In this chapter, I attempt to provide a framework for understanding and assessing a variety of aspects of online education quality within the context of more recent technology-based innovations in the field, many of which have at their core the drive to address the critical relationship among cost, access, and quality.

The relationship among cost, access, and quality has been mentioned frequently in the literature. Because of the tight connections among these three elements and their significance as part of institution and government missions and goals throughout the world, they are often represented by a triangle, the “eternal triangle” or the “iron triangle.” Increase in access is imperative to respond to the growing demand for higher education. According to Maslen (2012, para. 1), “the number of students around the globe enrolled in higher education is forecast to more than double to 262 million by 2025.” Likewise, cost has to be constrained to maintain accessibility, and quality needs to be maintained notwithstanding the boundaries of cost-effectiveness and scalability. This is an impossible wish list, in which one requirement is potentially incompatible with the other; each of the unyielding sides of the triangle cannot be enhanced without diminishing the other two. Sir John Daniel (2011) explains the evident conflict: “Widen access by packing more students into each class and people will say quality is slipping. Improve quality with better learning resources and costs will go up. Cut costs and we damage both access and quality” (para. 6–8). One consequence of this in postsecondary education is the “unhealthy link between quality and exclusivity” (Daniel, 2011, para. 9), which has played out through the creation
COST, ACCESS, AND QUALITY

of entrance barriers and narrow funnels. Excluding people has become an assurance of quality.

In this scenario, technology has become a potentially powerful answer to the gridlock. Following basic economic principles of scale, technology could have the power to break the triangle and respond efficiently to the demands of greater access, high quality, and lower cost. Otto Peters (1983, 1998) similarly explained the use of technology in distance education as an “industrialized mode” of education, in which with a fixed cost, institutions were able to provide access to a larger number of learners by exploring scalability through division of labor and specialized roles. The difference today is that distance education has gained new momentum because of technologies that have eliminated the differences in learning experiences and put to rest the low-quality curse that plagued that mode of learning for decades. However, in many cases, these newer technologies have changed the original principles of scalability, and so to address the issues of cost, quality, and access, emerging technologies need to play the role of disruptive innovation, in terms of not only teaching and learning practices but also key strategic elements in all the service components of a student’s life cycle. The principles responsible for the industrial revolution “work even better with the technologies of today’s network revolution: the new technologies that let us share, study and socialise simultaneously” (Daniel, 2011, para. 19).

The evolution of online education has shown the strong connection between innovation and the adoption of emerging technologies (New Media Consortium, 2012). According to Veletsianos (2010), “emerging technologies are tools, concepts, innovations, and advancements utilized in diverse educational settings to serve varied education-related purposes” (p. 3); for the most part, they have demonstrated the potential for being disruptive but are “not yet fully understood, and not yet fully researched” (p. 3). Therefore, the discussion in this chapter is meant to improve our understanding of the impact of such innovations and to help shape strategies for their effective adoption given the contextual constraints of access and cost.

Since the focus of such innovations has been, for the most part, to increase student accessibility to education, it is imperative that I underscore the principles related to openness in education. A definite stance regarding this concept has not been established in the literature. On one hand, David Wiley (n.d.) states that the term open “has different meanings in different contexts” (para. 1). Therefore, open exists in a continuum; it is a gradient, not a true-false binary concept. George Siemens (2009), on the other hand, considers taking a relative view of the term open as an act of “moderation” that is in the end harmful to the effort of actually achieving open education. Graham Atwell (2010) discusses how focusing on open content has perpetuated the
idea that the quality of the learning experience is strictly dependent on the availability of content, and the teachers’ responsibility is solely to make sure that they gather and provide resources. Within this diverse set of perspectives, I approach openness from Illich’s definition of a good educational system:

A good educational system should have three purposes: it should provide all who want to learn with access to available resources at any time in their lives; empower all who want to share what they know to find those who want to learn it from them; and, finally, furnish all who want to present an issue to the public with the opportunity to make their challenge known.

