Examining effective factors in initial acceptance of high-tech localized technologies: Xamin, Iranian localized operating system ☆

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A B S T R A C T

An operating system (OS) is the most important software platform for secure electronic data transfer. Having an OS that is compatible with Iranian security applications and requirements is imperative. The first attempt to create local operating system in Iran was made some 10 years ago, when pertinent technological research led to the development of Xamin as Iran's localized operating system. When the first version of the Xamin localized operating system was introduced in the market, some 250 small and medium-sized enterprises (SMEs) as well as 5 large organizations adopted the national operating system. This study analyzes the process of acceptance of Xamin localized open source server operating system technology in Iran. A technology acceptance model (TAM) has been used as the base model, and external variables have been determined based on surveying method. Moreover, two moderator variables have been introduced as new contributors in this study. The results are extracted using path analysis based on structural equation modeling. The statistical population is 250 Xamin users. Data collection tools consist of 200 questionnaires filled out by these users. The results show that subjective norm component and absorptive capacity moderator are two factors affecting the acceptance of this technology. Eventually, given Iran's special conditions, recommendations have been provided for strategic planning or policymaking for acceptance of Xamin operating system. The research also improves knowledge of conceptualization and policymaking for acceptance of high-tech software products.

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1. Introduction

Gaining technical know-how to handle disruptive and convergence technologies such as aerospace technology, nanotechnology, and nuclear technology places the country with such technological capabilities among the highly distinguished, technologically advanced nations. Over the last two decades, the Islamic Republic of Iran has been aiming to gain emergence technologies (Soofi and Ghazinoory, 2013). Despite the vital, infrastructural role of information and communications technology (ICT) in all strategic technologies, and despite the fact that it serves as a pillar of national security in any country, ICT has received little attention from the technology planners in the country. Accordingly, no due attention has been paid to the ICT software infrastructures that serve as a connecting bridge to software and hardware entities. Infrastructure software paves the ground for a large spectrum of IT content services; therefore, their performance directly affects the quality and sustainability of cyberspace content services.

Information circulation in cyberspace is a major asset and is considered an important capability in each organization. Therefore, safeguarding the information and assuring their safe circulation are among the major concerns of organizations. In this connection, the operating systems and other related system software are extraordinarily important in the world of information technology due to the role they play in management and control of hardware sources and in an optimal execution of other software.

The operating system is an essential system software that uses hundreds of modules, library, and software packages to transfer the hardware power to the high-level software and the performance of each software is under the influence of OS performance. Due to such performance, operating system has been considered as a strategic product for years and the majority of large world corporations and developed nations have developed this product through various ways and means.

Xamin open source operating system is a developed virtualization solution in Iran that creates required capabilities for server hardware virtualization by using the Debian distribution of Linux kernel in Iran. Xamin virtualization solution simulates hardware resources and makes them accessible to a set of virtual appliances that each includes an application program along with the OS and firmware needed.

The main goal of this study is to identify the factors that contribute to the higher rate of acceptance of Xamin operating system in Iran. Specifically, this research seeks to provide an answer to the question of what model of acceptance is appropriate for Xamin operating system.

1.1. Development of Xamin operating system in Iran

This research project on the development of Xamin was launched in 2010 at "Iran Telecommunication Research Center," and the first version of the operating system was released in 2012. At the time of writing version, 7 of Xamin was available for use free of charge. The goals are to have a skilled team to work on developing the operating system kernel based on the development of the Linux technology abroad and to publish the new versions of the system in Iran for public use. Currently, the research team has made the software ready for use in cloud-computing service. Experts can use the system for presentation of their application software on Xamin platform. However, this operating system has not yet received the due welcome in Iran. It has been installed for use in some governmental centers and some experts of the open source community have so far used Xamin operating system in their organizations, but it is yet to be used widely. It is noteworthy to mention that the open source software and open source operating systems are not part of the curriculum in Iran even at the academic centers. The majority of IT-based enterprise application software (EAS) has been presented on Windows and in the form of closed-source software. Therefore, experts in this area are very limited in number. The largest open source community in Iran may have about 500 active members. These people are Linux and UNIX developers, still half of them have not used Xamin operating system to date.

