif and Professor Anant Agarwal. Rapidly, other universities joined the “X University” consortium, including University of California, Berkeley; University of Texas Systems; Wellesley College; and Georgetown University. As of January of 2013, more than 150,000 students enrolled in EdX’s first course, 6.002x: Circuits and Electronics. Learners earn a certificate issued by “X University” providing the course (Faviero, 2012).

d) Another model appearing in the last decade is the **global online accreditation** program. In this model, international organizations become global educational institutions (Patila & Codner, 2007). One such online program is a joint venture between the International Civil Aviation Organization (ICAO) and Airport Council International (ACI). The Airport Management Professional Accreditation Programme (AMPAP) (Behnke, 2012) was created in 2007 to develop a new generation of airport managers in strategic areas of airport business. Upon completion of this six courses blended program, students are awarded the International Airport Professional (IAP) designation accredited by both ICAO and ACI. In the first 5 years, over 800 airport professionals from 86 countries have taken courses in this specialized program, and 225 have already earned this accreditation.

e) **Massive open online course (MOOC)** is a recent incarnation on the use of online education. The term was coined by Dave Cormier of the University of Prince Edward Island, and Bryan Alexander of the National Institute for Technology in Liberal Education in 2008 (“Massive Open Online Course,” n.d., para. 7). MOOCs are online courses where the course material is dispersed across the web. Constructed around the concepts of autonomy, connectedness, diversity, and openness in the educational process, MOOCs are mainly based on cognitivist principles. MOOC is an extension on the concept of digital repository, where a massive amount of instructional material is gathered on a specific course subject and offered to potential learners (Daniel, 2012)

It is still unclear which of these solutions will still be here at the end of this decade, but enthusiasm for new digital learning solutions is growing. Our next challenge as researchers and practitioners is to develop frameworks to analyze and possibly predict the impact and challenges these new digital learning solutions will bring.

**A Proposed Framework to Analyze and Plan Digital Learning Ventures**

In reviewing some of the digital learning ventures over the last two decades, one easily has the impression that there are as many digital learning failures as there are successes. To better understand this phenomenon, we need to investigate the different aspects of implementing digital learning in education and the workplace in order to recognize the factors that influence the success or failure of these ventures. According to Elloumi (2003), there are many reasons why digital learning ventures fail; they often include business, technical, and pedagogical issues.
Initial attempts to analyze the inner workings of digital learning ventures (Woudstra & Powell, 1989) provided a few of the key facets of the organization, but these studies mostly focused on the pedagogical and the business aspects of the organization. Having professionally analyzed and reviewed over 15 digital learning ventures launched over the last two decades, we have refined the existing models and obtained six dimensions that organizations need to consider. We found that these dimensions seem to be intimately interconnected with each other. This is why we decided to use interconnecting cogs to illustrate the model of interdependence between each dimension (see Figure 3.1).

This representation also illustrates well that decisions made in any one of these may affect all the other dimensions. The cog model also represents this as an organic and iterative rather than linear process. In the next section, we will present a summary of each of the six dimensions and explain why these are essential components of a descriptive and prospective digital learning model.

**The Strategic Business/Societal Dimension**

This first dimension focuses on the needs, goals, and deliverables to be accomplished (Kaufman, Herman, & Watters, 2002). Organizations often consider digital learning solutions to answer some fundamental need, like increasing the access to instruction, developing competencies skills, or providing services for a disperse targeted population. Inspired by Roger Kaufman’s “Mega Planning” model, this dimension links the micro or specific digital learning intervention to the larger goal of the organization or society it serves. It proposes that digital learning interventions must be more than surface interventions that are added on top of an existing organization. They need to be intimately aligned with the host organization. It should include requirements for new or updated processes and the impact it will have on organization and the society it serves (Kaufman, 2011). It should map out the main implications and even forecast some of the challenges one might encounter along the way (literacy, access to technology, budget, etc.).

![Figure 3.1 The Six (6) Dimensions of the Integrated Digital Learning Model](image-url)
This dimension is strategic as digital learning interventions are often linked to the success or growth of organizational and societal development. According to Global Partnership for Education (2013), training and education are often the keys to unlocking a country’s potential for economic growth. They propose that even basic education in developing countries offers tangible results, such as

- each additional year of schooling increases an individual’s potential income by up to 10%;
- four years of elementary schooling increases a farmer’s productivity by nearly 9%;
- each additional year of education, in the population of a country, increases the annual GDP by 1%.

A good example is India’s education and manpower strategy that included massive investment in digital learning solutions over the last two decades (King, 2012). Their strategic use of digital learning helped this country move from a status of underdeveloped to one of international economic leadership. The research on the impact of training and education is steadily growing and provides notable results when the digital learning interventions are aligned with the organizational or societal goals. This dimension is often the first and the last to be accomplished as it allows the project team to determine the needs and goals to be attained at the outset as well as validates whether these needs have been achieved at the end of the process.