(as cited in Atwell, 2010, para. 25)

As it will become clear throughout this chapter, technology has the potential to help establish a compromise among the frequently confrontational goals of reducing costs, expanding access, and offering quality education. Different stakeholders will prioritize these elements of the triangle in different ways; hence I will analyze technology from the perspective of faculty, administrators (representing an institutional viewpoint), and students.

First, I will present the current landscape of several of the disruptive innovations inundating the online education field and establish the practical connections between emerging technologies and their interdependencies. Then, I will identify the main quality measures associated with such innovations through a broad framework for quality viewpoints, taking into account the perspectives of the institution, faculty, and students and the tight bonds among quality, cost, and access.

The Landscape

The growth in online education over the last twenty years has been dramatic (Hill, 2012). During most of that time, online education has suffered from skepticism and a general perception of lesser quality. Consequently, it has been dismissed by most prestigious institutions. Institutions have undertaken successive waves of investment in technology to support teaching and learning at a distance. As of mid-2013, the landscape is in great flux, largely because of the emergence of massive open online courses (MOOCs) and the enthusiasm shown for them by many of those same prestigious universities.

During the first decade of the 21st century, a perfect storm of factors has refocused the discussion of online education. Workforce demands have pushed academia to give much more thought to increasing access to education—and to discuss the purpose of higher education more broadly. Concurrently, legislatures, parents, students, and the federal government
have pushed for greater accountability regarding the cost of education, which has increased much faster than that of many other services. Finally, faculty, institutions, and employers have tried to maintain quality in the face of these competing pressures. Academic technology, which has been traditionally considered a cost center, now has greatly improved, has become pervasive, and has the potential to help higher education address these pressures. Although all this is true for traditional, face-to-face education, it is much more so for online distance education. The Internet and the development of the World Wide Web as an information delivery vehicle have changed the game. Access to higher education is now enabled by technology, and online learning is seen as a major disruptive innovation in American higher education. Institutions have been forced to reflect on their business models, which include development and delivery of instruction and support services (Aslanian & Clinefelter, 2012).

**mLearning**

The web has become even more pervasive with the growing availability and diversity of devices providing connectivity. Mobile computing has enabled the surge of an entirely new sector of learning: mLearning. This area has grown exponentially with the use of devices within several categories, including smartphones, netbooks, tablets, e-readers, and laptops. The market for mobile software (apps) is not only a booming industry but also at the fingertips of any user who wants to create new apps and share them with the world in real time, without intermediaries or advanced expertise. In many ways, what once required a computer is now frequently more easily done through a mobile phone. Because smaller devices offer extreme portability and connectivity at a lower cost, mLearning opens new doors for access to education. This type of learning, however, does require rethinking pedagogies. Some of the questions currently being studied by the online education community include, How much and what kind of content can be pushed through mobile devices? What kind of interactive activities are actually effective through such devices? And what models of learning can make best use of this mode of learning (Educause, 2010)?

**Open Educational Resources**

The open educational resources (OER) wave has been building since the first reference to open content by David Wiley in 1998 (Hewlett Foundation, n.d.). The Hewlett Foundation defines OER as follows:

> OER are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that
permits their free use or re-purposing by others. Open educational resources include full courses, course materials, modules, textbooks, streaming videos, tests, software, and any other tools, materials, or techniques used to support access to knowledge. (Hewlett Foundation, n.d., para. 2)

This movement has had a significant effect on educational publishing owing to the initiation of several open textbook projects, and together with the technological advancements in user-generated content, it has allowed for “thousands of individual instructors and teachers creating openly licensed learning content” (Reynolds, 2012, para. 4). Olcott (2012) observes that the promise of OER is that of “bridging the digital divide, leveling the educational playing field between developing and developed countries and challenging the restrictive sanctions imposed on open content by proprietary providers and licensing vendors” (p. 283).

As of this writing, OER are focused solely on making content available; they do not provide or suggest ways or scenarios in which they should be used to achieve specific learning outcomes. Therefore, OER are, for the most part, void of specific instructional design information that could potentially associate content with tailored teaching and learning activities and assessment. This is one of the major barriers to the massive adoption of OER.

