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# VIRTUALISATION OF ADMINISTRATIVE WORK ENVIRONMENT IN DEVELOPING COUNTRY HIGHER EDUCATION INSTITUTIONS: AN ACTIVITY THEORY PERSPECTIVE

Ibrahim Adam

*University of Ghana Business School, ioadam@uds.edu.gh*

John Effah

*University of Ghana Business School, jeffah@ug.edu.gh*

Richard Boateng

*University of Ghana Business School, richboat-eng@ug.edu.gh*

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# VIRTUALISATION OF ADMINISTRATIVE WORK ENVIRONMENT IN DEVELOPING COUNTRY HIGHER EDUCATION INSTITUTIONS: AN ACTIVITY THEORY PERSPECTIVE

*Research in Progress*

Ibrahim Osman, Adam, University of Ghana Business School, Legon, Accra, Ghana, ioadam@uds.edu.gh; ioadam@st.ug.edu.gh

John, Effah, University of Ghana Business School, Legon, Accra, Ghana, jeffah@ug.edu.gh

Richard, Boateng, University of Ghana Business School, Legon, Accra, Ghana, richboateng@ug.edu.gh

## **Abstract**

*The purpose of this study is to understand how Higher Education Institutions (HEIs) in developing countries virtualise their administrative work environment. Despite the increasing use of the internet and web technology to virtualise education and related activities, IS research on HEIs in both developed and developing countries has focused more on learning environment and less on administrative work environment. Therefore, not much is known about how HEIs migrate from physical to virtual administrative work environment. Given this research gap, this study employs activity theory as analytical lens and interpretive case study as the methodology to investigate the attempt by a developing country university to virtualise its administrative work environment. Although teaching and learning are the core activities of HEIs, administrative work provides the necessary support. It is thus important that IS research in higher education pays attention not only to learning environment but also to administrative work environment. The study expects to draw specific implications and provide rich insight on how HEIs in developing countries virtualise their work environments.*

*Keywords: Higher Education Institutions, Administrative Work Environment, Virtualisation Activity Theory, Developing country.*

## 1 Introduction

The purpose of this study is to understand why and how Higher Education Institutions (HEIs) in developing countries virtualise their work environment. Virtualisation is the process of migrating physical activities to virtual environment such that rather than being conducted through physical contacts between humans and objects, activities are conducted through the Internet and Web information systems (Overby, 2008a). Work environment generally refers to the surrounding conditions in which an employee operates and this consists of office space. Work environment may be physical or virtual. In the physical work environment, there is a designated space and face to face contact employees within this physical work environment share a common workspace and may not necessarily collaborate using communication and collaboration tools such as email (Schweitzer and Duxbury, 2010). A virtual work environment (VWE) however, is an electronic work workspace in which members use technology to interact with each other from remote locations (Martins et al., 2004, Townsend et al., 1998, Watson-Manheim et al., 2012). Advancement in internet and web technology is having a profound impact on the way work is undertaken (Boell et al., 2013) in some HEIs in developing countries, and this is leading to HEIs migrating their work environments from the physical to the VWE.

Generally, work is a rationally prescribed set of activities that are carried out in an organization for compensation (Cummings and Srivastva, 1977). Based on this definition learning is not considered work. In HEIs, work can be categorised into three areas; teaching, administration and research (Hrastinski, 2008, Kohoutková, 2006, Jones et al., 2006). Accordingly, HEIs have teaching work environment, administrative work environment and research work environments. This study is situated in the administrative work environment where IS are used in the areas of management of human resources, finance and academic support services. Whilst a plethora of research exists on virtualisation in HEIs (Songkram and Puthaseranee, 2015, Keller, 2009, Rae and Samuels, 2011), the focus has generally been on virtual learning environment (VLE). As a result, less research attention has been paid to the administrative work environment and how it is virtualised. There is therefore a knowledge gap in understanding why and how the administrative work environment in HEIs is virtualised.

The administrative work in HEIs in developing countries is largely conducted in physical work environments and this leads to delays in communication, inefficiency bureaucracy and redundancy. These challenges negatively affect teaching and learning as well. Therefore, the virtualisation of the administrative work environment has the potential to address these challenges by enhancing learning and improving efficiency in administrative work. To address the knowledge gap, this study seeks to answer the following questions:

- i. *Why do HEIs virtualise their work environments?*
- ii. *What are the contradictions in the virtualisation of HEI administrative work environment?*

In addressing the above questions, the study uses activity theory (AT) (Leont'ev, 1978, Vygotsky, 1978, Engestrom, 2000) as the analytical lens and an interpretive case study approach (Walsham, 2006, Barrett and Walsham, 2004, Klein and Myers, 1999) as methodology to understand an attempt by the University of Ghana (UG) in a developing country context to virtualise its administrative work environment. The study is being conducted at the University of Ghana (UG) because it is considered as a typical developing country university that has attempted to virtualise its administrative work environment.