**The Learning/Teaching Dimension**

As with all instructional ventures, there is an intimate relationship between learner characteristics, course content, and instructional strategies. Most instructional designers perform this type of analysis at the course or program level. We propose to extend this type of analysis to the organizational level. Based on the organization’s mission statement, this dimension maps out the general characteristics of the different learners targeted and cross matches them to the different types of content to be disseminated. This process connects the characteristics of the learners to the specifications of the content to determine the optimal delivery and instructional strategies. This approach will allow developing general and specific instructional policies and processes to be used as guidelines to develop courses and programs.

This type of mapping is particularly useful when planning a digital learning intervention that targets multiple territories or a loosely specified targeted population. During the development of the AMPAP, this type of mapping identified multiple learners and content characteristics such as language proficiency, technical prerequisites, and collaborative style. It also helped to plan the digital learning environment and the instructional strategies that best fit this diverse and international population.

**The Program Structure and Accreditation Dimension**

This dimension looks at the way the courses and programs are presented to the population of learners. This dimension investigates how instructional material is packaged and what certificate, diploma, or accreditations are offered once the activities are successfully completed. Closely linked to the strategic business/societal and learning/teaching dimensions, this dimension defines how the program structure and the accreditation offered will bring perceived and tangible value to the targeted learners. In too many online programs, it is difficult to define the actual value of the instruction obtained (Coats, 1999). Many institutions now go out of their way to explain...
how students will benefit from successfully completing their courses or programs. Institutions like University of Phoenix or the Indira Gandhi National Open University offer a clear rationale on how a course or program may fit in an individual career path and explain their societal mission in this process. Other programs such as the AMPAP have gone further by creating an industry-wide accreditation, the IAP.

This process is often associated with the marketing of a program, but it has become an essential part in the credibility of any digital learning institution. Early digital learning institutions were often associated with online diploma mills (Piña, 2010), where devious online organizations would grant worthless degrees to unsuspecting learners. To prevent the contamination from less credible institutions, many digital learning institutions have now joined national accrediting organizations and offer nationally or internationally recognized diplomas. Another factor is the structure of the program and course catalogue. Many early digital learning projects were an addition to existing offerings, where students needed to go through separated systems, registrations, and catalogues. More recent approaches offer integrated programs or blended competency-based approaches where students are guided through the different types of material. Mapping out the programs, competency, or certification paths greatly helps to see how the students flow through the organization and identifies peaks/bottlenecks for each instructional activity. In this process, the team can identify mandatory and electives activities, prerequisites, and potential challenges in the delivery schedule.

The Administrative Dimension

This fourth dimension looks at administrative activities and how they create a good environment for targeted students. This information might not be essential to attract students, but it is often one of the key aspects to keep them in digital learning programs. Starting with course-centered policies such as grading schema, attendance, and grade reevaluation, these types of administrative processes can make an important difference on how a program is perceived by the student population. Other elements focused on program administration, such as tuition fees, payment methods, drop out/course change policy, equivalencies, and time to completion can also favor or restrict student flow in the instructional activities. For example, in the AMPAP administrative factors were found to have crucial impact in the success of the program, as administrative procedures needed to fit well with the complex schedule and lifestyle of airport professionals registering to the program.

The administration of financial support such as grants and bursaries may also be critical for programs reaching a clientele that has modest financial resources. Administrative processes in a blended or hybrid environment are particularly challenging, as they need to adapt to multiple modes of instructional delivery. Unless they are handled by one generic process, they may create student confusion and frustration. Defining and mapping out the flow of administrative processes helps to understand how these processes need to be performed or integrated in the existing administrative structure. In many digital learning projects, some of the administrative tasks are duplicated or added on top of the existing process giving administrators, teachers, and students additional work.

The Financial Dimension

One dimension that is often partially overlooked in the implementation of digital learning projects is the operational financial aspect. Let’s here distinguish between implementation cost and long-term sustainability expenditures. Most digital learning projects require substantial initial
investment to offer services. These include the financing of the initial technical infrastructure, the development of courses, and administrative organization. Developing a financial framework for a digital learning organization is a challenge in itself, but the initial investment alone will not ensure the survival of the project. After the initial implementation, long-term sustainability requires a different financing model. It should allow the project to minimally cover the operating cost and, in some cases, growth. Many corporations using digital learning are now requiring projects to become cost neutral or self-sustaining. This means that all sources of funding must be identified and mapped out for both the implementation and the long-term operation of the project. These may include the following:

- The financial support from the parent organization
- Tuition and fee model
- Funding from benefactors, governments, and foundations
- Funding from advertising, sponsorships, or other commercial sources
- Funding from loans and investors

One of the key challenges in this dimension is to distinguish between projection and valid estimates. Tuition fees are an example to illustrate this difference. One can easily make a projection of the tuition revenues by arbitrarily setting tuition-fee levels. A more valid estimation would analyze the tuition cost that the students or parent organizations are willing to pay for that service. Too many times, tuition fees are inflated, thus reducing enrollment levels and overall funding. Once credible sources of funding are identified, they need to be integrated in the project timeline. The incoming funds and expenditures are mapped out to forecast the financial health at different stages of development and operation.