Massive Open Online Courses

As of the summer of 2013, the hype over the tsunami of MOOC offerings has persisted for a year. Organizations are definitely feeling the pressure to participate in the MOOC movement, and the almost daily headlines announcing the releases of new courses and contracts between startups and universities (high profile and not) is impressive (Chronicle of Higher Education, 2012).

Each of the two main models of MOOCs have special traits and are suitable for different audiences, subjects, and learning goals. xMOOCs are mostly organized around presentational materials but also include unstructured discussion forums for participants and quizzes or other standard types of assessment.1 Some MOOCs have created more authentic learning activities, such as group projects that are assessed via group interaction and peer review. The use of rubrics has helped enhance the feedback process, but contact between instructor and student does not happen at this level given the massive number of participants.

cMOOCs (the $c$ stands for “connectivism”), however, are the original form of MOOCs and are completely different. According to Siemens (2004), connectivism synthesizes concepts derived from “chaos, network, and complexity, and self-organization theories” (para. 25). cMOOCs are therefore
less structured, and learning is based on the different streams of interaction among participants, who, based on simple guidance from an instructor, communicate with each other through online discussions, Twitter feeds, personal blog posts, and other modes of sharing. Not all participants will take part in each mode of discussion, but instructors will aggregate all these sources into course information streams that are continuously diffused to participants through predefined information channels, such as a common blog, a central Twitter account, and daily newsletters. The learning platform allows users to receive personalized notifications, which help them follow, filter, discuss, reuse, and remix the content created as the course moves forward. This web of connections and exchanges is at the core of the connectivist approach to learning. Thus, cMOOCs are closely related to the learning that happens within communities of practice.

As of mid-2013, acceptance of academic credit for MOOCs is small in scale and clearly controversial, but the potential, and in many cases, the actual, value of MOOCs is not doubtful. There is, however, an inherent dichotomy between the best practices related to well-designed interaction, incorporation of authentic assessment activities, and rich feedback coming from direct contact with the instructor and the need to provide access to a massive number of students (Moore, 2005). Technologies are still promising “automated personalized feedback to learners on the basis of their actions” (Laurillard cited in Farmer, 2012, para. 5), but like past attempts to substitute artificial intelligence for human labor, this has yet to be achieved. Therefore, the forces of cost, quality, and access are very much still at odds in this form of online education.

Nonetheless, MOOCs are the best effort seen to date involving multiple players using technology to address the burning educational needs of our time. Such efforts should not be dismissed, but they should also not be overemphasized as the holy grail for solving the problem of access to education. Many moving parts are necessary to make the equation work. After the splashes, there will be a period of maturation and consolidation, during which the loose ends will be tied up. There will also be a moment when we will see MOOCs as a common part of a larger spectrum of options that is “closer to being a form of education that requires less faculty effort and reduces costs” (Farmer, 2012, para. 7).

Cloud Computing and Analytics

The growth in cloud computing has enabled the sharing of data and applications alike. Computing power has shifted to the web. The almost infinite capacity of cloud storage and the advances in data mining have together enabled the collection, management, and maintenance of massive data sets.
Complex algorithms that manipulate large sets of data through a myriad of statistical operations have enabled the creation of new knowledge, going far beyond the learning possible from the original raw data. These algorithms unveil patterns and relationships and help develop predictions and diagnoses of intricate systems or problems. They are now used widely by social media companies to determine the behavioral patterns of consumers by capturing their activities on the web (e.g., navigation and transactions). Learning about consumers allows organizations to target specific groups with products or services of particular interest in a personalized fashion.

Higher education is starting to adopt such practices as well for different purposes, including marketing, retention, intervention, and enhancement of learning outcomes. By collecting data from learning management systems and institutional portals and services, organizations may now employ similar techniques to determine students’ learning patterns, identify at-risk students, and find out what kinds of services and resources have greater impact in retention and student success. This brings enormous potential to a more personalized delivery and support system in online education (Wagner & Ice, 2012).

