

# Innovation Processes and Technologies for Improvement and Support of Education

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## Abstract

The education institutions present a complicated economic and social ecosystem with many processes that are constantly under pressure from many stakeholders. Learning organizations are trying to find ways to improve them, but they crash at "unmistakable claims" about the need to build extensive infrastructure for modernization, innovation and greater efficiency. This approach creates requirements for the maintenance and operation of complicated technologies that naturally requires additional resources, both financial and human. In our contribution, we want to present innovative approaches in processes of education based on the agile event management. The agile environment enforces to use the intelligent tools through providers, third parties, allowing automation of service management and replacing many manual activities. Automation provides two-way real-time communication that creates space for users quickly respond to different needs, events and increase productivity.

**Keywords:** education, automation, artificial intelligent, universities

**JEL classification:** M21

## Introduction

Innovation is an important output of organizations interested in keeping on the market and securing their long-term economic growth. From a definition point of view, they are defined as a specific tool of entrepreneurs, a means by which they use changes as opportunities to differentiate their business or services (Drucker, 1985). From the structural point of view, four types of innovations have been identified, which are reflected in every organization (OECD/Eurostat, 2018).

They are:

- **product innovation**, visible changes in product and service capabilities. Such changes encourage the launch of new services or products, or their visible improvement, and thus differentiation from existing products.
- **process innovations**, in this case are important changes in the methods of creating and delivering products or services
- **organizational innovations**, are aimed at creating a more effective organizational structure and communication, including changes in workplace organization or in external business relationship roles, accountable

- **marketing innovation** is presented by introducing new marketing approaches that can include product design changes, packaging, promotion and placement forms as well as changes in pricing and service delivery methods.

The introduction of innovation in organizations is contingent on two possible approaches, reactive or proactive.

The first approach, i.e. reactive, applies when an organization needs to respond to competitor activities. That is, they must keep up with product or service offerings. To eliminate possible risks of failure, but the economic benefits of such a strategy are limited (Zelenay et al., 2018).

The second approach, proactive to bring new products and services to market with measurable benefits, to attract customers and competitive advantage over other providers. A proactive strategy requires a creative and creative team of workers.

From the point of view of scale, we divide innovation into the following five levels:

- simple implementation of the technical system, replacing the old tool by new one,
- innovation that addresses technical discrepancy. In this case, the knowledge of the different fields of industry and knowledge relevant to the desired area is needed,
- innovation containing physical contradiction, knowledge of other industries is required
- new technology is developed containing a breakthrough solution that demands knowledge from different areas of science. This level of innovation also improves technical systems without addressing existing technical issues. Thus, it solves the existing problem by replacing the original technology with a new one,
- the discovery of a new phenomenon, natural, technical, economic and other phenomena.

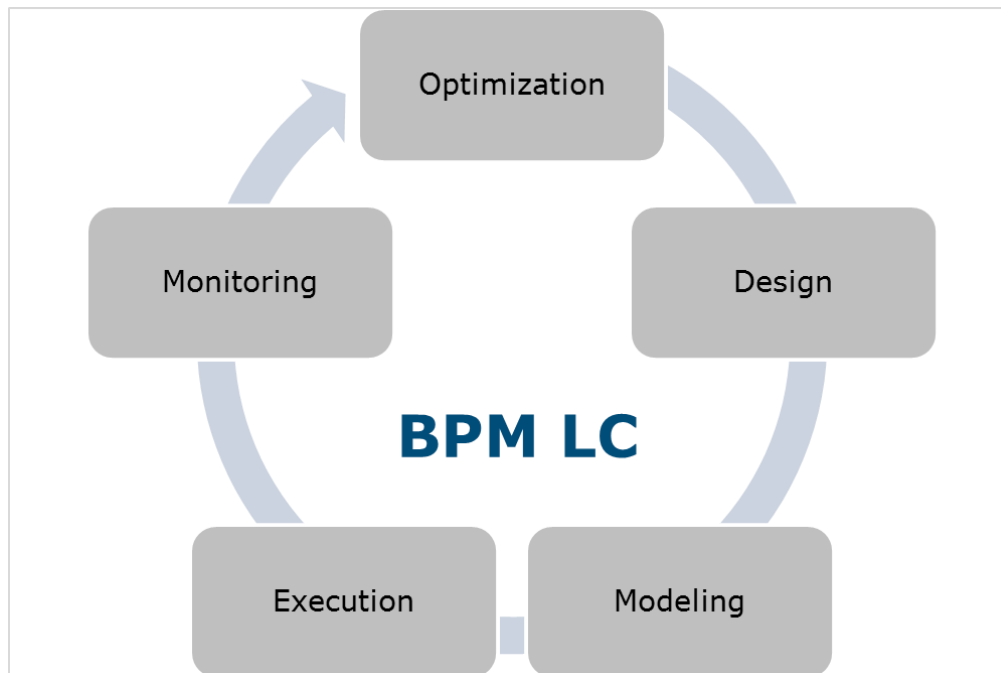
## Business process management and innovation

Organizations of various types, commercial or non-commercial, are introducing and maintaining BPM - Business Process Management to maintain competitive advantage on the market. A business process is a precisely defined sequence of events or tasks that need to be performed to create a product or service. BPM is a business process management discipline in which process owners, or individual activity owners, model, analyse, measure, improve, optimize and automate (Balco and Drahosova, 2017).