The rest of the paper is structured as follows: Section 2 reviews the literature on information systems (IS) and the work environment in HEIs. The theoretical foundation and methodology are presented in Sections 3 and 4. Section 5 presents the research findings, which are discussed in Section 6. Finally, Section 7 concludes the paper and outlines its contribution, implications and suggestion for further research.

## 2 IS Research in HEIs

There has been increasing use of IS in HEIs over the years. One aspect of IS use has been the application of the internet and web technology to virtualise teaching and learning. Much of the IS literature on HEIs in both developed and developing countries has concentrated on the virtualisation of learning. In developed countries, the literature on e-learning has included discussions on various aspects of e-learning such as the effectiveness of e-learning (Douglas and Van Der Vyver, 2004), student and teacher satisfaction (Liaw et al., 2007), participants' interaction in an online environment (Arbaugh and Benbunan-Fich, 2007) and the student experiences in the e-learning environment (Gilbert et al., 2007). Though e-learning has also been discussed in the literature on IS in HEIs in developing countries, the implementation and use of e-learning platforms in universities is still very low despite the opportunities that are provided by open source technology and the conducive environment created by some developing country government (Lwoga, 2012). Such discussions have included the usability of learning management systems, the potential and challenges of e-learning in tertiary education (Al-Harbi, 2011) and user acceptance of virtual learning environments (Keller, 2009). Others are the implementation of e-learning systems in higher education (Thowfeek and Jaafar, 2012) and the critical success factors in implementing e-learning (Krotov, 2015, DorobĂȚ, 2014).

Apart from e-learning, many HEIs around the world also use IS in educational management (Tatnall, 2005). Whilst developing country HEIs continue to invest heavily in IT and information systems, empirical evidence suggest that many of these systems are underutilised (Phahlane and Kekwaletswe, 2014). The issue of IS in HEIs has been necessitated by the expansions that has characterised HEIs in developing countries lately and thus HEIs investment in the development and implementation of such systems (Semeon et al., 2010) has become critical. This has led to increasing research to investigate the utilization of IS in HEI management. Though there is evidence to support HEIs in developing countries implementing IS to support their core functions including administration (Uwadia et al., 2006, Tusubira, 2005, Rodrigues and Govinda, 2003), the emphasis has been about the strategy for implementation and utilisation of IS in HEI as seen in Uganda (Magara, 2009, Bisaso, 2009), use of IS in HEI in south African HEIs (Phahlane and Kekwaletswe, 2014) and the success of student management IS in Ethiopia (Semeon et al., 2010). Whilst a good deal of research has been done in HEI management in developed countries (Tatnall et al., 2005), there is little literature on how HEIs migrate their physical administrative work environments to the virtual in developing countries.

Also, there has been studies on how physical processes can be moved to the virtual environment (Balci and Rosenkranz, 2014, Overby, 2008b) through process virtualisation. However, such studies have relied on the process virtualisation theory (PVT) (Overby, 2008a) which focuses on some deterministic criteria on whether a process is amenable to virtualisation or not (e.g. Overby, 2008b, Balci and Grgecic, 2013, Barth and Veit, 2011, Overby, 2012). PVT is not suitable in the study of this phenomenon because of its lack of precision in some domains and that some factors that influence the virtualizability of processes in one domain may not be the same in another domain (Overby, 2008a). For instance, teamwork, governance and the organisational norms and practices which are context specific and may characterise an HEI work environment virtualisation is absent from the PVT. Also, in work environment virtualisation, entirely new processes may be developed in the VWE that had not physically existed in the TWE. It is therefore not clear how PVT will address this new processes.

