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ICT Assimilation in Ethiopian Institutions

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ABSTRACT

Information and Communication Technology (ICT) affects how organizations deliver services to their customers. ICT is now used not only to improve back office routine activities but also to act as strategic partner for achieving organizational goals. Although ICT has many benefits for organizations, its assimilation is the most challenging process as there are high failure rates as reported by many researchers. This paper examines the factors that influence ICT assimilation in organizations. The extant literature in this area is focused on high-income countries. There is a dearth of ICT assimilation research in low-income countries like Ethiopia. Therefore this study will attempt to validate ICT assimilation model developed for high-income countries with new data from a low-income country. A modified model of Chatterjee et al's (2002) Web Assimilation model will be used to investigate ICT assimilation in Ethiopian institutions. Four variables (top management championship, extent of coordination, strategic investment rationale, and technology readiness) will be discussed in relation to ICT assimilation. This study will use survey method for data collection in service sector institutions run by the government.

Keyword

ICT assimilation, public organizations, top management championship

INTRODUCTION

ICT has enabled service sector institutions deliver efficient public services. ICT provides the infrastructure for economic development, helps create the knowledge society, contributes to innovation and creates value for the economy (Ho, 2007). It also used to provide value added services to customers. For example, organizations can publish their product information on a Website and make it available online to their customers.. This arrangement encourages open markets and value-added services that are inconceivable in a world of closed trading partner relationships (Karimi, Somers and Gupta, 2001). Hence, organizations can save their scarce resources as well as their customers' expenses.

However, ICT integration within the organization is a very demanding process. Implementing ICT projects in itself does not deliver the promised benefits. The new technology brings disruption to the existing organizational culture. Bajwa et al (2007) states that "... the assimilation of [ICT] in an organization can lead to different 'end states' or 'transitional states' as IT innovations are acquired and deployed". Employees need to learn new way of doing things which require extra training effort "...or they may also be 'de-skilling', requiring workers to be less skilled than previously (Forman and Goldfarb, 2005)". Users will also develop resistance to new innovations if they perceive learning barriers to be too high (Sharma and Yetton, 2003). Some may also see the new innovation as a threat to their existing power as it brings a power shift in the control of information resource within the organization. As a result, ICT assimilation process has usually a high failure scores that went up to 70 percent (Sumilo and Woong, 2004)

Prior studies on innovation diffusion show that an innovation must be integrated or ingrained into the corporate value chain before it can generate significant business value (DeLone and McLean, Sethi and King, Devaraj and Kohli cited in Kevin, Kenneth, and Sean, 2006). ICT assimilation is a process that takes time to "... fuse the potential power of IT into the fabric of business processes and business networks (Zee and Jong, 1999)". It passes through different stages of development "... from a firm's initial evaluation of e-business at the pre-adoption stage (initiation), to its formal adoption, and finally to its full-scale deployment at the post-adoption stage in which e-business becomes an integral part of the value chain activities (routinization)" (Kevin, Kenneth, and Sean, 2006).

Research Question

This paper examines the factors that influence ICT assimilation in organizations. The extant literature in this area is focused on high-income countries. There is a dearth of ICT assimilation research in low-income countries like Ethiopia. Therefore this study will attempt to validate ICT assimilation model developed for high-income countries with new data from a low-income country. A modified model of Chatterjee et al's (2002) Web Assimilation model will be used to investigate ICT assimilation in Ethiopian institutions. Four variables (top management championship, extent of coordination, strategic investment rationale, and technology readiness) will be discussed in relation to ICT assimilation. Therefore the specific research question is:

Do top management championship, strategic investment rationale, extent of coordination and technology readiness influence the extent of ICT assimilation in the Ethiopian context?

LITERATURE REVIEW

ICTs increase organizational competitiveness by facilitating the efficiency of internal communication and organization, and the development of new or improved products and services. For example firms using e-mail for customer communication showed a growth of 3.4 per cent faster in terms of sales than those which do not (Qiang et al., 2006). ICT also increased firm's profitability by reducing operation costs. In general ICT improves organizational performance in value chain activities such as cost reduction, market expansion, and supply chain coordination (Kevin et al, 2006). In order to bring such benefits in the organization, ICT has to be accepted, adopted and assimilated in routine organizational activities. Assimilation is defined as the extent to which the use of a technology diffuses across organizational work processes and becomes routinized in the activities associated with those processes (Chatterje et al, 2002).