These various online learning trends are operating synergistically to push organizations to change their business models, improve learning effectiveness, and at the same time, facilitate access to education in a scalable and cost-effective manner. Such changes have a direct impact on the meaning of quality and on the measurement of quality. With the variety and expansion of possible educational paths involving different sets of technologies and appropriate pedagogies, quality benchmarks need to be revisited and reevaluated. What might emerge is a plurality of scales that will be deployed differently according to the context and target student population.

**Toward a New Framework for Quality**

In this section, I attempt to establish a framework for quality that will support discussion and possibly decision making surrounding disruptive innovations in distance education. At the same time, I consider the iron-triangle relationship among quality, cost, and access previously described. Given that new educational technologies are continually emerging and their effects are not yet clearly determined, the framework postulates several key viewpoints and expectations to help establish directives regarding desired and feasible combinations of quality, access, and cost that account for the perspectives of all stakeholders.

**Existing Standards of Quality**

The feasibility and appropriateness of changes to existing standards will depend directly on context and formal systems that have evolved over time.
Because accreditation in American higher education is a decentralized process and a unique and collective system of standards does not exist, the number of models, benchmarks, frameworks, and checklists intended to promote and guarantee quality in distance education has proliferated. Most accrediting agencies have expanded their existing standards to include distance learning, in recognition of the existing differences between distance- and traditional-learning models. Examples of such standards are offered by the Council for Higher Education Accreditation (2002), the Higher Learning Commission (2009), and the Southern Regional Education Board (2006). Several other associations and recognized organizations have developed their own sets of principles: the Sloan Consortium’s quality framework and scorecard for quality administration (see chapter 3, “The Sloan Consortium Pillars and Quality Scorecard”); the International Association for K–12 Online Learning (see chapter 4, “K–12 Online Learning: Recommendations for Assuring Quality”); and Quality Matters (see chapter 6, “A Process to Improve Course Design: A Key Variable in Course Quality”).

Given the extensive literature offering several proposals for frameworks, the task of developing a new framework that will focus on emerging technologies and disruptive innovations within the constraints of quality, cost, and access is accomplished by first considering an extension of Daniel’s triangle proposed by Power and Morven-Gould (2011). In the revised triangle, the vectors are named “priorities” and the terms cost and access are replaced by cost-effectiveness and accessibility, respectively, to capture their nature as priorities. These revised terms better describe what is to be achieved. Moreover, the new triangle includes references to specific stakeholders: faculty, students, and administrators. These stakeholders are associated with their main priorities: “students are naturally most concerned about accessibility,” “faculty will typically be defenders of quality” (Power & Morven-Gould, 2011, para. 20), and administrators are focused on ensuring the cost-effectiveness of the overall system (see Figure 2.1). This is exactly the approach taken herein, where the analysis of the impact of technologies and innovations depends on the stakeholders’ roles.

Power and Morven-Gould (2011) argue that “each stakeholder group is naturally inclined to promote its own priority, thereby bringing the parties into conflict” (para. 20) and that for open distance learning to succeed, all groups will have to meet their own needs above a certain predetermined minimum threshold. Power and Morven-Gould describe the push-pull relationship among these three distinct groups. However, for the purposes of the quality framework envisioned herein, the push-pull argument is less meaningful and is not included here.

In 2003 Sherry recognized the intricate and close relationship among these same stakeholders (students, faculty, and administrators) when it comes to quality. She suggested that “learners are at the core of the distance
learning picture” (p. 435) and that there are four main types of learner outcomes involved—attitudes, competencies, applications, and impacts. These outcomes require quality responses that are the responsibility of faculty and the institution. Therefore, Sherry’s framework clearly underlines that quality should be analyzed with respect to these three different perspectives, even though there are interdependencies among them.

A Revised and Expanded Framework

The approach in this chapter is to combine Power and Morven-Gould’s revised triangle with Sherry’s quality assurance scheme, producing a revised and expanded framework for the adoption of disruptive innovations in online learning that addresses the fundamental elements and issues associated with quality assurance, while staying within the requirements of expanding access and reducing costs. The goal is to create a framework that considers different models of quality and questions how the adoption of emerging technologies and subsequent disruptive innovations modify or influence the quality expectations of the different stakeholders and how changes will affect decision making when attempting to balance quality, access, and cost.