## 3 Activity Theory

AT is a theoretical framework for the analysis and understanding of human interaction through the use of tools and artefacts (Hashim and Jones, 2007, Vygotsky, 1978, Leont'ev, 1978) in work practices (Uden, 2007). The basis of the theory is the concept of an activity. An activity involves different processes used to accomplish an objective. An activity consists of a subject (actor), and an object (objective) which are mediated by a tool. An object can be a material thing, less tangible (a plan) or totally

intangible (an idea) as long as it can be shared by the activity participants (Kuutti, 1996). In order to portray the social context in which an activity may occur, the theory also includes a community, rules and division of labour to support the collective sense of the activity's environment. Whilst an activity is geared towards a motive, it can be micro-analysed into actions and operations which are guided by goals and conditions. Activities always take place within a context (Engestrom, 1987) which exist as a network of different elements that influence each other in what is called an activity system. An activity system consists of interacting components of subject, object, rules, community, division of labour and mediating tools (Engestrom, 1987) as shown in Figure 1.

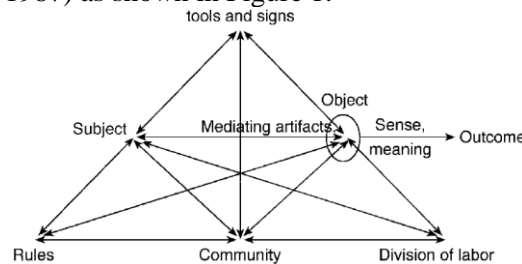


Figure 1: The Structure of an Activity System (Engestrom, 1987)

AT consists of a set of principles which can be used for describing and explaining phenomenon (Kaptelinin and Nardi, 1997). These principles have been summarised into five (Engeström, 2001). The first is the notion of activity systems as the unit of analysis. The second is the multi-voicedness of activity systems where activity systems are seen as having various viewpoints, traditions and interests. The third is historicity which means that activities are under continuous change and development and the changes that occur are based on the history of the activity (Kuutti, 1996). The fourth is contradictions which draw from the idea that activities do not exist in isolation, but are influenced by other activities and its environment and these influences may sometimes cause imbalances. The term contradiction (Engeström, 1987) is used to describe these imbalances. The last is the principle of expansive transformations in activity systems. Activity systems can get transformed especially when the contradictions intensify and individual subjects start questioning and deviating from the norms. Through these efforts an expansive transformation may occur when the object and motive of the activity are reformulated to embrace a new object and motive than the previous (Engeström, 1987). AT was selected because of its appropriateness in offering rich insight into the complex and sociotechnical nature of the virtualisation of a HEI work environment. In much of the IS literature on HEI information systems, AT has been widely used in researching teaching and learning, especially to evaluate learning technologies (Scanlon and Issroff, 2005, Issroff and Scanlon, 2002, Murphy and Manzanares, 2008, Murphy and Rodriguez-Manzanares, 2008) and understand the use of social networking in HE (Hamid, 2011, Hamid et al., 2010) but not in a process of HEI migration from TWE.

## 4 Research Methodology

An interpretive case study method (Walsham, 2006) was adopted. Interpretivism facilitated the researcher's understanding of the virtualisation process in the social and organizational contexts of UG by assuming that as various actors within and outside UG interact with the world and with each other they create subjective meanings (Orlikowski and Baroudi, 1991). This meant that virtualisation of the work environment as a reality could only be understood through social constructions (Myers, 1997, Myers, 2013) and through the meanings that the various actors assigned to the reality (Orlikowski and Baroudi, 1991). The data collection occurred in two main stages. The first was a stage of familiarisation to develop an understanding of the context of the study, the technology employed and the actors involved. This was achieved by the first author by observing project meetings, requirements gathering, demonstration sessions, tests and training sessions. Project documentation such as minutes of email correspondence, requirements documents and project reports, user manual were reviewed to build understanding of the project and context. This helped in the preparation for interviews and in exploring

further issues during the interviews. The next phase was the primary data collection which involved open ended interviews and observation. Interviews are best in accessing the interpretations of the participants (Walsham, 1995) and allowing the researcher to see things that are not ordinarily visible (Rubin and Rubin, 2011). Open-ended questions are being used allowing for some fine-tuning of the questions during the interviews. Although some of the interviews were not recorded, detailed notes were taken and some clarifications sought later through email. Each interview is being analysed before the next one in order to capture emerging issues. The interviewees consisted of 4 project consultants who occupied various roles as business analyst, developers, the 4 local project team members, 15 staff from the various offices identified through purposive sampling. The interview numbers were arrived at heuristically. This means the researchers only stopped interviewing when nothing new was being gathered from the interviews (Guest et al., 2006, Mason, 2010, Baker et al., 2012). Participant observation is being employed to collect further data. The researcher has observed some staff in the use of the systems and has also participated in the user acceptance testing of the system. In all, the first researcher visited 20 administrative work environments of the University with the project team to understand the workflows and all other aspects of the work environment.

