CLOUD AND MOOCS: THE SERVITIZATION OF IT AND EDUCATION

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Abstract

Early literature on servitization was focused on the necessity and rationale for the need to create value by adding services to products. This approach regarded services as additional offerings to core (often physical) products. However, recent writings on the subject of servitization recognize that a service can also replace the main product itself. Other approaches to servitization suggest that providing pure services (epitomized in a company's ability to use its knowledge, skills and capabilities) or a combination of physical products and services (where services assume greater importance) is becoming increasingly popular.

New disruptive innovations such as cloud computing and Massive Open Online Courses (MOOCs) add an interesting dimension to the contemporary debate about servitization. In the case of cloud computing, its emergence represents a new paradigm of servitization where a physical product is "morphed" into a service. Furthermore, the ascendance of MOOCs has the potential to servitize education in a manner that is unprecedented in its history.

This paper will explore these two phenomena within the contemporary context of servitization and will highlight the implications of a more servitized Information Technology (IT) and educational world.

Keywords

Servitization; Cloud Computing; Massive Open Online Courses (MOOCs); Higher Education.

Introduction

Cloud computing is increasingly emerging as a new model for servitizing the IT industry. Many organizations, small and large, have embraced this new servitizing model for IT due to the advantages it promises in terms of flexible cost structure, scalability and efficiency. Furthermore, the MOOCs phenomenon is also predicted to do to higher education (HE) education what cloud computing did to IT by providing education as a service (EaaS) that can potentially be consumed on a pay-as-you-go basis (Sultan, 2014). But cloud computing and MOOCs are also disruptive innovations that are likely to require a fundamental and cultural

shift in the way organizations (both cloud providers and consumers) view IT and in the way universities and society view education. Both the cloud and MOOCs paradigms represent an approach to providing services (e.g., IT and education) that is different from the traditional delivery of such services. This article will attempt to highlight this issue and reflect on the development of these emerging business and education models and their implications for organizations, universities and society.

To describe the cloud computing and MOOCs phenomenon within the context of "servitization" requires some understanding of the history and the literature that gave birth to the concept of servitization. This is important as it will provide some insights into the characteristics that make cloud computing and MOOCs fundamentally different from other servitized forms of business and educational activity. Furthermore, the disruptive nature of cloud computing and MOOCs requires further investigation of this phenomenon within the context of the theory of disruptive innovation as described by Clayton Christensen and his colleagues. This approach will enable a greater understanding of the behavioural issues that disruptive innovations give rise to and will provide a basis for understanding the cultural implications of cloud computing and MOOCs. Moreover, a good understanding of the cloud and MOOCs phenomena is required. This will be presented in the next few pages.

The Servitization of Products

The literature on sertivization is relatively new and the understanding of the phenomenon is developing quickly (Barnett *et al*., 2013). The term "servitization" was coined by Vandermerwe and Rada (1988) in the late 1980s and became widely recognized as the process of creating value by adding services to products. They define servitization as "the increased offering of fuller market packages or 'bundles' of customer-focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings" and claim that manufacturing firms are increasingly moving towards offering services in order to avoid competing on cost alone. This concept suggests that "core products", often physical products, can be supplemented by adding services to them in order to add value to the main product. For example, some manufacturers such as those that produce Combi gas boilers (e.g., Vaillant, Worcester-Bosch) have provided their customers with annual service contracts. Such contracts are often affordable and can be paid for on a monthly basis and would normally include service, repair and parts. In a country such as Britain, breakdowns of such appliances can be very expensive to repair and finding reliable and qualified plumbers is a problem and often the focus of many TV programmes targeting rogue workmen. The servitization of products is therefore a strategy of creating value by adding services to products (Baines *et al*., 2009). More recent writings on the subject of servitization recognize that a service can also replace a main product in itself. Indeed, according to Vargo and Lusch (2008), over the last several decades a number of leading-edge firms, as well as many business scholars and consultants, have advocated the need for refocusing a great deal of firm activity through transforming the entire firm orientation from producing output, primarily manufactured goods, to a concern with service(s).