The critical question is how can organizations grab the potentials of ICT? Although ICT has enormous potential to transform the fundamental nature of organizations, the high rate of ICT's project failures raise important questions regarding its implementation within organizations (Wong, 2004). The failure is very high in low-income countries (Stanforth, 2006). In this regard there are many investigations and theories developed by researchers that serve as guide for future ICT assimilation in the organization. However there is no one definite prescriptive answer for organizations. One can not say that one theory is better than the other as all theories are equally applicable and valid in different contexts. Therefore selection of a theory that works for particular contexts is an important research area that gives answers for managers and practitioners who want to introduce ICT applications in their organizations.

One of the most cited theories in explaining the adoption of new innovation among communities is Roger's diffusion of innovation theory. The theory contains three main components: innovation-decision process, characteristics of an innovation and adapter characteristics (Rogers cited in Bates et al, 2005). For a new technology to be accepted, adopted and used, it passes through different stages of decisions which include knowledge about the new innovation, persuasion, decision, implementation and confirmation. The technology characteristics such as its complexity and compatibility affects the decisions made at different stages. On the other hand, all individuals do not have same response to the new innovation. Some are willing to accept and use the new technology while others are resistant and want to observe and test the benefit of the new innovation on others. Roger classified innovation adapters as innovators (described as venturesome), early adopters (respectable), early majority (deliberate), late majority (skeptical), and laggards (traditional) (Rogers cited in Surry, 1997). An important aspect of diffusion of innovation theory is the concept of "assimilation", as adoption of technology cannot predict well its successful implementation (Andreini, 2007).

ICT is seen as innovation and its assimilation can be explained by diffusion of innovation theory. Diffusion of ICT applications in the organizations has three stages: pre-adoption or initiation or inter-firm diffusion, infusion or assimilation and post-adoption (Rogers, 1995). Likewise, Swanson's (1994) describes these stages as Type I innovations where information technologies are assimilated to enhance the efficiency or effectiveness of the IS function such as the use of relational database to enhance database management activities, Type II innovations where the IS service enhance the efficiency and function of administrative functions such as the use of productivity or decision support tools such as spreadsheet software and Type III innovations are technologies that have strategic relevance for firms such as web-enabled customer support services which directly impact financial performance.

Diffusion of innovation theory is good to explain the process of ICT applications diffusion in the organization but it did not consider the heterogeneous cultural, social and economical environment in which the technology diffuses. Tornatzky and Fleischer (cited in Andreini, 2007) included external factors in Rogers' model and proposed TOE framework which comprises: technology, organization and environment variables.

In TOE framework, ICT assimilation in organization is the result of the function of the three variables. Each variable is important to affect ICT assimilation in the organization either independently or in group. Technological context is represented by information technology infrastructure competence and e-business know-how (Scott, 2007). For organizations to appropriate the potential of ICT, they need to have technically proficient and capable IT staff. These people are responsible to build and leverage technology assets and plan an IT infrastructure in the organization (Feeny and Willcocks cited in Scott, 2007). Once the necessary technologies are in place, they have to be properly managed, used for business advantage and dynamically adapted with the changing user, technological and environmental needs. This is an intangible knowledge acquired through experience by the organization and is considered as e-business know how (Scott, 2007). Hence the availability of the qualified IT staff and business know how are important predictors of ICT assimilation in the organization.

Organizational context includes organizational culture and organizational change process. Culture is defined as social or normative glue that holds organizations together (Suri, 2006). It is associated with the organization's sense of identity, its goal or core values, its primary ways of working and a set of shared assumptions (Schein cited in Scott, 2007). ICT applications bring disruptive changes to this entrenching status quo. But this change is not handled in the same way by different organizations. Some organizations see the change as opportunity and engrossed in their structure. While others see the change as a threat to their status quo and resistant to accommodate the new change brought by ICT applications. Schein (cited in Suri, 2006) mentioned the critical role of cultures when organizations attempt to improve their operations in response to new data, from the economic, political, and technological environment. Hence an organizational culture is an important factor that influences ICT assimilation in the organizations.

