SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2019
ORGANIZATION AND MANAGEMENT SERIES NO. 136

ANALYSIS OF USE OF SELECTED IMPROVEMENT INSTRUMENTS IN UNIVERSITY MANAGEMENT SYSTEMS

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Abstract: The article constitutes a theoretical-empirical study concerning possible improvement instruments that can be implemented in the management systems of Poland's public, economic universities. The theoretical part of the article concerns critical analysis of literature relating to improvement and improvement instruments dedicated to the examined universities. In the empirical part of the article, analysis of use of improvement instruments was done by employing the following methods: case study, standardized questionnaire, documents analysis and deduction. The analysis concerned: knowledge about instruments, their usage, instruments' assessment and directions of possible improvements of management systems of the examined universities.

Keywords: improvement, management, university.

1. Introduction

The system of university management is complicated. It concerns many, diverse resources, areas and processes, for example: education, science, research, human resources, finance, investments, improvements and others. However, contemporary times are difficult for realizing the basic mission and vision of university management. Using traditional management tools is not enough. Rectors, the managers of universities, must implement into management systems, improvement instruments that ensure proper management effectiveness and innovativeness. The article presents a catalogue of such improvement instruments.

The following article consists of two parts – theoretical and empirical. In the first part of the article, the author, using the method of critical literature analysis, describes the main elements of improvement instruments.

The second part of the article relates to empirical analysis of use of improvement instruments. The main methods employed during the examination are: case study, standardized questionnaire, documents analysis and deduction. Two goals – theoretical and empirical, concerning the research, were formulated. The theoretical goal concerned a description of improvement instruments in the conditions of university management. The practical embraced analysis and assessment of potential improvement instruments that are applicable in the conditions of current university management systems to identify and solve problems.

2. Improvement instruments in management system of university – theoretical background

The catalogue of improvement instruments is very broad (Figure 1).