The common justification, according to these authors, is that these initiatives are analogous with the shift from a manufacturing to a service economy in developed countries, if not globally. According to Vargo and Lusch (2008) there are two types of output that can be produced by firms: (1) tangible (physical goods) and intangible units of output (services) and (2) intangible output (services produced in their own right) that has no reference to a physical product. They refer to the former concept as the goods-dominant (G-D) logic and the latter as

the service-dominant (S-D) logic. The notion of dominant logic refers to the shared mental maps which groups of managers use and develop as part of their core business operations. This is often represented through a common mindset or shared perception of how a business works and the accepted tools and approaches which are in use by the "dominant coalition", or senior management team, when making decisions (see Ng *et al*., 2012).

The most "critical distinction" between the two logics, according to Vargo and Lusch, is found in the conceptualization of "services". In S-D logic service is defined as the application of competences (knowledge and skills) for the benefit of "another party" (i.e., partner or customer). Vargo and Lusch (2008) grounded their definition of services (as the main business activity) mainly in the activity of marketing. It was B2B (business-to-business) marketing, according to these authors, that recognized the need to develop collaborations and partnerships with customers and also recognized that these customers were not buying output, but rather the service capabilities of that output. Ahmed *et al*. (2013) provide a useful example of an S-D logic epitomized in the case of International Business Machines (IBM). Faced with many challenges during the 1980s and 1990s (e.g., inability to crack the personal computer (PC) business, the impact of the PC on its mainframe computers, crashing stock price, loss of revenue) the company, thanks to the efforts and vision of its new CEO at that time (Louis Gerstner), managed to overcome many of its problems. For example, it was able to move up in the value chain from production of hardware and reinvented itself as provider of "business solutions". These solutions were drawn from an industry-leading portfolio of consulting, delivery and implementation services, enterprise software, systems and financing (Ahmed *et al*., 2013). Solutions, according to these authors, are customer-focused and are provided not merely by a good and some added-on services but by means of packages that include both goods and services.

The aforementioned definitions of servitization suggest that providing pure services (epitomized in a company's ability to use its knowledge, skills and capabilities) or a combination of physical products and services (where services assume greater importance) is a new business model for generating income and also for providing value (or better service) for their customers. In either case, the notion of establishing a close relationship with the customer assumes great importance in the delivery of a service. Interestingly, the emergence of cloud computing represents a new paradigm of servitization; where a physical product is "morphed" into a service. Understandably, the S-D logic concept is different from the service model that was created by cloud computing. The S-D logic does not see service (or services) as an alternative (to goods) form of product. Furthermore, S-D logic defines service as being a source of benefit that is "co-created" with the consumer rather than embedded in the output and that the consumer-orientation is redundant (see Vargo and Lusch, 2006). It is, therefore, difficult to see how the S-D logic can be applied to the cloud model or MOOCs models. In fact, the S-D logic came under some criticism for being relevant only to managerial activities, e.g. marketing (ibid.). Even Vargo (2011) acknowledges some of that criticism and refers to the S-D logic as a "pre-theoretic" lens or perspective for viewing the economic and social world differently from the traditional microeconomic view. IT companies that traditionally sold (and physically delivered) complete software and hardware products can now, thanks to the cloud business model, do so remotely and more efficiently by providing those products as services. It is model in which a physical product is transformed into a service that not only does the same task as the physical product but also does it more efficiently. By the same token, education (e.g. HE) that required the physical presence of students and teachers in the same room using tangible resources (e.g. books, notes, registers) can now be delivered remotely.

Description of Cloud Computing and its Services

Cloud computing can be defined as a modality that uses advances in IT technologies such as virtualization and grid computing for delivering a range of IT services through software, and virtual hardware (as opposed to physical) provisioned (by data centres owned and operated by cloud providers and/or end users) according to user demands and requirements and delivered remotely through public (e.g., Internet), private networks or a mix (i.e., hybrid) of the two delivery modes.