Organizational change processes is a manifestation of organizational motivation to accommodate new changes. This change is moderated by visionary leaders. Such leaders communicate the urgency for change and the vision for the transformed organization (Scott, 2007). They also have clear vision how ICT applications are used to create new opportunities and solutions such as operational efficiency, better customer service, and increased ability to compete. If the organization is not open to new changes, the success of ICT assimilation in such organizations is very unlikely.

On the other hand, environmental factors include competitive pressure, regulatory environment and customer readiness. The type of organizations makes a difference in ICT assimilation (Chatterjee, 2002). Organizations which operate in competitive environment are open to new changes that can bring efficiency and cost saving. The government regulatory framework creates conducive environment for adoption of ICT by organizations. In Ethiopia, the telecommunication infrastructure is monopolized by government and it has become a serious obstacle for the development of ICT in the country (Assefa, 2007). It is also mentioned in the literature that the most cited reasons for failure to exploit networking and communication opportunities are the lack of a fast and reliable internet connection and the cost and reliability of telephone links (Matthews, 2007). In low-income countries like Ethiopia, the subscription fee of broadband connection is very high compared to high-income countries. It is about 10 times more expensive in low-income countries compared to high income ones (Matthews, 2007). Customer readiness for e-business will affect adoption of the innovation by organizations (Scott, 2007). Unless customers do not have good access to ICT applications, the benefits obtained from ICT applications by organizations will be limited. In low-income countries like Ethiopia, access to Internet and personal computers is very limited, only 14 percent of the civil servants have access to person computers (Feller, 2004).

Orlikowski (1991) develop Structuration Theory of Technology Assimilation which conceptualize ICT's unique duality as objective reality and as socially constructed product. The underlying assumption of this model is the concept of interpretive flexibility. Interpretive flexibility is an attribute of the relationship between humans and technology and is a function of the material artifact, characteristics of the human agents, and the institutional context in which technology is developed and used (Orlikowski, 1992). Hence technology assimilation in the organization is the function of three interacting variables: technology, human agent, and institutional properties. Human agents create and use technology. And the new technology with its superior advantage causes the human agents to change their current routine practices. For example handling records by a database will make a person more efficient in finding records later compared to a person who uses paper based record management system. If the new routine is found bringing efficiency and effectiveness in the institution, others will adopt it and consequently become institutionalized and changes the institutional properties. The structurationist framework views the mutual adaptation of technology and organization as one involving reciprocal causation – it is a relationship where the specific institutional context and human actions are both mediators in the ongoing interaction (Orlikowski, 1992).

Chatterjee et al (2002) developed Web Assimilation model based on Structuration Model of Technology. They identify three significant actions: top management championship, strategic investment rationale, and extent of coordination as institutional enablers of the technology structuring actions of individuals and, thereby, the assimilation of Web technologies (Chatterjee et al, 2002).

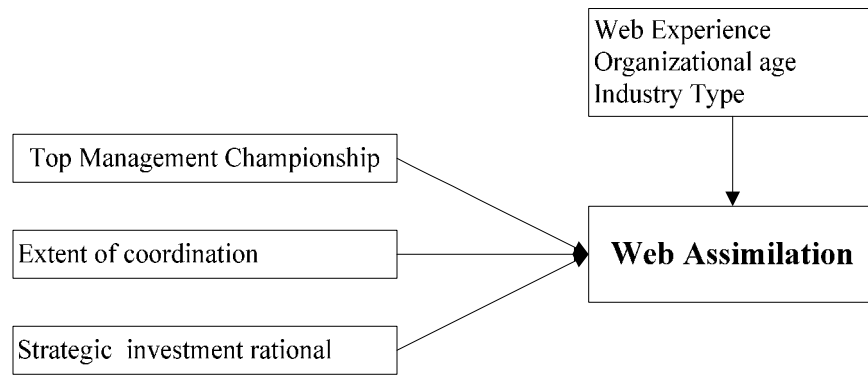


Figure 1. Web Assimilation Model

Since this study will address all forms of ICT assimilation in the organization and the name Web assimilation is changed to be ICT assimilation. In addition ease of use, perceived benefits and availability of continuous technical support are important determinant factors for ICT assimilation in the organization (Kevin et al, 2006, Paul & Berranger, 2002). Hence technological readiness variable is added to the Chatterjee et al’s model to address the research question mentioned above.

