Impact of Implementing Virtual Work Tools  
in the Globalization of Enterprises

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***Abstract* —** *Today’s global work environment is becoming increasingly virtual, driven by the need for increased productivity and supported by advances in information and communications technologies (ICT). Implementing virtual work tools in higher education requires vigilance in understanding the nature of these tools, how these tools can be used to support business processes, and the management issues associated with managing virtual work groups.*

*This paper begins with a discussion of the nature of virtual work tools within a higher education enterprise. There will be a review of three categories of virtual work tools: communication, conferencing, and collaboration tools. Next, there will be a discussion of virtual work tools implementation issues. Finally, the future trends and areas for future research will be identified.*

**I. Introduction**

A number of years ago, my colleague, Dr. Alan McCord, and I began looking into the topic, “virtual information and communication technologies’’ as they are applied to global business work processes. In 2008, our chapter, *Technologies and Services in Support of Virtual Workplaces (McCord & Boone, 2008),* was published in the *Handbook of Research on Virtual Workplaces and the New Nature of Business* (Zemliansky & Amant, eds., 2008). We took the basic premise of this work and applied it to higher education in a presentation, *Implementing Virtual Work Tools in Global Enterprises,* for the I-TCE International Conference on Technology, Communication and Education (Boone & McCord, 2008). I have extended the original work in this presentation as I explore the impact of virtual work tools in the globalization of higher education today.

A growing number of technologies are available to support virtual communication technologies; however, the more sophisticated the technologies are the more they may fail if deployed by enterprises not prepared to use them. This is especially true when virtual tools are used in a global setting. We should keep in mind that less complex technologies may yield significant benefits when used by enterprises that understand how to manage them.

The paper contains six sections: 1) Introduction; 2) Virtual Work: a discussion of the nature of virtual work tools within the higher education enterprise; 3) A review of three categories of virtual work tools: communication, conferencing, and collaboration tools; 4) A discussion of virtual tools and the impact of their implementation; 5) A discussion of the future trends in virtual work tools; 6) Conclusion.

**II. Virtual Work**

Our original research was based on the definition of a virtual worker as anyone working in a different geographic location from co-workers or supervisors (McCord & Boone, 2008). Later, we took this base and applied it to the globalization of higher education. The definition of a virtual worker then changed to: “A virtual worker in this context is a student, faculty or staff member who routinely works in a different geographic location from others.” Some virtual workers are teleworkers – working from home – while others may work on a campus without significant interaction with co-located colleagues and students. Still other virtual workers are nomadic themselves, regularly working at multiple locations, in some cases without a permanent location, such as university extension programs reaching out to military personnel around the world. Virtual workers may experience an absence of traditional workplace intermediation factors such as physical workspaces, face-to-face classes, and chance physical encounters. Enterprise technologies are defined here as those technologies that are deployed for use by all workers (Boone, M. & McCord, A., 2008).

An example of an enterprise technology in higher education is online or virtual learning which has become an increasingly important component of institutional strategic plans and academic programs. In 2010 the Sloan Consortium reported that sixty-three percent of all reported institutions said that online learning was a critical part of their long-term strategy. Over 5.6 million students were taking at least one online course during the fall 2009 term. Nearly thirty percent of higher education students in the United States take a least one online course (Allen, I. E. & Seaman, J., 2010).

Online learning is a form of a new generation of distance education that is Internet-based and asynchronous. As Power & Gould-Morven (2011) state, “In our view, the hallmarks of this new educational environment will be sufficient ubiquity and user-friendliness to assure improved levels of accessibility; sufficient technological sophistication to allow for a quality online teaching and learning environment; and sufficient cost-effectiveness to me university resource limitations.”

Asynchronous learning networks (ALN) differ from what has become generically known as “online learning” or “e-learning” since ALN emphasizes computer and Internet technologies to facilitate interactive communications between the instructor and the students inside an online learning environment (Lorenzo & Moore, 2002). A recent example of a Massive Open Online Course (MOOC) partnership utilizing ALN technologies is the one-year-old nonprofit X Consortium between Harvard and MIT that has been expanded into the new nonprofit edX Consortium with 27 institutional partners that has recently expanded the virtual education platform into four continents (Hashmi & Shih, et al, 2013). There will be a discussion of this new movement in Section 5 – Future Trends.