The data collection and the data analysis was concurrent (Myers, 2013) and inductive. Hermeneutics as the mode of analysis (Myers, 2004) provided concepts to interpret and understand the meaning of text. The key hermeneutics concepts that are being used are the *hermeneutic circle and historicity*. The *hermeneutic circle* implies that the whole phenomenon of virtualisation only became clear from the understanding of the individual parts and the meaning of the individual parts can also only be clear from the understanding of the whole (Myers, 2013). Historicity on the other hand means that the historically informed present influences the interpretation of a phenomenon. To achieve an interpretive perspective during the analysis the understanding of the virtualisation was achieved through the understanding of the various elements of the virtualisation activity system and how these shaped the overall virtualisation activity. Also the understanding of the virtualisation is strongly influenced by the historical context of the HEI. The hierarchical analysis of activity was also helpful in the use of the hermeneutic circle because it supported the analysis of the levels of activity and how the various levels explain the whole activity and vice versa. Linking the epistemological commitments of AT in the analysis to concepts such as historicity, hierarchy of activity and the methodological concept of the hermeneutic circle shaped the interpretive nature of the analysis.

## 5 Case Study Description

The UG work environment has been physical for a long time. The work environment is largely characterised by two components; the first is the physical part which is static in nature and consist of a fixed office location, a physically metallic or wooden filing cabinet with lock and key, physical files and folders, and so on. The second is the dynamic part which involves the workflows which are also largely physical and characterised with minimal virtual interactions. Though these lead to red tapes and bureaucracy, workflows are executed following these channels. A senior administrative officer indicated that: *“Though this may be laborious sometimes, we ensure that the right procedure is followed at all times. For instance, if correspondence is received, only the officer in charge can open or distribute it to the offices and officers and this may delay the response to some of the mails”*

However, in 2014, the University embarked on a project with funding from China EXIM bank facilitated by Government of Ghana to implement an intranet portal to provide an Enterprise Content Management and Intranet Portal (ECMIP) to about 2000 staff of the University. The main aim of the University is to digitalize the current paper records of UG archives and automate their existing manual workflow processes around the records and documents. The ECMIP enables the creation of template based virtual offices and virtual cabinets with the required access rights to help manage records and documents. The creation of virtual offices is done under specific categories or sub categories as per the University’s hierarchical structure. The system provides the creation of  $n$  level of cabinets for each office and 2 levels of folders under each cabinet which are managed by providing different permis-

sions on the folders to different office members and groups. Office files are then managed under each folder by the office members based on the access rights given by the office administrator. The system also provides the functionality to automate the existing intra and inter office manual workflows whilst providing Single Sign On (SSO) for Liferay and Alfresco which are the applications for the system. The system also provide collaboration between staff using Liferay's collaboration features like message board, wiki, polls, calendar, chat, records management and reporting. Alfresco is an open-source enterprise content management systems and comprises a client/server application that provides a powerful Application Programming Interface (API) for web services integration.

The virtualisation of the administrative work environment was done through an engagement between UG and Cignex Datamatics (CD), India. To undertake the task of virtualising the administrative work environment, the project had some key milestones. These are: Statement of Work (SOW), Sign-offs, requirements elicitation, design, and development, Quality Assurance (QA), User Acceptance Testing (UAT), and Go-Live. These milestones have all been achieved and there is a functional VWE.

Though the project has been widely embraced by many of the offices that were visited, there are a generation of workers in the Ghanaian public sector of which UG is part of who are luddites- commonly referred to us BBC (Born before computer) in the workplace. During the requirements gathering, these category of staff were very concerned about the introduction of a VWE and how they will be affected by it. One administrative officer lamented that: *"the problems my office and others across UG are likely to face are that work is going to be pending in the VWE for action of a superior who is a BBC and it may take time before he visits the VWE to work on it. Even with emails we have problems with superiors not checking their emails and taking action let alone this VWE where more than just responding to an email will be required"*.

## **6 Preliminary Analysis**

### **6.1 The Cultural-Historical Context**

The discussion above reveals the cultural-historical context and also a range of motivations. History is an inevitable part of the activity system and the virtualisation of the administrative work environment is affected by the historical antecedents. The TWE stifled efficiency because time management was not at optimum. The time and effort that was put in physical everyday tasks and workflows were longer and cumbersome. The VWE is expected to improve this so that content can be published easily and efficiently allowing for fast and efficient work in order to save UG cost and time. Whilst some security is maintained in the TWE with regards to who accesses what information, the new technology helps to strengthen this to make sure that information is accessible only to the right people.