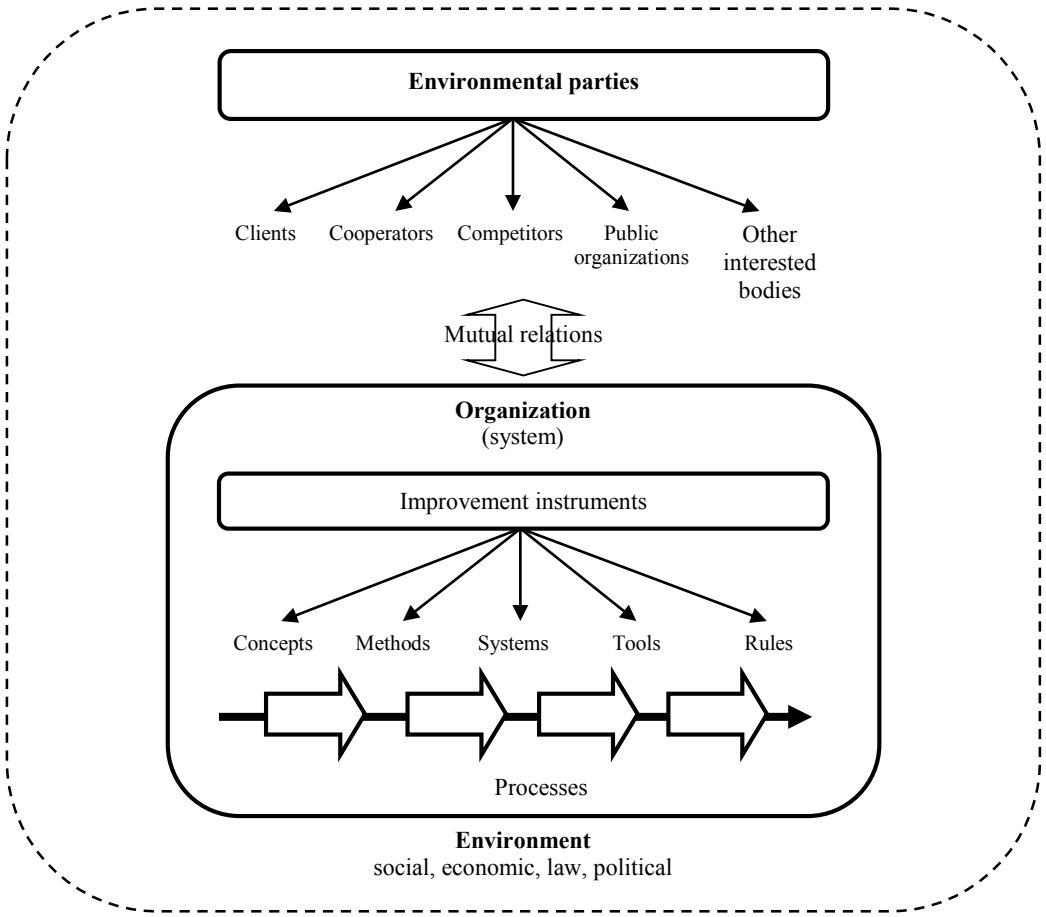

Figure 1. General factors and ways of improvement. Adapted from: "Projakościowe zarządzanie przedsiębiorstwem" by M. Jakubiec. Copyright 2017 by Difin.

These concerns rules of management (Deming rules, defined in ISO 9001 and others), improvement concepts (such as TQM, Lean management, Kaizen, 6 Sigma and others), methods of improvement (designing, controlling, benchmarking, reengineering), management systems, regulating quality category, environment and others, as well as tools of management (traditional, new, according to branch). All instruments can contribute to broad improvements of systems, processes and tasks.

The majority of mentioned instruments are generally based on the PDCA cycle. The PDCA cycle, also known as the Deming Circle, was proposed by W.E. Deming (Figure 2). The cycle includes four stages: planning, doing, checking and acting. Planning means identifying and analyzing the problem or opportunity, developing hypotheses about what the issues may be and deciding which one to test. The second stage, doing, is testing the potential solution (ideally on a small scale) and measuring the results. Checking the results stands for measuring effectiveness and deciding whether the hypothesis is supported or not. The last stage, acting, means implementing the solution if the result was successful (Yan Chen, & Haoqi Li, 2018; Madhav Madhusudan Singh, 2019).

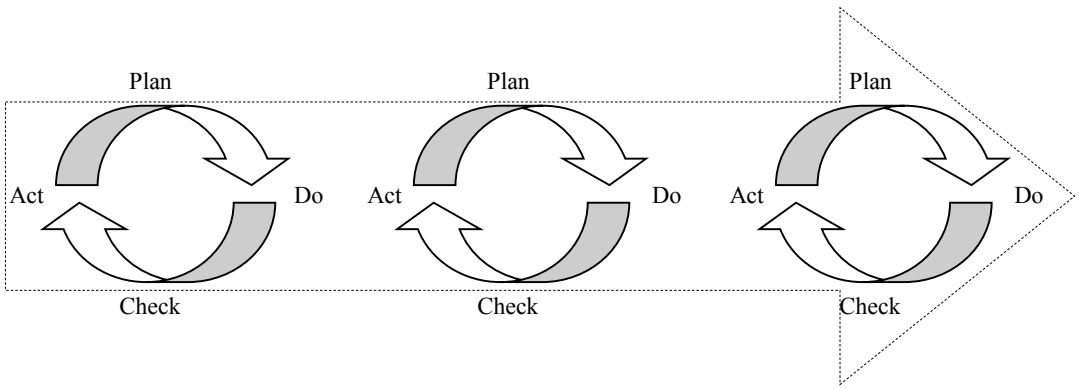

Figure 2. Continuous improvement. Adapted from: "Instrumenty doskonalenia jakości w przedsiębiorstwie" by M. Jakubiec. Copyright 2015 by Katedra Zarządzania Jakością Uniwersytet Ekonomiczny w Krakowie.