The global growth of online education and ALNs has resulted in more heterogeneous virtual (Internet-based) classrooms. In addition to students with different cultural and educational backgrounds, students interact with online environments in far more diverse ways than they do in a traditional environment. Today’s course management systems and learning management systems provide faculty members with new tools to organize course content, package assignments, conduct assessments, facilitate discussions, and maintain digital copies of student work. In addition, globalization de-emphasizes face-to-face communication and can leverage intellectual capital generated by faculty and students. Increased and sometimes discontinuous use of communication, conferencing, and collaboration tools can result.

Our technology environment is evolving from an industrial model to a pervasive model. The advent of the commercial Internet in 1995, explosion of cellular telephony, and proliferation of personal computing devices has given rise to “nomadicity,” defined by Kleinrock (2001), as “transparent virtual networking.” Nomadic users access data, programs, and services as they move from place to place in a transparent, integrated, and convenient fashion. Gupta & Moitra (2004) describe virtualization [enterprise technology resources found on servers or storage devices supporting the operation of multiple virtual resources on a single device] and pervasive computing [a technology environment that supports individuals using wireless networking] as “an umbrella of IT capabilities …characterized by mobility, wireless connectivity, context awareness, implicit inputs, pro-activeness, smart spaces, and the use of natural interfaces for human-device interaction.”

Not long ago, it took years for virtual technologies to find their way into homes. Today, virtual workers, such as students, faculty and staff, often use technologies prior to enterprise (university) adoption. Examples include video capture and editing, peer-to-peer networking, instant messaging, blogging, tweeting and portals. Teleworkers can install very capable home technology infrastructures at modest costs. Pervasive technology, nomadicity, and consumerization contribute to a culture of “networked individualism” where individuals interact with the network on their own terms (Boase, Jorrigan, Wellman & Rainie, 2006). The enterprise or institutional implications are clear: implement a technology infrastructure capable of supporting virtual work, but support nomadic workers using their personal technologies.

Most of the prior and current research has been from a U.S. perspective; however, it should be evident that this discussion requires a global perspective. The term *globalization* is somewhat of a modern term and it still hasn’t been sufficiently defined - different users of this term may label it as they wish. Here, it relates to areas of human activities, information and communication technologies as they affect enterprises. Globalization is a consequence of modernization that supports the notion, “it is an ever increasing small world.” The challenge today is that countries and regions within countries need to seek partnerships that result in mutual beneficial collaboration.

How do these trends relate to higher education’s use of virtual work tools? Globalization, pervasive technologies, wireless technologies, and the consumerization of technology provide opportunities for individuals to do more of their work from anywhere, and for higher education enterprises to design learning delivery systems with less regard for location.

Virtual work is a multi-dimensional phenomenon. Holtshouse proposes a “four space” model of the future work environment comprised of physical, organizational, informational, and cognitive spaces (Holtshouse, D., 2006). Physical and organizational approaches differ for virtual and on-site work. Tacit work [requiring workers to exercise experiential judgment and collaboration] will personalize today’s “one size fits all” information space to address multiple and sometimes conflicting cognitive needs. A major challenge for higher education enterprises deploying virtual work tools is to seriously address both technological and managerial issues. It has been proven over and over again that information and communication technologies have been implemented without adequate management strategies.

**III. Virtual Work Tools**

Until the late 1990s, most enterprise applications – even e-mail – used client-server technology that required specialized client software on end-user computers. Internet and cellular telephony services became globally available in the late 1990s, followed closely by broadband wireless services and personal digital assistants (PDAs). The adoption of the Web browser as a “universal client” has simplified desktop management and promoted software standards but has complicated the delivery of content. Some workers may use a desktop computer with a hard-wired network connection while others use PDAs and cellular network services. Other workers maintain multiple devices and require seamless access to information regardless of which device they choose (Boone & McCord, 2008).

Several trends drive the evolution of virtual work tools. Significant improvements in international Internet bandwidth have been accompanied by dramatically reduced costs, promoting point–to-point network connectivity. Tools for remote team collaboration have been available since the mid-1980’s. Enterprises are rapidly globalizing and becoming more dependent on comprehensive collaboration applications to coordinate virtual teams (Intel Technical Articles, 2013).