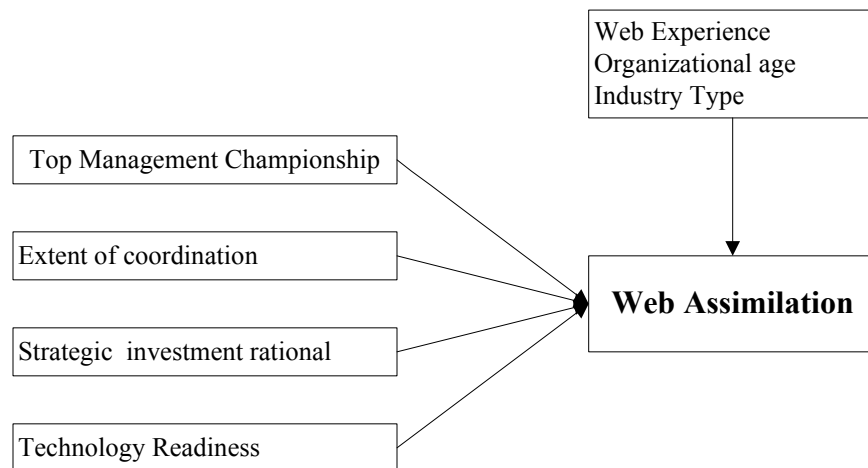


Figure 2. Proposed Research Model

PROPOSED RESEARCH MODEL

The proposed model has four determinant elements: top management, extent of coordination, strategic investment rationale and technology readiness that affect ICT assimilation in the organization. This model is an extension of Chatterjee et al’s (2002) Web Assimilation model. Its contribution will be an addition of new knowledge to already existing knowledge. The model will also add new perspective in ICT assimilation by adding technology readiness variable as one influencing factor on ICT assimilation. Each of the model variables will be discussed below. ICT assimilation refers to the extent to which the use of a technology diffuses across organizational work processes and becomes routinized in the activities associated with those processes. When ICT is fully integrated in the organizations, it becomes a strategic tool to achieve competitive advantage. Besides, it helps organizations to generate new products and services such as web based service delivery or doing existing organizational routine activities.

Top management championship refers to the belief and participation of top management in ICT assimilation activities. “Top management championship is a metastructuring action because it defines institutional norms and values regarding how managers should engage in structuring actions related to the Web technology (Chatterjee et al, 2002, p70). Without the top management support, the process of ICT assimilation can simply come to a standstill (Deepinder, 2004).

Hypothesis 1: top management championship has a positive impact on ICT assimilation in the organization.

Strategic investment rationale is defined as value propositions that will guide the identification of promising organizational opportunities and justification of resource commitments toward the implementation of those projects (Chatterjee et al, 2001, p: 71). Perceived potential of ICT applications will motivate managers to allocate resources and commit their time for implementation of ICT projects in their organizations. It gives legitimacy to use organizational resources for ICT assimilation activities. It is also an important instrument that guides how the expected benefits can be achieved and puts the organization at a competitive advantage.

Hypothesis 2: A well-developed strategic investment rationale will positively impact ICT assimilation in the organization.

Extent of coordination refers to the extent to which different ICT project managers are able to coordinate their efforts into a synergistic whole (Negash, 2004). ICT assimilation involves participation of people with different professions and experiences. There must be mechanisms that serve as common protocol to facilitate communication among actors and develop a shared value for the new innovation. "Shared values create a framework of cultural norms and performance standards that are sanctioned by the organization and embraced by its employees (Clark et al, 2008)". Therefore, the new communication mechanisms affect assimilation actions of individual managers.

Hypothesis 3: extent of use of coordination mechanisms will positively influence ICT assimilation in the organization.