The table created by Sherry (2003) offers a starting point, and I recommend that readers review the detailed table available in the Handbook of Distance Education (Moore & Anderson, 2003). Basically, Sherry’s framework of quality outlines viewpoints to consider on topics important to learners, instructors, and institutions.

The new expanded table keeps the same distinct viewpoints but provides additional details relevant to the focus on emerging technologies and disruptive innovations (see Table 2.1). Table 2.1 takes into consideration the

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**Figure 2.1.** Revised iron triangle.
TABLE 2.1
Revised and Expanded Viewpoints on quality

<table>
<thead>
<tr>
<th>Interaction</th>
<th>Institutional viewpoint</th>
<th>Instructor's viewpoint</th>
<th>Learner's viewpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Provides at all levels (course, program, and university-wide) for timely, technology-supported faculty-student, student-student, and student-content interactions, through both synchronous and asynchronous means, as well as through diverse media.</td>
<td>Encourages student and faculty contact, providing clear guidelines and modeling appropriate behavior and protocol. Allows for teaching, cognitive, and social presence.</td>
<td>Connects learning activities to his or her own personal and professional experiences, enhancing the value of prior learning, both formal and informal. Interaction is cognitively relevant and provides a sense of belonging through social exchange.</td>
</tr>
<tr>
<td></td>
<td>Interaction is at the core of learning effectiveness. Technology is seamless and allows the instructor to focus on the subject matter and best use his or her expertise.</td>
<td>Encourages and stimulates reciprocity and cooperation among students through appropriately designed discussions and assignments. Interaction is at the core of learning effectiveness. Technology is seamless and allows the instructor to focus on the subject matter and best use his or her expertise.</td>
<td>Participates in a highly interactive peer-learning community that provides tools for personalization to enhance interest and easiness of access. Facilitates collaboration among peers in an anywhere/anytime environment.</td>
</tr>
</tbody>
</table>

(Continued)
TABLE 2.1 (Cont.)