We took the groups in today’s virtual work and divided them into three broad categories – communication, conferencing, and collaboration.

***Communication tools*** comprise the most ubiquitous set of virtual work technologies and are available to virtually all global enterprises and workers at relatively low cost. Telephony services are available virtually anywhere as public switched, private switched, voice over IP (VoIP), or cellular services. E-mail is widely deployed, and most workers routinely send documents as e-mail attachments, although many enterprises do not effectively manage attachments. Productivity tools – word processing, spreadsheet, presentation, and database applications – are used to document tacit knowledge. Most enterprises have deployed local area networks or enterprise file systems for shared document storage, although document knowledge is most often managed at individual or departmental levels. Informational web sites provide product and service information, and secure intranets are used to store documents and process transactions (Boone & McCord, 2008).

Skype, a VoIP software service was founded in 2003 and purchased by Microsoft in 2011 provides both audio and video communication; however, it has had many challenges to its intellectual property and faced political concerns by various governments. Since its inception in 1992, text messaging via mobile devices has become more and more a general means of communication in a wide variety of cultures. It is a simple and quick way to communicate. According to ComScore Research (2011) more than 70% of all mobile phone users send text messages. The topic of mobile technology will be discussed in Section 5 under trends.

***Conferencing tools*** comprise more complex virtual work tools supporting real-time meetings between virtual workers. Conferencing tools require a more robust infrastructure, greater investment, and better worker training to be used effectively. Audio conferencing connects participants using telephones, cellular phones, or VOIP, and is widely available from many service providers. Video conferencing adds full-motion video to real-time meetings and can be carried over ISDN or Internet connections. Conference bridges can add audio participants to a videoconference session. Videoconferences can be webcast in real-time or streamed on-demand following the event (Boone & McCord, 2008).

Many enterprises extend their use of conferencing tools by using Web conferencing, providing participants with an online meeting environment for sharing text or presentations. The leader can stream audio or video to participants. Participants use a chat window to send text messages to the group, and may be authorized to transmit audio or video content. A whiteboard allows participants to mark up a shared workspace. Web conferences can often be recorded to provide on-demand streams of prior sessions. Some conferencing tools support file and application sharing where participants manipulate a file or an application. Many conferencing tools also provide survey and polling tools (Boone & McCord, 2008).

A technically different version of video conferencing is *telepresence.* It is a hardware-based system rather than traditional software-based video conferencing. PC-based video conferencing reaches multiple participants and is the most cost effective, but has limitations regarding broadcast quality. Telepresence has limitations regarding reaching multiple participants and cost, however, it is an option for providing a continuous HD video and audio more lifelike experience (Vu Telepresence, 2013). Such high-end video conferencing tools might be appropriate for specialized applications such as medical demonstrations.

***Collaboration tools*** comprise the most complex virtual work tools, integrating project and document management functions into communication and conferencing tools. Collaboration tools are expensive to acquire and maintain, require ongoing management and user training, and require integration with enterprise applications and productivity tools. Collaboration tools support document or product development using productivity or design tools. They include project management systems for task and participant assignments, team work areas, and shared calendaring. Many collaboration tools include unified communications and workflow systems to integrate telephone, facsimile and e-mail messages into the virtual work environment and to route tasks between participants. Collaboration tools provide federated contact lists, presence indication and social networking features (Boone & McCord, 2008).

Many enterprises extend their use of collaboration tools by using document repositories to provide shared access to versioned project documents. Participants receive automatic change notification through e-mail messages, voicemail messages, or Real Simple Syndication (RSS) feeds. Project dashboards aggregate critical project information, support personalization of screen layout and notification, and may provide intelligent agents to take actions on behalf of participants. Some collaboration tools support real-time engineering design. Enterprises may use collaboration tools to provide input to knowledge management systems (Boone & McCord, 2008).

Pickering & Wynn (2004) summarize the shortcoming of today’s virtual work tools, including lack of cross-cultural or cross-language support, inability to interpret context and nuance, and lack of social networking features. Today’s solutions also lack interoperability, suffer from usability issues, are sometimes unreliable, and are often deployed without attention to [individual] needs. Implementing virtual work technology on a regional or global scale presents additional challenges, including the wide variation in broadband services in different regions, difficulties managing groups across time zones, communication issues resulting from network latency, the lack of end-to-end quality of service capabilities on today’s networks, and providing technical support to end-users on a 7x24 basis (Boone & McCord, 2008).