When it emerged in 2007 the cloud model attracted a great deal of attention from many quarters (e.g. authors, consultants, technology analysts, companies). Many people (including industry analysts and leading figures in the IT world) dismissed it as a "fad" (Hasson, 2008; Johnson, 2008). With time, the model began to gain currency and many of the big players in the IT world (e.g., Amazon, Microsoft, Google, IBM, Salesforce.com) threw their weight behind it. Concerned with being left behind (and with the KODAK experience still fresh in people's minds), many companies jumped on the cloud bandwagon. The IT services that can be offered by cloud computing can be listed in the following three main areas (Sultan, 2011):

- Infrastructure as a Service (IaaS): Products offered via this mode include the remote delivery (through the Internet) of a full computer infrastructure (e.g., virtual computers, servers, storage devices). Some of the most notable vendors under this category include Amazon's EC2, GoGrid's Cloud Servers and Joyent;

- Platform as a Service (PaaS): Services provided by the traditional computing model which involves teams of network, database, and system management experts to keep everything up and running. (e.g., operating systems, databases, middleware, Web servers and other software) are now provided remotely by cloud providers under this category. Some of the early market leaders in this area include Google's App Engine, Microsoft's Azure, Amazon Web services, and Force.com (supplied by Salesforce.com);

- Software as a Service (SaaS): Under this layer applications are delivered through the medium of the Internet as a service. Instead of installing and maintaining software, one can simply access it via the Internet; thus freeing oneself from complex software and hardware management. This type of cloud service offers a complete application functionality that ranges from productivity applications (e.g., word processing, spreadsheets, etc.) to programs such as those for Customer Relationship Management (CRM) or Enterprise-Resource Management (ERM). Products under this category include Yahoo mail, Google Apps, Salesforec.com, WebEx and Microsoft Office Live.

Interestingly, the notion of providing software as a service (SaaS) is not a new ICT practice. In fact, it predates the emergence of computers themselves. In the 1930s some companies (such as IBM) specialized in producing electric accounting machines based on punched cards and were able to offer data processing services (e.g. payrolls) to organizations. Providers of such services operated many "service bureaux" where customers would bring their data for processing in return for a fee. Organizations that were unable to purchase the data processing equipment found it economically viable to pay for those services. Then came mainframe computers in the 1950s and 1960s which continued this practice that became known as "timesharing". Organizations that were unable to afford buying mainframe computers would rent the data processing functionality of those machines from a number of providers. Connection to mainframes was achieved through a normal telephone line connecting those

massive machines and "teletypes", replaced afterwards with better visual display machines, at the clients' end (Campbell-Kelly, 2009). One author (Campbell, 2009) refers to the model of cloud computing as "Timesharing 2.0".

Description of MOOCs and their History

The history of MOOCs is traced back to early efforts by two Canadians: George Siemens (an educator Professor at the Center for Distance Education) and Stephen Downes (an online learning designer and researcher). In 2008, Siemens and Downes offered a free online learning course entitled "Connectivism and Connective Knowledge 2008 (CCK08)". The course was offered formally through the University of Manitoba and informally through open enrolment (at no cost) to anybody in the world (Fini, 2009). Some initiatives aimed at providing free university education have emerged since. One of those was initiated by the University of the People (UoPeople). UoPeople was founded in 2009 by educational entrepreneur Shai Reshef and is affiliated with the United Nations GAID, the Clinton Global Initiative, and the Information Society Project (ISP) at Yale Law School. Courses provided by UoPeople are free but students are required to pay a one-time application processing fee of US$50 and subsequent examination processing fee of US$100 levied per course. The free university has signed collaborative partnership agreements with New York University (NYU) to accept students; and with Hewlett-Packard (HP) – through the Catalyst Initiative – to provide student internship opportunities. It offers undergraduate programmes in business administration and computer science and has more than 1500 students from 135 countries.

However, what is very interesting about new developments in free online learning and teaching (L&T) is a surge of interest in MOOCs by leading US universities who seemed keen to deliver their own online courses "free". Since 2011, MOOCs began to attract a great deal of interest, especially from highly prestigious US universities. Examples include Harvard, Stanford, Michigan, Pennsylvania, Princeton and MIT (to name but a few). Several start-up companies since then have developed partnerships with universities and professors to offer MOOCs. These include companies such as Coursera, Udacity, edX, Udemy and Khan Academy. Coursera, Udacity and edX are among the leading (and high profile) providers of MOOCs.