The financial dimension is often a reality check between the needs, the organization to best address it, and the financial means available. Far from being an obstacle to the development of such ventures, it is usually an eye-opener for the parent organization that may then start looking at alternative models of financing and operation. For an organization strapped for funds, the review of the financial dimension often opens the possibility to other sources of funding or partnering with complementary organizations that were rejected initially. In the last decade, we have seen an increased variety of funding for digital learning ventures. This trend will more than likely continue and grow.

The Technological Dimension

The technological dimension is often felt as one of the most challenging aspects of integrating new digital learning solutions. Yet, many digital learning implementations start with the assumption that we need to first look at the technical possibilities that are available, and then evaluate how these can answer the needs of the organization and targeted population. In that context, numerous digital learning implementations use technological solutions that only achieve a portion of the needs and requirements. The balance between what technologies can offer at any given time and the real needs of an organization raises the question on whether we should risk implementing technological solutions that partially respond to the need of the organization (Van Den Ende & Dolfsma, 2005). Too often, technological solutions do not fulfill key administrative, educational, or financial needs. This is often amplified by the fact that few organizations have IT professionals that have strong digital learning technology experience among their ranks.

In this model, we propose that the technical dimension should be the last to be investigated as it may limit or contaminate the needs defined in other dimensions. Only then should we identify
the gap between the technical possibilities available and the defined needs. This will greatly help determine the overall impact of the functionalities that are missing or partially addressed. The process itself remains fairly straightforward, where requirements and processes are compared to software functionalities, each being weighted on their compliance and importance to the project. Once the technological dimension is analyzed, we need to go back to all six dimensions and determine what are the remaining challenges and acceptable compromises. Revisiting afterwards all of the dimensions ensures that no one dimension is left to operate in a vacuum, but rather all dimensions work together in a global model.

Minimally, the technological dimension should answer all key requirements for course development and delivery while streamlining administrative processes to reduce their negative impact on students, teachers, and administrators.

**Using This Modeling Approach**

First, let us say that this chapter only represents a summary of the modeling approach proposed and that each dimension could be described in much more detail. The basic idea behind this model is to develop a system perspective to analyze, plan, and implement digital learning projects. We propose that the six dimensions should be considered as an iterative process that requires analytical thinking and synthesis.

In a *first phase*, a general overview of all six dimensions should be performed to gather the key needs and challenges. It is usually recommended to start with the business/societal and learning/teaching dimensions as they offer a more global perspective and will greatly help for the development of other dimensions. In particular cases, where the goal of the organization is not clear, the other dimensions may offer guidelines to help plan the goal and target of the project.

In a *second phase*, each dimension is revised to consider all the information gathered. Once all requirements and needs from all the different dimensions are assembled, then the team determines how they could influence each other. During this phase, the project team produces a list of conflicting issues and potential solutions/compromises as the global digital learning model is assembled.

In the *third and last official phase*, the organization refers back to the business/societal dimension to ensure that the proposed model answers the goals and needs previously defined and decides whether the project should still go forward. It is not abnormal that organizations withdraw from these ventures once all information has been gathered and they better understand the required resources (financial, human, and technical) to sustain such a venture. Another interesting result occurring at this stage is that organizations may reassess their initial assumptions and accept new out-of-scope possibilities. This is what happens in many global or international organizations when they start with the assumption that they would do this venture completely internally. Once they realize all the implications, many of them understand the need to integrate partners or other financial sources to ensure the sustainability of their digital learning ventures.

**Conclusion**

As we witness an explosion of new digital learning models appearing in the educational and training landscape, it becomes crucial to develop better investigative tools to analyze, plan, and implement these types of projects. Organizations that want to leverage digital learning solutions need to gather all the necessary information in these six dimensions to obtain sustainable results from these solutions.
The framework presented in this chapter is the first version of a model that has already been applied in over a dozen organizations. The main advantage of this approach is that it offers a more global system perspective that should help guide both theorists and practitioners in their use of digital learning. It will also help envision the different challenges that need to be addressed and the key interrelations that need to be mapped out. We are convinced that this type of modeling will evolve, and we hope it can be used as a starting point to ensure more productive and successful digital learning implementations.

References