As virtual tools, Course Management System (CMS) and Learning Management System (LMS) tools are essential management tools within virtual (online) learning initiatives. The two systems have the same basic purpose but differ in comprehensiveness. A CMS is a set of tools that allows the instructor to create online course content and put in on the Web. On the other hand, an LMS is a software application that also allows the instructor to create online course content but it also automates the administration, tracking and reporting of instructional activities and may be integrated with other enterprise computer-based applications (Ellis, 2009). A full-function LMS may be considerably more expensive than a CMS.

**IV. Impact of Implementation Issues**

Enterprises deploying virtual work tools need to address both technological and managerial issues, and we know that some technologies are implemented without adequate management capabilities. To decide when and how to deploy virtual work tools, we need to understand the global and enterprise technological context, the nature of virtual work tools, and best practices for managing virtual work. Best practices for such management require three essential steps: planning, selecting, and deploying. These steps incorporate the following activities: define the reasons for implementations, identify the functionality issues, select critical components, and estimate the volume of information to be carried.

***Deciding how the business of the enterprise will be conducted.*** Enterprise practice decisions broadly define how business will be conducted. The enterprise should consider its need as centralized versus decentralized operations, and how much tactical and strategic work will be conducted internally or with partners. The enterprise should also consider how much work will be cooperative or collaborative. Collaborative tasks are divided into independent subtasks and managed hierarchically, but they are organized as intertwined layers. Cooperative work requires synchronicity only when assembling partial results, but it requires continuous synchronicity to focus on emerging products and services. Communication and conferencing tools can support cooperative work, but collaborative work requires collaboration tools.

***Selecting and implementing the most appropriate tools.*** A virtual work environment will likely consist of a number of tacit [personal] tasks, projects, and programs. Some tacit work profiles are more appropriate for communication tools support, while others may be more appropriate for conferencing or collaboration tools. As the cost of implementing and maintaining virtual work tools varies widely, managers must pay close attention to the allocation of virtual work tool resources to ensure that valuable resources are not squandered (Boone & McCord).

A strategic technology assessment can estimate the potential for using technology to support business strategy. The assessment provides a “reality check” link between business strategy, business practices, and virtual work tools. The strategic technology assessment should evaluate evolving technologies from the perspectives of stages, adoption cycles, commoditization, and “buy versus build.” An inaccurate assessment of a potential new technology may lead to acquiring a technology that is not used by partners or customers. Predicting the availability and pricing of hosted services has long-term consequences for deploying virtual work tools (Boone & McCord).

***Intellectual property and security policy decisions in reaction to unforeseen events.*** It is highly recommended to define broad intellectual property and security policies before deploying virtual work tools. Intellectual property and security policy decisions define policies for phases of the collaboration life cycle, frameworks for security practices, and a better understanding of the enterprise strategy and implementation practices. Security policies reflect intellectual property policies, statutory requirements, and contractual obligations. Security policies have shorter life cycles than intellectual property policies, and virtual work requires sophisticated use of access control of all initiators and users of a virtual system. A need for flexibility is in direct conflict with traditional enterprise security practices (Boone & McCord, 2008).

***Managing virtual groups.*** Virtual teams require proactive leadership, project management, and personal attention to team members. Open and frequent communication can build team trust. Team leaders should build clarity and predictability by setting clear objectives and responsibilities, using clear language, and promoting constructive discourse. Team leaders also need to interpret facts and tasks within the larger context of the enterprise (Boone & McCord, 2008).

Managing virtual team members from different enterprises requires attention to group formation and norming activities. Where possible, team members should possess strong personal networks. Teams should have time to form personal relationships and identify mutual interests, and leaders should provide opportunities for task-related and social interaction (Boone & McCord, 2008).