Disruptive Innovations

In developing their theory of disruptive innovation, Christensen and his co-authors (see Christensen, 1997[1]; Christensen and Raynor, 2003; Christensen *et al*., 2004) describe two types of innovations: sustaining innovations and disruptive innovations. Sustaining innovations, according to these authors, are often innovations that occur frequently and are implemented by established large companies in order to improve the performance of some of their products or services that have strong market shares. Disruptive innovations, on the other hand, occur less frequently and tend initially to have performance problems. However, they are likely to be less expensive, simple and more convenient to use. Most importantly, they introduce a new value proposition. They either reshape existing markets or create new ones. Hence, there are two types of disruptive innovations: low-end and new-market. Low-end disruptive innovations can occur when companies offer "good-enough" products and services to "overshot" customers (i.e., customers content with those products and services) at much

[1] In his 1997 book Christensen used the term "disruptive technology" which he changed to "disruptive innovation" in his subsequent publications.

lower prices. Wal-Mart's discount retail store and Dell's direct-to-customer models are examples of low-end disruptive innovations. New-market disruptive innovations can occur when characteristics of existing products and services (e.g., size, price, complexity) limit the number of potential consumers or force consumption to take place in inconvenient or centralized settings. Apple's personal computers and eBay (among others) are examples of new-market disruptive innovations. They all created growth by making it easier for people to do something that historically required a great deal of expertise or great wealth. Taking the PC as a prime example, it disrupted the market of mainframe and minicomputers computers by creating a new PC market. It removed the complexity and expense that were associated with mainframe and mini computers and provided a convenient way of using the services that were brought by the digital technology. Like many other disruptive innovations, the PC suffered from many limitations when it first emerged. It was relatively bulky, crashed more often, had little memory, slow processing power and limited storage space. However, with time those limitations were overcome.

On that basis, the servitizing of the IT industry by cloud computing can be classified as a disruptive innovation. It differs from the aforementioned types of servitizations in that it destabilizes an existing market that relies on the physical delivery of a product (be it software or hardware) and creates a new market where delivery of a product is served remotely and does not involve many of the infrastructural requirements that are often associated with the old delivery model. By the same token, the other types of servitization did not create a new market. They were simply improvements to existing products and services. This feature, according to the theory of disruptive innovation, therefore makes early types of servitization "sustaining" innovations.

The same argument (albeit in a different context) can be made about MOOCs. The Web has had a profound (and disruptive) impact on our lives (both as individuals and organizations). It created a new market opportunity, epitomized in online trading or e-commerce, and disrupted many traditional businesses such as those involved in music, books, stocks etc. Increasingly, the Web is having a disruptive impact on L&T. Since the early 2000s, online L&T was often being provided by institutes (e.g., colleges, universities) as an additional L&T tool (to other existing traditional tools, e.g. classroom lectures) or provided by institutes (mostly commercial) as a tool for programmes fully accessed using this mode of delivery.

Christensen, Horn and Johnson (2010) see great potential for online L&T to have a disruptive impact on traditional class-based L&T. This is because there are significant areas of nonconsumption (often one of the main targets of disruptive innovations) that online L&T can meet. Providing examples from the US, the authors list a number of those nonconsumption areas such as offering AP (advanced placement) classes, delivering popular arts, humanities and language courses (shunned by resource-constrained urban secondary schools), homebound and home-schooled students (due to such reasons as suspension or sickness) and offering opportunities to make up credits (due to lack of "remedial" classes available to students who fail a course). The authors see online learning as a classic example of a new market disrupting or substituting an existing business model (i.e., class-based education). They argue:

> This substitution is happening because of the technological and economic advantages of computer-based learning, compared to the monolithic school model. Online technology provides accessibility for those who previously would not have been able to take the course. It provides convenience for a student to fit the course into his or her schedule at the time and place that is most desirable. To varying degrees, it is

> simpler because it offers comparatively greater flexibility in the pace and learning path. And when it is software-based, it can scale with ease. (Christensen, Horn and Johnson, 2010)

Advantages of Cloud Computing

The servitized nature of cloud computing has the potential to bring a number of advantages to the consumers (and the wider community) of this service model. Cost, efficiency and the environment are the most important ones.