Management focuses on improving the performance of organizations by using a variety of methods. Every business process has its birth certificate, the reason for its existence and its life cycle, which consists of five following activities, design, modelling, execution, monitoring, and optimization. Figure 1 shows the business process life cycle model.

Design and implementation of any business process is preceded by planning and linking with the organization's corporate strategy. The aim of this activity is to review the business process and align it with the services provided, product creation, i.e. the business goals of the organization. It is therefore necessary:

Figure 1  
Lifecycle Business Process Management



Source: Authors' work

- to clearly understand the organization's profile
- to identify critical and supportive processes have been identified
- to describe planned, realistic KPIs

On the other hand, if the process does not reflect current needs and its optimization is impossible, we are going to change it, that is, we apply reengineering. It is a situation where the process becomes too complex or inefficient and the optimization does not produce the desired output. In practice, this means that the entire process cycle needs to be reorganized to achieve greater efficiency, desired savings or productivity (Balco and Greguš, 2015; Garg, Vecchiola and Buyya, 2013).

## Process of automation and artificial intelligence

By practice is proven, the introduction of automation in the areas of production or service can be the way to increase the efficiency of management and productivity of individual processes. In this case we are replacing the service provider, responding to the suggestion by the slot machine. The idea of introducing a predefined response to a clear stimulus is not new. This approach has been long in the history, where such approaches have already been implemented in mechanical devices.

The automation presents a degree of development characterized by the implementation of manufacturing, management and other processes with minimal impact of human intervention. These technological changes are associated with the existence of automatic production lines and the introduction of automated plants and plants that utilize elements of modern computing and control technology. Automation does not completely exclude human participation. Its role is important in controlling, managing the work of individual technology units (Kvasnička et al., 2010).

The modern IT environments is presented with an intelligent tool that allows you to automate service management and replace manual events used to manage events. Process automation keeps repetitive and manual activities that are a source of error,

limiting employee development and leading to frustration. In such a situation, we need to think about how to deal with different types of events, requests, complaints or changes in the long term, and how to replace manual work with reasonable automation, which allows operational teams to respond promptly to events (Garg, Versteeg and Buyya, 2011; Garg, Vecchiola and Buyya, 2013).

Removing man's influence in decision-making in automation and increasing the autonomy of technological units is realized through artificial intelligence. Artificial intelligence covers several theories aimed at imitating human schemes or, in general, the biological behaviour of evaluating and analysing environmental stimuli or creativity. Artificial intelligence sets goals, that is, the level of intelligence of the autonomous system, the expectations and seeks solutions available in various disciplines (Balco and Drahosova, 2017).

Artificial intelligence can be used for the following reasons:

- artificial intelligence can be offered as a cloud service, making it available continuously,
- decreasing costs,
- the degree of application and continuous advancement of intelligent algorithms that can learn.

To correctly assess the possibilities of applying artificial intelligence and the potential for the economy, it is important to understand its feasibility.

Autonomous services systems present complicated solutions integrating a wide range of configuration items, communicating bidirectionally integrated into many business processes. These processes include the perception and interpretation of the environment, as well as the transformation of these stimuli into concrete actions. Artificial intelligence technologies are progressing steadily despite the existing setbacks, but it can be said that this is a major challenge that cannot be ignored.

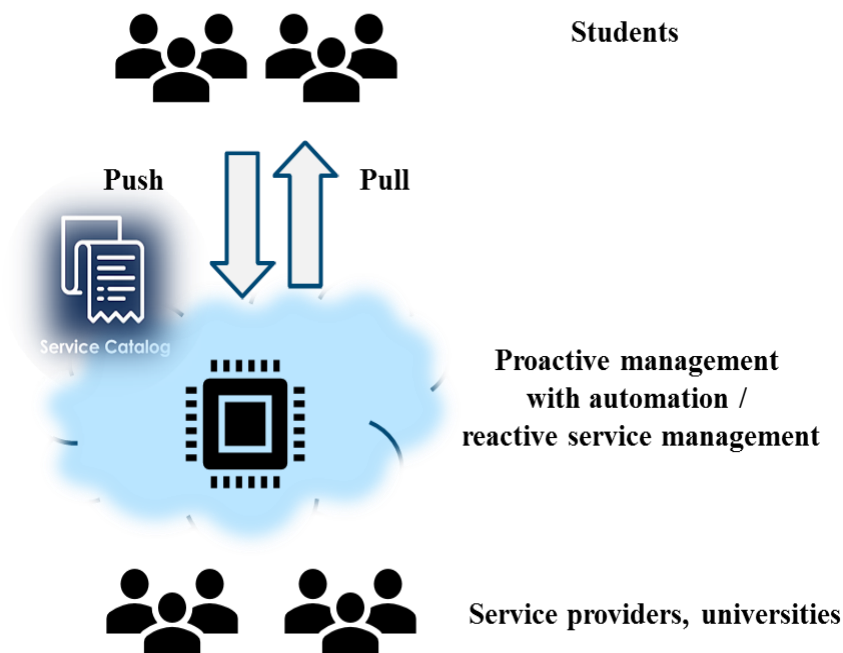
## **Case study - automation routines and economic impacts**

Practice shows that even a small increase in efficiency can drastically reduce labour, costs and release budgets for other strategic opportunities. We carry out many activities within individual processes manually without automation, resulting in their inefficiency and low productivity.