<table>
<thead>
<tr>
<th>Institutional viewpoint</th>
<th>Instructor's viewpoint</th>
<th>Learner's viewpoint</th>
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</thead>
<tbody>
<tr>
<td>E-resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensures student effective access and use of a wide variety of high-quality digital resources (e-resources) of diverse media types, including e-journals, digital databases, e-textbooks, e-books, videos, podcasts, and web-based tools for search and bookmarking. Provides incentives and appropriate means for faculty and students to engage in creating new content and shares resources with the wider community. Content becomes part of larger universe of accessible resources, expanding the opportunities for reuse, remixing, and repurposing. Provides appropriate virtual environments for conducting investigative, scientific, and other scholarly activities appropriate for and required by specific subjects.</td>
<td>Uses active learning techniques to promote creation of shareable content and use of existing open content and adds value to such resources when possible. Technology is accessible and requires acceptable effort to be embedded into the learning process. Creates possibilities for students to enhance their technology fluency and information literacy, developing strategies to assess the value and authenticity of e-resources.</td>
<td>Balances active and reflective modes of learning. Has easy access to a variety of resources that are well connected to the prescribed learning activities. E-resources are diverse enough to respond to the needs of different learning styles. More often than not, learner is responsible for engaging in collaborative learning activities and understands these activities’ value and the expectations of peers and faculty.</td>
</tr>
<tr>
<td>Program evaluation and assessment</td>
<td>Institutional viewpoint</td>
<td>Instructor’s viewpoint</td>
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<td></td>
<td>Ensures comparability of learning effectiveness between traditional, face-to-face programs when evaluating distance education programs. Defines and employs quality measures that are based on accepted standards defined by appropriate outside groups/associations/agencies. Uses a diverse set of measures throughout its quality assurance process, including student satisfaction, learning outcomes, retention, and accepted rubrics for best practices in online education. Technology supports collection and analysis of data, which allows for an efficient full-quality assurance process that enables enhancements as well as needed innovations.</td>
<td>Gives prompt, rich, and personalized feedback to students and acknowledges students’ effort and commitment. Sees the institution as supportive of teaching and assessment practices that take place within the learning environment through efficient and transparent use of technology. Understands that grading and marking are integral parts of assessment and uses technology for greater efficiency as well as to support integrity and ethical behaviors.</td>
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<tr>
<td>Monitoring and progress</td>
<td>Institutional viewpoint</td>
<td>Instructor’s viewpoint</td>
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<tr>
<td>Represents programs, requirements, and services accurately online. Monitors whether students make appropriate use of learning resources through appropriate and efficient technology. Uses technology to provide services that support students in a timely fashion, in a personalized online environment, using accurate data and through scalable means.</td>
<td>Uses technology to collect feedback from students to allow for a change of gears as well as summative feedback for enhancement of learning experiences and teaching practices. Emphasizes time on task through an appropriate course and curriculum structure, in which deadlines and due dates receive the appropriate emphasis.</td>
<td>Anticipates fluctuating patterns of learning in which more intense activity will be necessary at times. Use the tools for self-diagnostic for improvement. Acquires better time-management skills and slowly becomes more autonomous. Develops technology fluency as a way to increase productivity and efficiency.</td>
</tr>
<tr>
<td>Planning and oversight</td>
<td>Provides 24/7 technical support to students in the use of technology for learning as well as other support services within the learners’ life cycle. Provides the means for students, faculty, and staff to safely communicate complaints and to follow through processes with transparency. Technology supports operational processes, and data is collected and analyzed to help improvement.</td>
<td>Does not have to deal with administrative or tech support issues from students. Perceives students as connected to and supported by the institution. Has the opportunity and the means to provide feedback to the institution and receives acknowledgment and recognition for contributions.</td>
</tr>
<tr>
<td><strong>Curriculum design and development</strong></td>
<td><strong>Institutional viewpoint</strong></td>
<td><strong>Instructor's viewpoint</strong></td>
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<tr>
<td></td>
<td>Ensures currency of e-resources, materials, programs, and courses.</td>
<td>Communicates high expectations. Offers challenging tasks, sample cases, and praise for quality work.</td>
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<tr>
<td></td>
<td>Ensures integrity of student work, credits, and degrees, and uses appropriate technology as support.</td>
<td>Expects integrity and uses existing technology to ensure such behavior within courses.</td>
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<td></td>
<td>Makes distance education a viable part in all long-range planning, budgeting, and policy development.</td>
<td>Offers engaging learning activities that explore diverse, easily accessible resources with appropriate and rich media.</td>
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<tr>
<td></td>
<td>Provides clear distance education policies on materials ownership, copyright, compensation packages, and revenue distribution.</td>
<td>(Continued)</td>
</tr>
<tr>
<td>Support</td>
<td>Institutional viewpoint</td>
<td>Instructor’s viewpoint</td>
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</tr>
<tr>
<td></td>
<td>Provides appropriate faculty support services for distance delivery. Provides adequate access to a range of academic and student support services through adequate and efficient technology, such as remedial instruction, community building, internships, and career advisement. Provides appropriate training and continuous professional development for distance-education faculty through the use of technology. Possesses appropriate equipment, technologies, and technical expertise for distance learning, providing possibilities for personalization and customization through the use of technology. Ensures technology used is appropriate to the nature and objectives of programs.</td>
<td>Respects diverse talents and ways of learning, by allowing students to choose project topics, and share diverse/diverging viewpoints. Seeks professional development in areas of study and in online pedagogical issues (teaching practice). Keeps abreast with newer technologies and seeks support from the teaching community. Uses technology to motivate students and to expand the horizons of the subject matter.</td>
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</tbody>
</table>

position expressed by Garrison and Anderson (2003) that “e-learning does not represent more of the same” (p. 7) and that we are witnessing a wave of new transformations as a result of technological advances and ubiquity. These changes are cumulative, and despite a few hypes and fads, the effects of such experiences are permanent and change the landscape of education. In that sense, quality and quality assurance have to be revisited and reexamined. Stakeholders take on distinct roles in the face of technological changes and will expect new behaviors from others accordingly. Institutions need to be aware that the support to students and faculty should encompass contextual variables as well. Students, as they become autonomous in their learning process, will slowly, through appropriate guidance, develop the necessary fluency to master the new medium, while navigating through the vast information stream. Interaction is seen as an essential piece of the learning process.