Cost and Efficiency: Cloud computing services could provide many organizations that use them with the opportunity to continue to take advantage of new developments in IT technologies at affordable costs. Organizations that adopt this service model will be able to access the latest technology in terms of software and hardware (on a pay-as-you-go basis) without having to spend great sums of money on software licences and upgrades and expensive hardware. One of the characteristics of disruptive innovations, as indicated above, is that they tend to occur when characteristics of existing products and services (e.g., size, price, complexity) limit the number of potential consumers or force consumption to take place in inconvenient or centralized settings. On that basis, cloud computing is likely to be particularly attractive (from an economic viewpoint) to startup, small to medium enterprises (SMEs) and educational establishments which have demonstrated increasing interest in this computing service (Sultan, 2010a; Sultan, 2010b; Sultan, 2011). However, contrary to conventional wisdom, there is also evidence to suggest that even large companies are actually embracing the cloud. A report by Forrester (the independent technology and market research company), a survey of small and large enterprises located in North America and Europe revealed that large firms were more interested than small firms in leveraging IaaS (Infrastructure as a Service) external cloud capability (Golden, 2009).

Environmental Factors: Most interestingly, cloud computing has the potential to "serve" clients (and indeed society) in other no less important ways. It has the potential to reduce companies' carbon footprints and, at the same time, reduce their electricity bills. It is estimated that the world's 1.5 billion computers consume about 90,000 MW of electric power, which is about 10 per cent of global consumption (see Lefèvre and Pierson, 2009). Subscription to public clouds will enable organizations to spend less money on electricity for powering and cooling their computing hardware. It will also enable those organizations to devote less space to house their IT infrastructures and resources (an advantage where square foot rent is at a premium). There is increasing government pressure on companies in the UK and elsewhere to reduce their carbon footprints. For example, the UK's Carbon Reduction Commitment (recently renamed the Energy Efficiency Scheme) is aimed at reducing carbon emissions within the UK by 60 per cent by 2050, in comparison to 1990 levels. On a regional level, the EU Energy Using Products Directive is aiming to reduce the environmental impact caused during the manufacture, use and disposal of a very wide range of products (except vehicles for transport). Consumers of cloud services will find themselves in an advantageous position with regard to this issue in a more environmentally friendly and greener future with more ethically conscious consumers.

Cloud Problems

Cloud computing, as indicated earlier, is an emerging paradigm for servitizing the IT industry and a disruptive innovation. And, as is the case with new disruptive innovations, there are likely to be some issues associated with it. Loss of control, vendor lock-in, security, privacy and reliability are examples of some of those issues.

A 2008 survey of 244 chief information officers and IT executives by IDC (International Data Corporation), the market research firm, revealed that 75 per cent of the respondents rated security as their main cloud computing concern while performance and availability were the next two concerns for 63 per cent of the respondents (Cisco, 2009). Moreover, various governments, such as those in the European Union (EU), have privacy regulations that prohibit the transmission of some types of personal data outside the EU. This issue, however, is no longer a problem as many cloud vendors now (such as Amazon, Microsoft and others) are able to establish some of their cloud data centres in various locations across the EU region and elsewhere in the world and can offer their cloud clients the option of where they want to store their data.

Organizations are likely to adopt a careful approach to cloud computing. Another previous survey by EDUCAUSE (a US-based non-profit organization) involving 372 of its member institutions revealed that a great proportion of the respondents with use cases that involved cloud-based services reported that data privacy and data security risks were among their top barriers to overcome (Goldstein, 2009).