Technology readiness consists of technology infrastructure and ICT human resources (Kevin et al, 2006). Technology infrastructure which includes all necessary hardware and software are key precursors to ICT adoption in the organization (Matthews, 2007). These technologies bring new benefit to the users by reducing previous work challenges. They have to be learnable without much effort (Venkatesh, 2000). These technologies are new for the staff of the organizations and need some knowledgeable person to guide and coach them. "[ICT] human resources refer to [ICT] professionals possessing the knowledge and skills to implement Internet-related applications" (Zhu and Kraemer cited in Kevin, Kenneth, and Sean, 2006). Knowledgeable ICT human resource serve as 'translator' between users within the organization and the technology, providing in-house technical support, user assistance, and perhaps even basic training or instruction. This role positively contributes to the rate of technology assimilation within the organization (Paul and Berranger, 2002). They also increase organization's learning capability of new technology. Paul and Berranger (2002) mention ICT providers have an important role in the codification and transmission of knowledge within the organization. User manuals, work procedures and system documentation are typically written and maintained by them. Many systems are failed or underutilized due to lack of proper support during the ICT assimilation process in many government organizations in Ethiopia (Assefa, 2007).

Hypothesis 4: Technology readiness is positively related to higher level of ICT assimilation in the organization.

METHODOLOGY

Instrument

The constructs and their associated variables and operational definition are shown in Annex I.

We will use instruments developed by Chatterjee et al (2002) to answer the research question. The survey questions will utilize a 5-point agree/disagree Lickert scale. The survey questions are modified to reflect the research context.

Sample Size

The target population of the study will be selected government institutions in Ethiopia which initiated and implemented ICT projects specifically to improve their internal operation and deliver better customer support service. Organizations which use productivity software like Microsoft Office without any automation project will not be included in this study. Four government institutions will be used for this study including Addis Ababa University, Addis Ababa Revenue Agency, Ethiopian Electric Power Corporation, and Ethiopian Federal Civil Service Agency.

Participants of the study will be only employees who work in the automated system and are part of top management. Additional qualitative data will be collected to enrich the quantitative data collected by survey questionnaire. For the qualitative data we will conduct in depth interviews with top management.

Reliability and Validity

The instruments used for this study were validated in prior research. However, we will collect pilot data to confirm the reliability and validity of the instrument the context of low-income countries.

DATA ANALYSIS

The collected data will be entered in SPSS software to produce different descriptive statistics. In addition, correlation coefficient and ANOVA will be used to test the hypothesis with the collected empirical data. Furthermore we will use structural equation model (SEM) to analyze the results.

Limitation of the study

As the sample population is restricted in Addis Ababa City Government, the result of the study may not be generalizable.

Contribution of the Study

The Ethiopian government is directing significant amount of investment to automate government services in hopes of bringing efficiency and effectiveness in service delivery. Unless this investment is used in a way it can bring a positive impact, it would be a waste of resources. This research will help evaluate the impact of these investments by empirically validating ICT assimilation models in Ethiopian context. The experience of developing countries to integrate ICT in the government organizations is not well addressed. With regard to this point, Kevin, Kenneth, and Sean (2006) mentioned the necessity to examine to what extent innovation theories can be generalized in different economic contexts. This validation work will help to raise implementers' knowledge and understanding of ICT assimilation success elements (Negash, 2004). Finally "... assimilation is a newer concept, little is known about how the factors influencing assimilation differ systematically from those influencing adoption (Hendershott, 2006)" and this paper will contribute new knowledge to ICT assimilation process. The proposed model also examines the influence of technology readiness on ICT assimilation. This will be a new contribution to the knowledge of ICT assimilation.

CONCLUSION

Failure rates for ICT assimilation are high for many organizations. After successful implementation of ICT project, it may not always be routinized in the daily activities of the organization. This creates lack of trust on ICT solutions for business advantage. Studies conducted so far showed that top management championships, strategic investment rationale, extent of coordination are important factors that affect ICT assimilation in the organizations. This study also proposes that technology readiness has significant contribution for ICT assimilation in the organization. Knowledge of factors that affect ICT assimilation in the organization serve as guide for implementers to successfully assimilate ICT in their organization and exploit the expected benefit of ICT investment for business success and growth.