The distinct kinds of interaction—student-instructor, student-student, and student-content (Moore, 1989)—are all integral parts of learning, each playing a different role and displaying distinct challenges when considered through the lenses of quality, access, and cost. The importance of interaction is well understood through the Community of Inquiry (CoI) model (Garrison & Anderson, 2003). Interaction includes cognitive presence, social presence, and teaching presence. Cognitive presence “speaks to intent and actual learning outcomes” (Garrison & Anderson, 2003, p. 28). Social presence is related to the participants’ projecting themselves socially and emotionally. Finally, teaching presence “is defined as the design, facilitation and direction of cognitive and social processes” toward the expected learning outcomes (Garrison & Anderson, 2003, p. 29). The teaching presence is the force that brings together the other two in a structured, meaningful, and purposeful form.

Learning Theories, Assessment, and Newer Technologies

Harasim (2012) discussed the connections between learning theories and newer technologies. She introduced online collaborative learning theory to describe the potential of teaching and learning within the knowledge society, building upon a constructivist approach and exploring further the wide spectrum of possibilities that have emerged with the Internet. This approach focuses on knowledge building through interaction. It encompasses formal and informal learning and connects the two as part of a lifelong continuum.

Although newer technologies have increased the potential and the reach of communication between learners and instructor, they have also altered the economies of scale of distance education, once based on distribution
of materials. The easiness with which instructors can now communicate with students has an immediate impact on the costs of online education. Models that count on direct interaction as a main pillar of the learning experience can be crippling to scalability and sustainability. Many of the new emerging technologies tackle this limitation, and newer models of learning are based on social interaction, crowdsourcing, automated feedback generated from analytics, and peer-based learning.

One outcome of maturing technologies and the ability to self-publish and distribute via social networks is to free content creators from the constraints, and costs, of traditional publication and distribution. The definition of OER is broad, sometimes vague, and certainly increasingly promising. Downes (2011) offers a succinct, objective, but all-encompassing definition of OER: “Open educational resources are materials used to support education that may be freely accessed, reused, modified and shared by anyone.” The deployment of OER raises the immediate question, How does one assess the quality of self-published or collaboratively published materials, which will depend on the reliability of their sources? As the OER movement matures, it is increasingly apparent that the appropriate use of these resources is not a natural consequence of their availability or even accessibility (Ehlers & Conole, 2010). For e-resources to be employed efficiently as part of the learning process, institutions must support faculty members, students, and staff in sifting through existing resources; have clear benchmarks for quality; and have adequate tools to choose and embed e-resources into effective course structures. This requires investment in technology and personnel. Establishing open educational practices (OEP) will require different concerted strategies, as well as clear policies and procedures (Conole, 2010). It might require that institutions deploy more structure in management, teaching, and learning to fully use OER in a flexible but sustainable form.

Assessment and Accountability

Assessment of the newer, more widely used online distance-education formats has resulted in attention to assessment of quality. Hrabowski, Suess, and Fritz (2011) pointed out, “National standards of excellence are also emphasizing a culture of assessment” (p. 16). Accountability has come to the forefront of higher education and distance learning. To maintain comparability, learning objectives and program goals need to be independent from the mode of delivery, whereas learning activities should explore technologies and web-based resources to enforce authentic assessment and shared quality standards for course work, such as common rubrics and opportunities for feedback.

When it comes to assessment of online programs, quality assurance models should include several dimensions with clear mechanisms for capturing
and analyzing feedback from different stakeholders, including faculty and students. Student satisfaction surveys when automated and used with other measurements can provide information concerning students’ learning experiences. Quality assurance processes will need to focus on closing the loop, using data and analyses to improve service and instruction. This is usually when processes break down because the diagnostics of the causes for underperformance are not always conclusive and there is not enough time or staff to explore and test the possibilities. In the existing educational system, more often than not, quality assurance mechanisms are in place for the purpose of generating reports to send to agencies outside the institution. As a result, institutional decision makers are not given the opportunity to intervene in response to the needs of faculty and learners.