Another concern is vendor-lock and failures. Currently, many cloud providers offer their services through proprietary APIs (Application Programming Interfaces). Portability is likely to be increasingly important as the number of cloud providers increases. One solution would be to base those APIs on open source message standards such as SOAP or REST. SOAP (Simple Object Access Protocol) and REST (Representational State Transfer) are open source methodologies for sending requests and receiving responses by client applications accessing Web-hosted applications. In some situations this is already happening. For example, Amazon Web Services and Microsoft's Azure can now be accessed through the SOAP and REST protocols. The need for inter-cloud interoperability was highlighted by Vint Cerf, a co-designer of the Internet's TCP/IP, who likened the current lack of cloud communication standards to that of computer networks in the early 1970s (Krill, 2010). However, there are currently efforts by some organizations such as the Cloud Computing Interoperability Forum to address this issue (Grossman, 2009), IEEE, the Open Data Center Alliance (ODCA) and the Distributed Management Task Force (DMTF) (the latter two working in partnership).

Furthermore, failure of a cloud provider that hosts client data in its data centres can have serious repercussions for those clients who entrusted their data to such providers. This issue could force potential cloud users to go for large and well established companies that are more likely to be around for many years to come.

Lastly, reliability can also be a serious problem for cloud users. Outages dating from 2008 to 2011 disrupted the services of many of the big cloud providers such as Salesforce.com, Amazon, Google and Microsoft. For more information on those and other outages in that period see (Raphael, 2011). In keeping with previous years, the year 2012 also had its fair share of high profile cloud outages. For example, on 28 February, a so-called leap-year bug caused Azure (Microsoft's cloud platform) to suffer an extensive, worldwide outage that lasted for more than 24 hours. Azure customers in Western Europe had also endured a loss of service (which lasted for 2.5 hours) on 26 July due to a "misconfigured network device" that disrupted traffic to one cluster in Microsoft's West Europe sub-region. On 15 June, an Amazon Web Services (AWS) power outage cut services to customers for about six hours,

affecting its Elastic Compute Cloud (EC2) service, Amazon Relational Database Service and AWS Elastic Beanstalk, which are run from Amazon's data centres in Northern Virginia. Google App Engine, the company's platform for developing and hosting Web applications in Google-managed data centres, went down on 26 October for about four hours due to slowness and errors causing 50 per cent of requests to the App Engine to fail (McCarthy, 2012).

Cloud computing may not be suitable for all organizations. For example, for large companies (especially those who use the Web for selling most of their products), the loss of service as a result of cloud glitches would be a major concern, particularly if it impacts on their customers and results in substantial loss of sale opportunities and customer dissatisfaction. The issue of reliability with relation to cloud services will continue to be a problem. Similar glitches that befell the aforementioned cloud services of Amazon, Google, Microsoft and Salesforce.com are likely to surface again as the number of cloud providers and users increases. However, for small companies struggling to survive the current global economic downturn and cash-strapped educational establishments, often used to similar glitches caused by their old in-house systems, cloud computing is likely to remain an attractive option due to its cost structure and flexibility.

For organizations involved in scientific and medical research, for example, most of the aforementioned concerns may not be as important to them as they might be to those who provide products and services to consumers, e.g. e-commerce companies. The loss of a few hours of services may not be as dramatic for an organization conducting a research experiment as it would be for online auctions or online retailers. Furthermore, issues of privacy and data protection are likely to be of less concern or indeed relevance, especially if research organizations only use an IaaS cloud for high speed compute operations. So, while the aforementioned cloud drawbacks will remain of concern to many organizations contemplating using cloud computing, their current advantages are likely to outweigh their potential disadvantages for SMEs and the educational and scientific communities.

Advantages of MOOCs

MOOCs are likely to be attractive to those people who cannot gain access to HE (due to cost or lack of sufficient secondary education entry requirements) and who might see MOOCs as a potential avenue towards achieving that objective. It could also be attractive to people who are already in employment and cannot afford the time and/or completion commitment required by campus-based (or even other traditional online-based) education but who aspire to achieve career progression, at their own pace, by having MOOC certificates from some of the most respectable universities in the world. Most interestingly, MOOCs could be hugely popular with learners from developing countries who seek to acquire certification from notable Western universities but cannot afford the cost implications associated with a Western education (e.g., travel, fees, subsistence) or do not have the required academic or pre-academic certification that is required by most Western HE establishments. The aforementioned people will form the bulk of the "non-consumers" which MOOCs (as a disruptive innovation) will need to target.