### **6.2 Hierarchical Analysis of Activity**

The virtualisation of the administrative work environment is in 3 levels: activities, actions and operations (Leont'ev, 1978). The activity of virtualising the administrative work environment is the highest level and was directed at the motive of providing a virtual administrative work environment. For the activity to be conducted, certain individual steps (actions) needed to be carried out in order to complete the activity. For instance, breaking down the activity of virtualising the work environment reveals several actions were taken, such as gathering the requirements of UG, designing and developing the virtual environment, testing the system with a cross section of the user community before finally rolling it out. The reason why the actions are taken are not relevant at this level. This is because there could be dozens of motives other than virtualising the work environment, raising the polymotivational nature of activity driven by several actors as well as the multivoicedness. Next are operations which are at the execution level of an action. Operations do not have goals and they are executed very frequently to the extent that they become routine. In other words, they are more or less automated and are performed without paying attention. Operations helps in answering the question about how each action is executed. The activity system for the virtualisation of the work environment are represented in Figure 2. This is derived from the activity that has morphed from the operations and actions undertaken towards the virtualisation of the work environment.

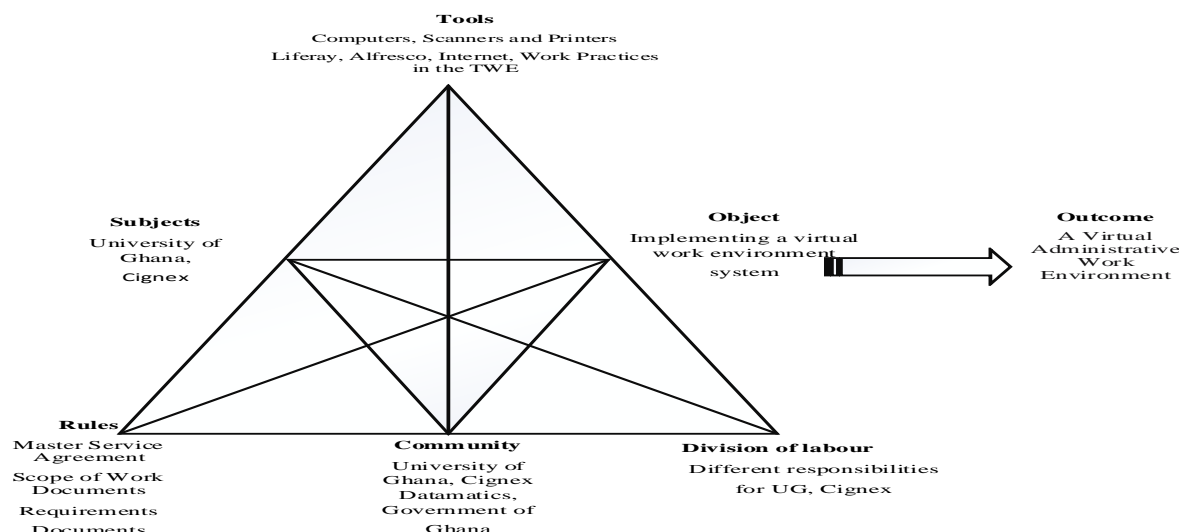


Figure 2: Virtualisation of Work Environment Activity System: Adapted from Engestrom (1987)

## 7 Discussion

Several actors can form the subject. Herein, the subject consist of the UG and Cignex. Even within UG several actors exist and each actor may have a motive and thus depicting the poly-motivational nature of activity. The motivations that drives the subject as a collective to act towards the realisation of the shared object of a VWE is why UG is virtualising its TWE. These are to digitalise current paper records and to automate workflows to ensure efficiency in work. The poly-motivational nature of activity driven by UG and Cignex as actors can be the basis of several contradictions. For instance, primary contradictions are breakdowns between actions or sets of actions that realise the activity and the fact that these actions are poly-motivated means that those actions can be executed by different actors for different reasons or by the same person as part of two separate activities (Uden et al., 2008, Karanasios and Allen, 2013). The cultural historical context of the activity and its poly-motivational nature are the critical basis driving the activity and reveals the motivation for the activity. Interviews with UG staff and the local project teams and management reveals that the TWE is saddled with bottlenecks such as bureaucracy, red tapes as well as duplication and redundancy that has characterised the TWE for a long time.