Managing virtual team members from different countries requires greater communication about work tasks. An initial face-to-face meeting can allow team members to establish relationships. Regularly scheduled status meetings, adjusted for participation across time zones, should be facilitated and documented. Team leaders should track team member participation to identify isolated team members. Managing virtual team members from different cultures requires an additional focus on cultural diversity. Team leaders should provide opportunities for members to discuss cultures and values, and to address cultural communication differences. Some cultures place great importance on face-to-face interaction, so scheduling periodic face-to-face or video meetings is important. Managing virtual team members who speak different languages requires educating team members about virtual communication and practicing communicating before beginning virtual work. Team leaders should identify language interventions including translation. Comprehensive written communication is critical to multi-language virtual teams, but team members will need additional time to review documents and interpret context (Boone & McCord, 2008).

***Enterprise supported knowledge practices*** are valued-added initiatives that may provide a competitive advantage if they are aligned with the enterprise level strategy and the technology architecture. To transfer “tacit knowledge” or “personal knowledge” generally requires personal contact and regular interaction, This type of knowledge is best obtained through practice and is supported when an individual joins a network or a community of practice. Riel and Polin (2004) categorized these initiatives as knowledge-based, practice-based, and task-based. Virtual learning community and virtual community of practice are two examples of enterprise knowledge practices that may either engage in task-based projects with a finite end or an open-edited time frame. A constant is that technology is the mediator for sharing and collaboration (Riel and Polin, 2004).

A virtual (Internet-based) *learning community* can either be open or closed to the general public as it facilitates its members to reach shared learning. Members may share their knowledge either by Internet-based synchronous or asynchronous text, audio, video, and social network technologies.

A virtual (online) *community of practice (CoP)* is a group of people who share a profession or a particular common allegiance. In many organizations these CoP’s have become an integral part of the enterprise (McDermott & Archibald, 2010). Similar Internet-based synchronous or asynchronous technologies support these virtual communities.

**V. Future Trends**

***Innovative mobile technologies*** will raise the bar in empowering individuals to participate in the knowledge revolution in both developed and developing countries. In early 2012 the World Bank calculated the global growth in mobile technology between 2005 and 2010. By 2010, there were 5.9 billion mobile subscriptions, 23 percent in high-income countries and 77 percent in developing countries (Harvard Business Review, April 2013, p. 1). For example, in 2011 Vietnam’s wired broadband was only 5% but wireless broadband subscriptions were 14% (Harvard Business Review, April 2013, p.3). As Andrew McAfee, principal research scientist at MIT’s Center for Digital Business, states, “We’re going to see some fantastic things, in every area of the organization” (Harvard Business Review, April 2013, p.1). The result of the proliferation of mobile devices is the vast array of cutting-edge applications that have the potential to transform the way people work and communicate (Harvard Business Review, April 2013, p.2)

One possible advantage for the higher education enterprise is the potential of low cost electronic tablets to reduce student’s cost of printed textbooks is possible. Further, as low-cost electronic tablets and access to wireless networks become ubiquitous the virtual student, faculty and staff can access information in all formats without being in any one specific location.

According to an E-Brief (Lenovo, 2012) there are five key trends in mobile technology: 1) Universities under pressure to develop a mobile learning strategy that is aligned with the institutional mission; 2) University administrators focus on operational efficiency such as moving from on-site email systems to cloud-based solutions; 3) New security tools will need to be developed to replace legacy tools; 4) More investment in the wireless infrastructure will be required; 5) Availability of appropriate applications (apps) in a ubiquitous wireless environment will become a competitive advantage. No two mobile technology projects are alike, but what is at the core of all projects is to provide usability and functionality and that the end user’s experience is successful.

***Innovative mobile social media*** are distinct from commercial or traditional media, such as newspapers and television as they are less expensive and more accessible to anyone who has a mobile device. There is an increasing trend to use social media monitoring tools such as those that may provide instructors with the ability to monitor student progress. Text messaging, or texting (SMS) is an example of a prolific mobile social media application. It has had a growing social impact as it allows for a conversation with another person without the constraint of the real-time influence. Rheingold (2002) argues that texting can bring people together and create a sense of community through “Smart Mobs” or “Net War”, which create “people power”. A form of social networking, the “blog” was created in 1997. A “blog” [*web-log*] is a type of website that contains content that is updated with new content on a reverse chronological basis. The content can be text, visual, audio or audiovisual. In 2007 this social media celebrated its tenth anniversary (Wortham J., 2007). Types of “blogs” include personal, micro blogging on such websites as Twitter, Facebook and Tumblr, corporate, organizational, by genre, by media type, by device, reverse blog and, the most applicable to virtual learning, the collaborative or group blogging based around a single theme or topic. A more recent mobile social media development is Twitter, created in 2006. It has become one of the ten most visited websites on the Internet and in February 2013 had 200 million users (Twitter.com, 2013). The video-sharing website, You Tube, was created in 2005 and bought by Google in 2006. It has great potential as part of visual virtual tools on the Internet. In January 2012 You Tube was streaming more than four billion videos per day (Oreskovic, January 23, 2012).