Newer technologies need to support the creation of valid automated and adaptive assessment tools, both formative and summative, at lower cost. These technologies should also support and facilitate the process of grading/marketing and the inclusion of relevant feedback. Current trends in online education point toward competency-based assessment and performance-based assessment, and several of the current innovations will create different pathways for learning, which will be validated only if credible assessments are in place. Meanwhile, authentic assessment has been proven to produce richer and more meaningful learning experiences, and the use of rubrics supports the assessment process and consistency in evaluations.

Technology has propelled the use of data throughout all organizational processes, for analysis, for decision making, for improvement, and for better understanding stakeholders and variables that affect outcomes. This wave has also reached educational institutions, which have come to understand the power of capturing and analyzing large amounts of data from students. These data include how students behave inside the learning management system, how they access resources, how much time they spend in certain activities, and how they use other support services. Seizing data from all stakeholders—staff, faculty, and students—has the potential to allow for the understanding of individual patterns at a detailed level never available before (Hrabowski et al., 2011).

Analytics should be integrated with assessment. Capturing and correlating data from separate systems have the potential to shed light on students’ performance and behavior, which will then help improve learning effectiveness. This kind of data mining can enable adaptive learning, in which students complete personalized activities with authentic and individualized feedback targeting their own instructional needs and learning styles. For some time, the new developments in technology targeting more personalized learning have meant more customization and therefore a higher cost per student,
reduced scalability, and less access. Much of the current disruption in higher education coming from online education is a result of the new possibility of achieving customized “massification”—individualized instruction that reaches huge numbers of students.

Given the widening of possibilities for academic development through distinct educational paths, institutions will need to consider creative ways to absorb students with distinct achievements in their learning and working experience. Increasingly students have experienced a mix of formal and informal learning. Institutions must have processes and procedures to accommodate students from different walks of life and recognize and value what these students have already achieved through prior learning, as well as tools to assist in individualized learning paths. Education products can now be tailored to ever-smaller segments of the population that share specific interests. As educational technologies continue to develop, there will be more to choose from and more individualized learning paths available.

**Final Remarks**

Siemens and Tittenberger (2009) summarize well the two facets of the revolution dramatically affecting higher education: “Today, the duality of conceptual (new models of education, advancement of social learning theory) and technological (elearning, mobile devices, learning networks) revolutions offers the prospect of transformative change in teaching and learning” (p. 1). Despite the inspiring potential, there is a dichotomy in the possible results of technology in learning: On one hand, technology can create an expanded and richer learning experience. On the other, when we look at the qualities of technological advances within the context of cost and access, it is clear that newer technologies are not all necessarily fit to respond to the growing demands of education. For example, in the various conceptions of openness, quality is seen through different lenses, and thus each conception mandates a distinct approach. These approaches will need to generate disruption at higher levels in order to make a difference for masses of people and allow for continuous improvement and reuse.

We are starting to see technologies accompanied by indispensable infrastructure, which can respond effectively and efficiently to such requirements, without necessarily delivering poor learning experiences. These new technologies have the potential to create significant disruptions because they directly affect underlying business models. They alter the tenets that once held quality dependent on high cost per learner and therefore on exclusivity. The reasons that once supported the need for exclusion are now being shaken by technology that has the potential to provide effective learning and wide
access at tolerable cost—hence, the recent rediscovery of online education. A synergy of factors is in play: world economics, social demand for education, and advances in technology that have reduced cost and expanded access to information. Fulfilling the educational potential of these technological advances will require new, unknown strategies; forward thinking from educational leaders; and solid research to help pave the way.

**Note**

1. The origin of the x in xMOOC is somewhat in question, but Stephen Downes (2013) suggests it stands for extension, that is, an xMOOC is an extension of, not part of the core, institutional offerings.

**References**


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