The activity of virtualising the work environment can provide a lens to see how actions directed at goals lead to the realisation of the object (Karanasios, 2014). At the level of operations for example, the VWE allows the automation and substitution of human operations (e.g. Automatic notification of action on an impending workflow). At the level of actions, the various component technologies of the VWE will enable workers to set up work activities which in turn will enable administrative staff to work collaboratively (e.g. Wikis, chat rooms, etc.), to create resources (e.g. links to on-line resources, documents in various formats) and to organise them so that meaningful work can occur. Finally, at the activity level, the VWE and its various component technologies can be the main enabler for an activity (Kuutti, 1996). By providing a set of options and templates, communication tools to work collaboratively, the VWE can be seen as some form of disruptive technology which is transforming how administrative work was traditionally carried out (Blin and Munro, 2008). The introduction of the VWE leads to a change in the actions of thousands of staff and offers them a choice of many actions. In the new VWE, virtual working is going to lead to changes in the actions of the staff in the work environment and this can change the choices of available actions with possible effects and outcomes of the work activity. In the VWE, the use of technologies such as virtual cabinets, virtual files and folders in a virtual workflow as tools to access information and facilitate work may initially be conscious and deliberate but with time and use, this may become a subconscious operation, and whilst the use of the



VWE may have been feared as replacement of humans by the computer, it may eventually lead to a change in the work activity of the HEI. Lastly, there were contradictions during the virtualisation because of the effects the object (implementing a VWE) will have on the UG community. For instance, comments from some administrative staff were that: *“the system will make our work easy and efficient. However, several of my colleagues will have nothing to do and may be laid off because the systems will cut their work off. If this is what is coming, how can we like this new system?”*. Staff was assured that whilst the workflow will be streamlined this will not lead to staff laid off. With this assurance, staff have shown their commitment to the success of the project. This was a secondary contradiction between different elements in the activity system (Engestrom, 1987).

Reliable internet connection and electricity supply (other tools) hampered training sessions on two occasions leading to postponement. Even with internet connection, some staff could not log on to the system because their credentials could not be verified against what was in the active directory (AD). One staff lamented that: *“our work is going to suffer a similar fate when the system become operational. One will not be able to do anything when there’s power or internet interruption or when you have a problem logging.”*. This created some fear among some staff. To allay the fears these contradictions were resolved. For the AD issues, for instance, it was probably because the credentials were missing in the AD or not properly captured. The AD issues triggered a sense of determination for the UG team to ensure the resolution of these issues for staff from 20 offices that were selected for the pilot of the system. The resolution is providing a smooth uptake of the system.

Contradictions also occurred between the subject and tools. There was a mismatch in the tools and subject (secondary contradiction). For instance, six months after the system went live and the training of 6 offices, only three of the offices that were selected and trained had set up their virtual offices and cabinets for full rollout. All offices need to set up and begin to use the system. However, the various offices are not actively participating in the uptake of the system use. Whilst, the number of trainers (four trainers) are inadequate at this stage of the project, the will-power for office staff to follow up and set up their various offices in the system is lacking. Adequate training staff and willingness of office members is critical in the uptake. Contradictions between the object and community also emerged in the software development activity. For example, in the VWE it is necessary to change other artefacts such as office management procedures and manuals. This will change the work practices of the various offices and the entire organisation. This has not been done yet and there are inconsistencies because some of the traditional work practices cannot be sustained in the VWE. To resolve this, office manuals to guide working in the VWE are being developed.

## 8 Conclusion

This study is investigating why and how a HEI can virtualise its work environment to a virtual environment. The study contributes to both IS and HEI literature as a first attempt to offer rich insight into the work environment virtualisation of a HEI in a developing country context. It also offers implications for research and practice. For research, the study enjoins IS in HEI and virtualization research to move beyond examination of migration from the traditional learning environment to the virtual learning environment to explore the work environment in HEIs through theories such as AT which can be used to explain a sociotechnical process change. For practice, the findings suggest that tensions between subjects which may be premised by the poly-motivational nature of a work environment virtualisation as well as tensions within rules, the division of labour and the larger community of the HEI are critical in shaping an HEI migration to a virtual work environment. This research-in-progress is limited by its single case study nature in one developing country HEI, but the findings provide insight into how AT can be used to explain why and how a HEI virtualised its work environment. Future research can compare the experience of different HEIs in different developing countries in order to account for contextual issues.

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