In the group of improvement instruments, the main concepts of support are Lean management and Total Quality Management (Table 1).

Table 1.
Improvement concepts

Concept	Description
Lean management	Lean is an approach to operations management that considers any resource expended that does not add value to the end customer to be waste. Lean emphasizes an array of tools and methods to aid managers and workers in improvement (for example: value stream mapping, Kanban and pull, demand leveling, single-piece flow, 5S, kaizen events). Implementing of Lean management removes eight types of wastes: transport, inventory, motion, waiting, over-processing, overproduction, defects and talent. Lean management helps the organization to achieve a "slim shape". So, in that sense, the organization is being slimmed, it has no unnecessary loads and it is more flexible and effective in its actions. Lean was developed in Japan, in the Toyota's plants, and then copied by organizations from around the world. However, despite that the origins of LM are based on the Japanese cultural circle, many of the elements were taken from other systems, for example, from the TQM.

Cont. table 1.

Total Quality Management	TQM is a holistic approach to the management of quality (mainly this category) that emphasizes the role of all parts of an organization and all people within the organization to influence and improve quality. To fundamental settings of the TQM concept, the following could be included: 1) Customer approach – the subsequent process is customer driven. 2) Process approach – the exact process is much more important than results achieved through unspecified ways. 3) Facts and data approach – intuition management should be avoided in decision-making processes. 4) Engagement of all employees – group wisdom is more effective. 5) Employees' development – this involves delegating entitlements and responsibilities, trainings and education, looking up to human dignity. 6) Broad and long term activity perspective –short-sightedness or too narrow views should be avoided while taking decisions. 7) Usage of PDCA Cycle – the Deming Cycle (plan – do – check – act) should be applied within the framework of all types of activities. 8) Scientific and logical approach – case studies, methods of scientific development must be applied in the analysis of results or outcomes. 9) Proper identification of "my problem" – deep recognition of "my problem" requires effort and insight. 10) Creating new methods – without creative ideas and an innovative approach, a company will not achieve a competitive edge. Total Quality Management is a concept of quality management, according to which all functional units in organization and its all employees have influence on creating quality and improvement within products and services.

Adapted from: "New approaches in Lean Management" by J. Kadarovaa, M. Demecko. Copyright 2016 by Procedia Economics and Finance; "Lean Management Genesis" by A. Parkes. Copyright 2015 by Management; "Management of Enterprise in the 21st Century. Conditions and Perspectives of Growth" by A. Barcik, P. Dziwiński, M. Jakubiec. Copyright 2015 by Difin.

Improvement methods are major tools in organizational improvement. Three main methods (in practice, the most popular) exist (Table 2).

Table 2.
Methods of improvement

Methods	Description
Failure Mode and Effect Analysis (FMEA)	The method, in analyzing causes and effects of malfunctions, consequently eliminates them from products (constructions) or processes. It does so by applying proper prevention actions. In the methodology, two types of FMEA method exist: FMEA product/ construction or process.
Quality Function Deployment (QFD)	The method lets the company measure, manage and improve product quality by listening to the voice of customers. In the method, the basic tool is standardized form used during the analysis of the specific object. QFD as a systematic method lets the business orient on customer wants during product design, or when defining and creating plans for new or improved products, so as to remain competitive on the market.
Statistical Process Control (SPC)	In business and industrial processes, even in conditions of stability, quantitative changes of parameters of processes and characteristics of products happen. From this fact comes the usefulness of statistic techniques in assessing these changes, in order to stop their destabilization generating inconsistent output products. The use of the SPC method lets employees avoid an increase in manufacturing malfunctions at the production stage and eliminates their sources. The method also helps in optimization of production process.

Adapted from: "Metody i narzędzia zarządzania jakością" by M. Jakubiec. Copyright 2012 by Wyd. Naukowe Akademii Techniczno-Humanistycznej w Bielsku-Białej.