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Annex I

Constructs' variables and operational definition

Construct	Variables	Definition
Web Assimilation	<i>Strategy</i>	The organization's translation of IT applications benefits into direct, measurable value
	<i>Performance</i>	The organization's enhancement of performance as attributed by IT implementation
	<i>Need</i>	Need for IT goods and services
	<i>Applications</i>	Specific IT applications that customers are interested in and/or demand
Construct	Variables	Definition
Top Management Championship	<i>Willingness</i>	The organization's willingness to take advantage of e-business opportunities
	<i>Understanding</i>	Ability to understand how e-business can be used to capitalize on opportunities
	<i>Readiness</i>	Top management's readiness to move into sophisticated e-business applications
	<i>Support</i>	Top management's degree of support for its e-business initiatives
	<i>Selection</i>	Top management's involvement in the selection process of e-business technologies
Construct	Variables	Definition
Extent of Coordination	<i>Strategy</i>	The organization's integration of its e-business strategy in the corporate planning process
	<i>Goals</i>	e-Business goals integrated with overall business strategy
	<i>Processes</i>	Role e-business projects play in company's process reengineering and streamlining processes
	<i>Teams</i>	Integration of e-business teams with development and user efforts
	<i>Project</i>	Organization using development and project management methodologies throughout
Construct	Variables	Definition
Strategic Investment Rationale	<i>Budgeting Process</i>	The organization's effectiveness of the budgeting process
	<i>e-Business Budget</i>	Current organizational dollars going into e-business initiatives
	<i>Initiatives Planned</i>	e-Business activities or initiatives that the organization is planning for investment
Construct	Variables	Definition
Organizational Culture	<i>Usefulness</i>	Usefulness of formal organizational guidelines and procedures toward e-business initiatives
	<i>Formality</i>	Formal e-business strategy in the corporate planning process
	<i>Beliefs</i>	Ability to deliver e-business initiatives related to shared beliefs
	<i>Resistance</i>	The organization's resistance to change in implementing e-business initiatives
	<i>Assumptions</i>	Assumptions that support the integration of e-business initiatives into the organizational processes and daily work

Annex II

Survey Questionnaire

ICT Assimilation

1. Please indicate how extensively your organization uses the implemented automated system is being used to support each of the following business strategies:
 - a. Enhancing company image
 - b. Attracting new customers
 - c. Offering value-added customer services
 - d. Creating a new advertising channel
 - e. Creating a new distribution channel

Top Management Championship (Independent Variable).Participation Dimension

2. Please indicate the extent to which the senior management of your firm actively participates in:
 - a. articulating a vision for the organizational use of ICT
 - b. formulating a strategy for the organizational use of the ICT
 - c. establishing goals and standards to monitor ICT projects

Top Management Championship (Independent Variable).Beliefs Dimension

3. Please indicate the extent to which the senior management of your firm believes in the following:
 - a. ICT has the potential of providing significant business benefits to the firm
 - b. ICT will create a significant competitive arena for firms
 - c. ICT is not a very secure medium to conduct business activities
 - d. ICT is not easily accessible to the existing and potential customers of firm

Strategic Investment Rationale (Independent Variable)

4. How are ICT related expenses justified in your organization? Please indicate the extent of importance placed on the following in justifying web related expenses in your organization.
 - a. meeting return on investment (ROI) criteria
 - b. new business opportunities rationale
 - c. realizing cost savings

Extent of Coordination (Independent Variable)

Organizations often use a variety of coordination mechanisms to manage key business initiatives. Some examples of such mechanisms are task forces, planning processes, etc.

5. Please indicate the extent to which existing coordination mechanisms of the following types are used to manage the ICT initiative:
 - a. **Standard Operating Procedures**

- (e.g., goals, policies, and plans)
- b. **Liaison Roles** (e.g., ICT managers)
 - c. **Task Forces**
 - d. **Oversight Teams** (e.g., Business advisory council)
 - e. **Planning Processes**

Technology Readiness (independent variable)

Human resources

6. Please indicate your knowledge and skill in ICT
 - a. Qualification in IT field
Certificate, Diploma, Degree, Masters, PhD
 - b. Experience with the system
0 - 6 months, 7 -12 months, 1 - 2 years, 2 - 3 years more

Technological infrastructure

7. Please rate the system with the following parameters
 - a. Access to the necessary hardware and communication facilities
 - b. system learnability
 - c. system usefulness to the task
 - d. system user friendliness
 - e. system simplicity (system developed based on previous knowledge, etc)
 - f. technical support from developers
 - g. Technical support by in house staff

Organizational Age (Control Variable)

8. Please indicate for how long has your company been in business:
0 -5 years, 6 -10 years, 11 -15 years, more than 15 years

ICT Experience (Control Variable)

9. Please indicate for how long you have started to use automated system
0 - 6 months, 7 -12 months, 1 - 2 years, 2 - 3 years more