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Innovation, Technology Transfer and Automation Systems in Albania

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Abstract

Science, technology and innovation are essential at all stages of development. There is a close correlation between technological change and development. Developing countries have difficulties to expand their potentials toward modernization, know-how and innovation due to high costs and competition that comes from developed countries.

Albania due to limited investments in research and innovation is importing automation technologies from developed countries. Despite great advantages of such technologies and the fact that nowadays these technologies are becoming less expensive; the market in Albania is still conservative. In this paper we try to review literature analyzing the constraints of private and public sector toward the adoption of automation innovative technologies and in the meantime present successful examples.

Keywords

Automatic systems, Efficiency, Intelligent control, Innovation, Technology transfer

Introduction

Science, technology and innovation are important at all stages of economic growth and development of a country. For some researchers economic growth implies increased per capita value-added while the concept development implies more, i.e., economic growth plus institutional, social, cultural and technological changes [1,2,3].

There is a close correlation between technological change and development [1]. Technology is the knowledge that changes and controls our environment [1,4]. New technologies which have the attribute to control and to change the environment indirectly induce also socio-economic change. One of the most recent and extreme example is the widespread application of computers and Internet. Developments in information technologies did not only make communication easier, generated new employment opportunities, opened up new markets but also raised social and political expectations.

Invention-innovation process of a new technology is a rather costly and risky process which is predominantly undertaken and/or controlled by globally operating enterprises [5]. A new technology requires the engagement of highly skilled human labour as well as

financial resources, given the appropriate technological, organizational, institutional and cultural infrastructure. The determinant objective of an investor to engage in such a costly and risky process is to obtain the maximum compensation (return on investment) in a viable time for money return. To achieve this goal, the new technology must be able to make the owner more competitive and profitable either in terms of lower unit costs by introducing a "new production method" for a "given" product or by introducing “new products and production methods" [4].

Economic performance of different countries in the world indicates a wide disparity in economic development and a big gap in innovation and technology modernization between the developed and developing countries [6].

Developing countries have difficulties to expand their potentials toward modernization, know-how and innovation due to high costs and competition that comes from developed countries. For this reason, developing countries are considering technology transfer as the most feasible solution for country development and modernization and as a first step toward development of innovation sector [6].

The channels of technology transfer can be classified in three groups [7]:

1) Transfer of Informative Knowledge;
2) Transfer of Products;
3) Transfer of Production Methods.

Technology and Innovation

The Albania country response toward the development of technology and innovation has not been in the proportion with the country objective for being member of European Union. Production sector composition is heavily skewed towards traditional low-technology activities, based on labour costs rather than high value-added products or services, and competitiveness remains low generally [8,9]

In the conditions of a runaway globalization and a trade ever more liberalized, spaces of survival with traditional ways are being more and more restricted for Albanian enterprises. Elements, that some time ago determined security in business, such as local costs, level of demand, free labour, low price of raw materials, have started to be devaluated, because differences are being restricted considerably. Today, other elements have appeared, leading to the increase of the weight and role of the technological level and efficiency of use of resources. For this reason an effective technology and innovation policy is necessary to enhance structural business adjustments towards knowledge-based and value-added activities, as complementary to other measures of economic modernization.

On the road toward country modernization, Albania is faced with two alternatives: encouraging indigenous technological efforts from research and innovation to produce development; or transferring the already existing technologies from developed countries.
The second alternative looks more feasible in a short term evaluation period because despite the recent efforts of the government to establish a strategy for research and innovation development [8] the capacity and competence to manage both basic and applied research in Albanian universities and research institutions are limited and

generally far from standards that would enable “high-tech” development. In the existing conditions, the price for technology transfer is lower than costs for local development or re-invention of the desired technology [9].

On the other hand, local investigation studies are indicating that consumers' preferences and competition are directed more and more toward technologically complex products. This is the reason why local enterprises are interested to invest toward technology transfer from developed countries rather than investing locally for research and innovation [9, 10].

Another factor which favourites technology transfer from outside is the weakness of intellectual property protection system in the country despite the fact that a law has been in force for some years. In this reality, the owner of a new technology is not fully protected by the authorities to enjoy the fruits of possessing a patent until the competitors develop similar products [9, 10].