***Innovated developments from online courses to the Massive Open Online Courses (MOOC)*** is one of the major opportunities for university enterprises to expand “distance learning” by offering quality online education with the appropriate use of a variety of virtual technologies. Globally, this can only be accomplished by carefully planned collaborative arrangements that lead to partnerships. Two years ago a new development emerged when the Massive Open Online Courses (MOOC) became a reality. Some of the top U.S. universities have joined together to offer non-credit, free online courses. Two of the largest are *Coursera* (Princeton, the University of Pennsylvania, Stanford and the University of Michigan) and *edX* (Harvard and the Massachusetts Institute of Technology). These courses are currently non-credit, but will not remain so for long. At this time, the MOOC is essentially a high-tech extension of the traditional university lecture-hall experience but by recognized instructors offering the course, however, the potential of having the movement make use of participatory-engagement tools, a learning management system, blogs, Twitter and videoconferencing is promising (King & Nanfito, 2013).

**VI. Conclusion**

Friedman describes a flattening of global business driven by existing and future technologies that enable enterprises to become increasingly collaborative (Friedman, T., 2005). More than 90 percent of Americans believe it is important to prepare future generations for a global society (Joseph, 2007).

Expect to see the continuing maturation of unified communications that integrate telephony, voice mail, e-mail, conferencing, instant messaging, and institutional data. The rapid deployment of ubiquitous wireless networks and consumerization of wireless technologies will accelerate development of pervasive computing. For example, if adopted, cloud-based Unified Communications (UC) will provide an avenue for VoIP to integrate voice with multiple other communication methods.

Additional investments in IT infrastructure and a shorter lifecycle for IT investments will continue to focus on collaboration technologies, especially those that support social networking by student workers. Within higher education there will be a need to “give up some control” of how students, faculty and staff use technology which will result in them using a mixture of their own personal technologies as well as the institution’s enterprise technologies.

The university enterprise will need to work with the commercial sector as it continues to develop opportunities for innovations in mobile technologies and social media; however, within the educational sector one of the most prominent areas needing intensive scrutiny and research is the impact of virtual course movements like MOOC on the university enterprise, its mission, its students and its faculty. EdX has recently announced that 15 new universities have joined the edX consortium. “The 15 schools span the globe, with six additions from Asia, five in the United States, three from Europe, and one from Australia” (Hashmi & Shih, et. al, 2013). Anant Agarwal, president of edX, has commented, “As we continue to grow the X Consortium and offer courses from institutions as diverse as our global community of students, we are moving forward with our mission to reimagine education…These schools, with their unique faculties and student bodies, will help us conduct collaborative research on best practices which improve education online and on campus” (Hashmi & Shih, et. al, 2013).

The question of accreditation of MOOC courses offered globally identifies a question for future research. Ellen Hazelkorn, in a recent *The Chronicle of Higher Education* blog, comments on the topic of education quality, specifically in relation to the MOOC movement. She states, “Traditionally, academe relied on peer review and internal procedures of quality assurance at the individual program or institutional level…Today, government involvement in the process and the assessment of quality is everywhere…Nonetheless, all these developments demonstrate that a Rubicon has been crossed. While higher education has traditionally been the guardian of quality, its role has effectively been usurped” (Hazelkorn, 2013). A few of the other questions needing thoughtful consideration are: When will these currently free courses become for-credit courses and how will the cost be distributed? How will secure assessment of student achievement be conducted? What effect will using non-institutional faculty have on each institution?

It is certain that the world of higher education is in a transitional period, and that virtual work tools and the trends in mobile technologies, social media and virtual learning are at the forefront. Much work needs to be done to ensure that our institutions, students and faculty do not suffer from negative consequences.

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