But can MOOCs disrupt campus-based HE by replacing it or by becoming a good alternative to it? One respondent to Shirky's interesting blog article wrote:

> The push for MOOCs is not coming primarily from students who want to take classes in their pajamas. Instead it is coming from administrators and investors who see a big

> opportunity to make a big pile of money . . . What you don't cite is the number of students who learned enough to have passed the course. My recollection is that it was something like 2% of the students enrolled. And the percentage is probably smaller given that many of them may have cheated their way to that result. Is that what the future narrative of education looks like? If so, I will be checking, very carefully, the credentials of my doctors and nurses before I count backwards from 100 inhaling the anesthetic. (Shirky, 2012)

Understandably, it will be naïve to think that MOOCs could be a suitable venue for courses such as medicine where some aspects of this discipline require prolonged face-to-face engagement and interaction. However, for many subjects where this level of engagement is not mandatory, MOOCs could potentially pose a serious threat to bricks-and-mortar universities. History, according to the theory of disruptive innovation, has been unkind to incumbents that ignore the signs of disruptive innovations. Kodak – which filed for bankruptcy in 2012 – is a recent and a classic example. The company (which was world market leader in "traditional" film and cameras) ignored the disruptive signs of digital photography and paid the ultimate price. One of the reasons, according to Christensen and Eyring (2011) for the survival of large (and even prestigious) universities is a dearth of disruptive competition. However, with the advent of MOOCs, this situation could change.

MOOC Problems

Acceptability, student experience and quality are probably among MOOCs' main problems. If MOOCs are developed so that they can carry credits awarded (and accepted by some universities), to what extent can providers ensure that the people they award these credit-bearing certificates to actually deserve them? And will employers eventually accept them as they were traditionally willing to accept qualifications from well-established universities? Some MOOC providers are already trying to address the first part of this question. For example, Coursera has introduced technology that identifies enrolled students through its "Signature Track" certification option. Where identity verification proves to be problematic, "protected" or supervised assessment may offer a solution. Indeed, Coursera is already also experimenting with this option through the introduction of live supervision for those students who sit online exams for some of its MOOCs (Palin, 2013). As is the case with disruptive innovations, performance issues such as these could be overcome with time. The second part of this question is a difficult one to answer as it will take a considerable amount of time before MOOCs become an acceptable licence for gaining employment. When that happens (if it ever happens) it will represent a cultural shift for organizations. It will take some bold decisions by employers (who are unimpressed by the content and relevance of traditional academic qualifications) to make this happen. The quality of the graduates that emerge from MOOCs environments (impacted by the quality of the MOOCs they took) could hasten that change. Indeed, the issue of quality is very much on the mind of the current MOOCs providers. Some of the MOOCs that are currently on offer by providers such as edX and others are provided by professionals and academics who are leading experts in their fields. Ulrich Hommel (Professor at the European Business School) commented that it is not "a given" that online learning will always be a second-best to face-to-face instruction in terms of quality and customer experience (Hommel, 2013).

Aware of the "solitary experience" that online learning presents, some MOOCs providers (such as Futurelearn) are trying to address this issue by creating a supporting online

community that will enable learners to discuss their courses and ask questions through social networking-style comments (Coughlan, 2013).

But should MOOCs actually compete for university degrees? Horn and Christensen (2013) suggest that this might be how MOCCs will eventually develop. They contend:

> We believe they [MOOCs] are likely to evolve into a "scale business": one that relies on the technology and data backbone of the medium to optimize and individualize learning opportunities for millions of students. This is very different than simply putting a video of a professor lecturing online.
>
> The initial MOOCs came from a "process business model" where companies bring inputs together at one end and transform them into a higher-value output for customers at the other end – as with the retail and manufacturing industries.
>
> But over time, an approach where users exchange information from each other similar to Facebook or telecommunications (a "facilitated network model") will come to dominate online learning. This evolution is especially likely to happen if the traditional degree becomes irrelevant and, as many predict, learning becomes a continuous, on-the-job learning process. Then the need for customization will drive us toward just-in-time mini-courses. (Horn and Christensen, 2013)

However, the "if traditional degree becomes irrelevant" is obviously a "big if" and only time will tell. But this is how the leading experts on "disruptive innovations" foresee the future of MOOCs.