In this part of an article, we will present the impacts of implementing automation on efficient process management in education.

Universities, education environment are complicated economic-social ecosystem where many events take place in parallel and in two-way mode. It is a provider of a wide range of services that are tracked and used by the users. In classic mode, we use face to face between providers and users, between teacher and students or administration services provided by universities and students. You tested how much time and resources we are losing ineffectively if we are providing these services without intelligent tools. Tool from our point of view are IT tools and services to increase quality and speed of delivered services.

Figure 2  
Model Push/Pull Services Delivery



Source: Balco and Studeničova, 2019

Imagine an ideal situation, where request for knowledge and information's is presented. The proactive management provide to customer automatic information and notifications too. In this way, most of the agenda that involves repetitive activities can be addressed - from requests, through confirmations to various other services. Practice shows that even a small increase in efficiency through process change can significantly reduce labour and costs.

In the Table no. 1, we summarized the effects of the model - Pull service delivery to customers, students. As we can see, in the case of a reactive delivery service, there is a natural phenomenon that service consumers are aware of the status of services through existing communication channels where unnecessary efforts are seen on both sides.

Table 1  
The Pull Service Delivery Model

**Our pilot represents group of 125 students, where all are using services, it means: The type of service represents "reactive" approach.**

Type of services	Type of communication channel	Time consumption per service and request by customer-student in "t-Time "	Time consumption per service and request by service provider - university in "t-Time "
Request for information (include administration as well as education service)	Call centre request	< 3t	< 3t
	E mail request		
	SMS request	< 7t	< 4t
	WEB browsing	< 2t	< 2t
	Paper sheet	< 5t	NA
Complaint	Ticket tool	< 40t	< 20t
		< 2t	< 3t
	Call centre request	< 5t	< 5t
	E mail request	< 7t	< 4t
Request for change	Paper sheet	< 30t	< 20t
	Ticket tool	< 2t	< 2t
	Call centre request	< 10t	NA
	E mail request	< 7t	< 30t
	Paper sheet	< 30t	< 60t
	Ticket tool	< 2t	< 30t

Source: Authors' work

Table 2  
The Push Service Delivery Model

**Our pilot represents group of 125 students, where all are using services, it means: The type of service represents "proactive" approach.**

Type of services	Type of communication channel	Time consumption per service and request by customer-student in "t-Time "	Time consumption per service and request by service provider - university in "t-Time "
Request for information (include administration as well as education service)	Call centre request	< 1t	< 1t
	E mail request		
	SMS request	< 7t	< 1t
	WEB browsing	< 2t	< 1t
	Paper sheet	< 5t	NA
Complaint	Ticket tool	< 40t	< 20t
		< 2t	< 1t
	Call centre request	< 2t	< 5t
	E mail request	< 7t	< 4t
Request for change	Paper sheet	< 30t	< 20t
	Ticket tool	< 2t	< 2t
	Call centre request	< 3t	NA
	E mail request	< 7t	< 13t
	Paper sheet	< 30t	< 60t
	Ticket tool	< 2t	< 10t

Source: Authors' work

Savings are presented in our case by time, which can be transformed into financial savings. The time saving is presented by the "t" parameter multiplied by the corresponding measured coefficient. In the case of deployment of automation on the customer side, we observe time savings from 20% to 60%. In the case of service suppliers, the time savings were higher, it means from 30% to 90%. The amount of savings depends on the type of service as well as the ability of customers to communicate with smart solutions.

## Conclusion

The implementation of automation as well as the intelligent services based on the artificial intelligence has visible influence the quality of delivered services. Our tests, which we conducted as part of a pilot on several services, shows saving the financial and FTE resources. These results are closely related to modification of business processes and implementation of IT tools in critical points. It cannot be confirmed that each automation generates savings, so it is necessary to apply an individual approach. We have found that many event responses can be realized immediately without waiting, as they have a high degree of uniformity and many users, including a rapid return on investment (ROI) (Balco and Greguš, 2014). The university environment is typical space where new IT tools and services can improve processes of education, speedup communication on the different levels. From the platform's point of view, we recommend going through the cloud services path, as these provide potential customers with pre-defined solutions that can be deployed and used in a few weeks without designing workflows and programming (Zelenay, Balco and Greguš, 2019; GregušKryvinska, 2015). The team's intention is to continue the project on a wider range of services and processes as well as to measure and optimize their connection to the local smart infrastructure.

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