A remote concerted, coordinated management of virtual machines is one of the main capabilities of Xamin operating system virtualization solution. In addition, software developers have quick, easy access to the OS and related applications for use in the production of their products. An Internet shop, offering applications based on Xamin operating system, is another facility that has been added to Xamin operating system virtualizing solution to help the customers and product users find the products they need in a trustable and centralized environment and to simply install them on their hardware after a brief test. An overview of products and technical achievements of Xamin operating system follows:

- It is a system for production and presentation of virtual application programs.
- It provides an Internet shop of virtual application programs.
- It is a comprehensive virtualization solution based on Linux kernel.
- It provides single window service to support enterprise users.

Xamin is capable of presenting IT services at the organizations and their integrated management locally or remotely that provide it with the ability to automate a large number of system administration activities. It has significantly reduced human errors in configuration and navigation software. Efficient use of hardware resources, reduced costs, increased efficiency, minimized setup time and server recovery, increased reliability, and improved safety due to the isolation of services are the main advantages of Xamin operating system virtualization approach.

Many components are required to assess and evaluate the current situation of IT in public organizations. Unfortunately, no accurate, reliable, and comprehensive statistics on the condition of IT use governmental organizations in Iran exit. In Iran, there is an excessive reliance on foreign technologies such as Linux, Red Hat, and Android. Those products are subject to the export control laws of foreign countries. As a result, the developers do not support such programs in Iran. Besides, these programs are not reliable in terms of security in the country. That is primary because the software producers obey their governments when required to disclose information or intentionally embed security holes in the name of updating software security.

The Xamin operating system project has attempted to gain experience in developing a product and an infrastructure service in the cyberspace. For that purpose, a significant approach in the project was the special attention paid to aspects of entrepreneurship and efforts made to create employment opportunities. It goes without saying that the project will survive when the Iranian users show a tendency to use the system in their business. The more Xamin operating system is used, and the more it is oriented toward public business demands, the longer it will survive.

The following points are worthy of attention in connection with the experience of producing a localized operating system in Iran:

Many in Iran believe that production of a local operating system could boost security and self-sufficiency in the country, although production and application of this product are in itself one of the most important pieces of the security puzzle of IT systems in Iran. However, one should pay attention to the other pieces of this puzzle.

The first attempt to achieve a local operating system in Iran began almost a decade ago. At first, the Persian language was added to the Linux version at several parts of the country. Consequently, experts began research on writing the kernel of the system. As the Desktop OS is not suitable for infrastructure security in the country, works began to develop a secure operating system for the server version. It should be noted that Xamin has been launched for different targets such as public sector and "sensitive" departments but the research team had no access to the data. Xamin has been written for the general purpose and for wide use at the public level. To develop and produce Xamin trusted advisors and engineers with many years of experience in developing operating systems were employed. They were among scientists trusted by the open source community of Iran, whose opinions were of significance to the community. Therefore, Xamin project managers enjoyed their reputation as influential beneficiaries.

As for the development of a local operating system, there was a need for highly qualified specialists. The people applied for cooperation were from among software engineers from reputable Iranian universities majoring in computer engineering. However, the majority of them were unfamiliar with the operating system. One of the advisors of the Xamin project was an engineer with over 30 years of experience in teaching Linux and related software who had established a community of university students who are now running software Small, medium enterprises (SMEs). Xamin project asked him to send an e-mail to 500-member open source community of Linux OS and asked them to express readiness for cooperation in Xamin Project. Upon his positive response, 100 more applied for cooperation, almost 15% of who were professionals in the development of operating system kernel.

Xamin project could not afford to employ some professionals, and it had to employ people with medium knowledge of operating systems to be trained gradually under advisors, and then to continue cooperation as Xamin kernel developers and technical supporters at Iran Telecommunication Research Center. Highly skilled individuals were asked to seriously attack released version of the localized operating system uploaded on the website to find and remove the probable faults with the system. This helped the substantial development of Xamin localized operating system.

Initially, the employer had stated that there was no need to re-experience an operating system in some key centers and important institutions in the country since these eventers and institutions already had developed the OS. This demand created some challenges for the R&D team working on the Xamin OS project at Iran Telecommunication Research Center (ITRC). It is worth mentioning that the information at these centers was confidential and had been accumulated for the security of the systems in the sensitive organizations only. In the meantime, the results of research works in these centers were not at the disposal of the Xamin's R&D team. The team wrote a proposal and briefed the authorities on the differences between newly developed operating