It is not an easy task to evaluate the real costs of imported technology. Our extensive research shows that there is no evidence for studies from Albanian government or other organisations or companies toward the costs of imported technologies or country benefits (or not) from them [6, 9, 10].

In this paper we shall analyze the technology transfer of automation systems in Albania and constraints toward the adoption of such innovative technologies.

Automation Systems

In Albania, during the last decade, different automation systems have been introduced in building industry mainly for the automation of heating, ventilation and air-conditioning systems of large functional buildings such as office buildings, business and shopping centres, hospitals, warehouses, department stores, etc. Recently, intelligent systems have also been presented in large commercial areas. The systems are imported from international integrator companies through license purchase or direct foreign investments. Contracts in most of the cases were based on turnkey arrangements [6, 9, 10].

As in other European countries energy efficiency is one of the objectives of the Albanian government. Energy efficiency issues are currently incorporated in a number of strategies and action plans such as National Strategy of Energy, National Energy Efficiency Action Plan, etc. [11, 12]. In the country, the share of residential load in electricity consumption is at level of 53%, almost double of the worldwide average of 27% [13].

Automation systems in buildings enables energy savings by using coordinated control capabilities for management of electrical loads, optimization of equipment utilization and demand, track of real-time power conditions, analyze of power quality and power factor, etc [14, 15]. This way the implementation of such systems can contribute significantly in efficiency of energy management. Research literature underline that at system level, savings opportunities are generally many times what can be achieved at device level, and these system-level savings can often be achieved at a net investment-cost savings [14, 15, 16].

Despite these great advantages of automation technologies and the fact that nowadays these technologies are becoming less expensive; the market in Albania is still very conservative toward such investments [6, 9, 10].

Based on a recent studies [6, 9, 10], management of construction companies, in general, see automation as a not strategic issue in competition and as a consequence they are not ready to invest in them. The studies underline that the most important factors that influence in the rejection of investments are the poor managerial culture and the lack of updating with modern technological knowledge.

Other reasons for such decisions are in the following arguments:

1 Lack of human resources with technical skills

2 The gap between academic knowledge and public sector-industry needs

3 Lack of experience and involvement in “hi tech” transfer procedures

4 Brain-drain

5 Low number of knowledge-based companies

6 Lack of public programs to encourage technology transfer and innovation.

Examples of Technology Transfer

In Albania there are good examples of implementation of automation systems in buildings (figure 1). The technologies are imported chiefly from EU countries [6, 14, 15, 16, 17]. These systems provide full integration of all engineering systems of the buildings through open, interoperable and portable automation systems. They also provide monitoring, control, alarm and operational services based on pre-defined algorithms/scenarios.

Figure 1.- Tirana International Airport, ABA Business Centre, Tirana East Gate shopping centre.

The communication protocol selected was usually EIB/KNX or BAC net. The most distinctive features of these implemented automation systems are:

1. Usability:
    a. Easy and intuitive interface.
    b. High usage of icons and graphics for immediate monitoring.
    c. Simple disposition of available commands and actions in different contexts.
    d. Same interface for all features and modules.
2. Scalability:
    a. Software modules for different subjects can be installed and upgraded independently.
    b. Extendibility of the solution to different hardware servers and clusters.
    c. Support for different technologies (e.g.: EIB/KNX, digital video surveillance, SMS communication, VOIP support) in an integrated management environment and in a transparent way for final users.
3. Customizability:
    a. Graphical theme, page layout and elements disposition in pages fully configurable through a powerful administration tool.
    b. Organization of elements and actions in a hierarchical treed structure of unlimited depth levels, editable by allowed users directly from the application itself.
    c. Disposition of elements and links in graphical pages changeable directly from web application.
    d. Capability of creating events, scenarios, logics, time schedules by allowed users for enhancing and customizing system behaviour without technical personnel.
4. Security:
    a. Powerful users' management with unlimited groups and different rights management.
    b. Possibility of giving a limited access to functionalities and/or plant sections to specific users.
    c. Top level web security standards compliance.
5. Portability:
    a. Pure HTML output for high compatibility and support to browsers on different platforms (PCs with different operating systems, mobile devices, media centres, etc.)
    b. Full remote (Internet) manageability

A typical architecture of the automation system used in buildings of figure 1 is shown in figure 2. Automation system functionalities are broken up into deferent levels, presenting the incarnation of the automation pyramid.