Will the Cloud and MOOC Problems be Resolved?

The theory of disruptive innovations suggests that disruptive innovations tend initially to have performance problems. Those problems eventually get resolved with improvements and enhancements. The PC is a good example. The early PCs tended to crash more often, had limited memory, storage and processing power. These issues were eventually resolved. As disruptive innovations in the early years of their development, cloud computing and MOOCs have their own set of problems. Security, interoperability and reliability (non-disruption of services) are examples of the main problems that cloud computing needs to overcome. As to MOOCs, concerns relating to credibility (e.g., gaining qualifications meritoriously) and limited scope for enhancing student experience seem the most obvious problems. Once these problems are overcome (as is often the case with disruptive innovations) the losers will be organizations that did little to embrace the cloud model (e.g., traditional IT providers) and the MOOC model (traditional campus-based educational establishments).

New Servitization Models Call for Culture Change

The disruptive and servitized nature of cloud computing MOOCs requires a radical response from organizations that provide "traditional" IT products (in the case of the cloud) and establishments that provide educational services (in the case of MOOCs). Organizations develop their own cultural identity as they grow. This cultural identity of organizations is their own way of conducting their business, epitomized in the values exhibited by their employees when they decide which orders are more important, what type of customers should have priority and whether an idea of a product is attractive. As well as defining what an

organization can do, it also defines what an organization cannot do. Culture is therefore a double-edged sword. When great changes such as disruptive innovations occur, case studies have shown that organizational culture generates cultural inertia which is so difficult to overcome directly. It is often a key reason why managers fail to introduce timely and substantial change, even when they know that it is needed (Christensen and Raynor 2003; Henderson 2006; Tushman and O'Reilly 2002, cited by Yu and Hang, 2009). Ignoring the signs of disruptive innovations by incumbent (i.e., well established) organizations is well articulated by Christensen, Anthony and Roth (2004) in this quote:

> An incumbent's strengths are its weaknesses. Its values, which make sure it delivers excellent products to demanding customers, stop it from going after markets where ultimately its strongest competitors will forge their processes and values. Incumbents' processes, those that allow it to serve its customers well, are weaknesses when the game changes and new capabilities are necessary. Fleeing from the disruptive attacker feels good in the short term but further deprives the incumbent of the necessary skills to compete. The end can come swiftly and can appear stunning to the untrained eye.

Conclusion

The literature of servitization is relatively new. Dating from late 1980s, this literature was an academic recognition of the developments that manufacturing companies had introduced in order to provide better products and services to their customers in order to avoid having to compete on cost alone. Later developments in the literature took into consideration the dynamic conditions of a world that is increasingly shifting from a manufacturing to a service economy where services have assumed greater importance.

Cloud computing and MOOCs are portrayed in this article as new disruptive (and servitized) innovations. The cloud has servitized the IT industry by enabling the scalable delivery of IT services (both hardware and software-related) remotely through the medium of the Internet. By the same token, MOOCs, as argued in this article, have the potential to servitize the HE industry by enabling the scalable delivery of educational services in a manner that has not been experienced before. Indeed, the MOOC phenomenon could end up doing to HE what cloud computing did to IT by providing education as a service (EaaS) that can potentially be consumed on a scalable pay-as-you-go basis.

Current evidence suggests that servitizing the IT and educational industries is an innovation that has the potential to grow in popularity, especially in the present global economic environment of budgetary cuts and austerity. The success of this growth will depend on the extent to which current problems with both innovations can be resolved. It will also depend on the extent to which decision makers in those industries are willing to embrace cultural changes and are able to read the signs of disruptive innovations.

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