There are certified evidences that implemented automation systems in the buildings have increased significantly user comfort, reduced operating costs and improvements energy efficiency [17].

The total energy footprint of these buildings is 100-140kWh/m2/year (maximum demand of energy to satisfy all the needs of the building, without any exception: heating, cooling, sanitary hot water, ventilation, auxiliaries, lighting, and all other specific uses of electricity). This is a very good result which satisfies the energy efficiency goals of many developed countries [18, 19].

Albanian experience shows that the cost for implementation of automation systems in the buildings did not exceed 9-15% of the total investment cost. Based only on energy safety cost, the investment is expected to be returned in a period between 6 to 10 years [14, 15, 16, 17].

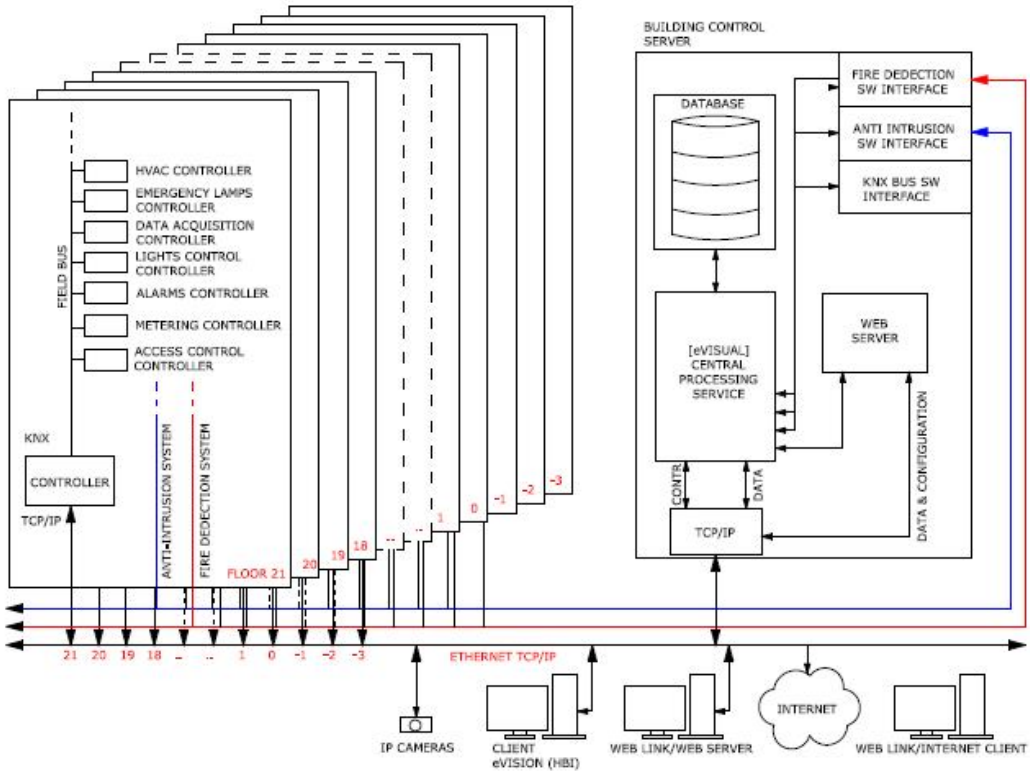

Figure 2 - A typical architecture of the automation system used in buildings of figure 1

Conclusions

Science, technology and innovation are important at all stages of country development. New technologies indirectly induce socio-economic change. They lead to inevitable modifications in the institutional setting and cultural values.

On the road toward country modernization, Albania is faced with two alternatives: encouraging indigenous technological efforts from research and innovation to produce development; or transferring the already existing technologies from developed countries. The second alternative was economically more feasible in short term evaluation.

In this paper we review and analyze the technology transfer of automation systems used in buildings in Albania and constraints on the private and public sector toward the adoption of this innovative technology. Examples of successful technology transfer and their features were presented. The analysis of successful examples shows that automation technologies have the potential to be used successfully in Albania. There are certified evidences that implemented automation systems in the buildings have increased significantly user comfort, reduced operating costs and improved energy efficiency.

Albanian experience shows that the cost for implementation of automation systems in the buildings did not exceed 9-15% of the total investment cost and the investment return period, due to energy savings, is between 6 to 10 years.

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