As evidenced in the previous, the catalogue of improvements is very broad. The tools of improvement are normalized management systems and approaches. From the university perspective, the most implemented is the quality management system, described by ISO 9000. An emplaced quality management system can help organizations in improving client satisfaction. Moreover, an approach that includes quality management systems encourages organizations to analyze client requirements, define processes allowing them to maintain a product accepted by customers, and to actually maintain these processes under supervision.

According to Barcik, Dziwiński & Jakubiec (2015), the focus on preparing and implementing quality management system protocols includes:

1. Defining customers' needs and wants.
2. Preparing an in-organization quality policy and quality goals.
3. Defining processes and responsibilities necessary to achieve goals concerning quality.
4. Defining and insuring resources necessary to achieve goals concerning quality.
5. Setting up measuring methods of efficiency and effectiveness at each stage of the process.
6. Using these measure methods to boost efficiency and effectiveness in each stage of the process.
7. Defining means that will prevent unconformities and eliminate their causes.
8. Setting up and using a process of continuous improvement of the quality management system.

Other improvement tools that are taken under consideration in the empirical part of the article are: value stream mapping, Kaizen, 5S, audit, brain storm, block diagram, Ishikawa figures, Pareto diagram, control charts, checklist, process decision program chart, 5Why, SWOT, knowledge management, intellectual capital management, trainings, motivation system, corrective actions and preventive actions.

3. Method and research methodology

The empirical analysis involves four public, economic universities in Poland: Katowice (UKa), Krakow (UKr), Wroclaw (UWr) and Poznan (UPo). The presented research constitutes a part of wider empirical studies concerning analysis and assessment of conditions of use of the Lean concept in Poland's academic universities, and has a pilotage character. The main research method used during the examination was case study, however, this was supported by standardized questionnaire, documents analysis and deduction.

The case study method enables a researcher to closely examine the data within a specific context. Case studies, in their true essence, explore and investigate contemporary real-life phenomenon through detailed contextual analysis of a limited number of events or conditions, and their relationships (Zaidah, 2007). Three main categories of case study research can be defined: exploratory, descriptive and explanatory case studies. Exploratory case studies set to explore any phenomenon in the data which serves as a point of interest to the researcher. For instance, a researcher conducting an exploratory case study on individual reading processes may ask general questions, such as, "Does a student use any particular strategies when he reads a text?" and "if so, how often?". These general questions are meant to open up the door for further examination of the phenomenon observed. Descriptive case studies set to describe the natural phenomena which occur within the data in question, for instance, what different strategies are used by a reader and how the reader uses them. The goal set by the researcher is to describe the data as they occur. Explanatory case studies examine the data closely, both superficially and in depth, in order to explain the phenomena that stood out in the data. For instance, a researcher may ask the reason as to why a student uses an inferencing strategy in reading. On the basis of the data, the researcher may then form a theory and set to test this theory. Furthermore, explanatory cases are also deployed for causal studies where pattern-matching can be used to investigate certain phenomena in very complex and multivariate cases (Zaidah, 2007).

The descriptive case study approach was used in this article. The case study research was realized according to following steps (Figure 3). Table 3 presents the assumptions of the research.

Table 3.
Assumptions of the research

Item	Description
Research goals	Theoretical: description of management system and instruments of its improvement in conditions of university Empirical: analysis and assessment of improvement instruments for use in conditions of university's management system to identify and solve problems
Research problems	1. Which improvement instruments do representatives of the examined universities know? 2. Which improvement instruments are used by the analyzed universities? 3. Assessment of used instruments from point of view of their usefulness. 4. Identification of ways of management system improvements by use of examined instruments.
Research method	Case study research
The interviewees	The highest representatives of the analyzed universities
Date of realization	May-June 2019

Note. Personal elaboration based on the research.

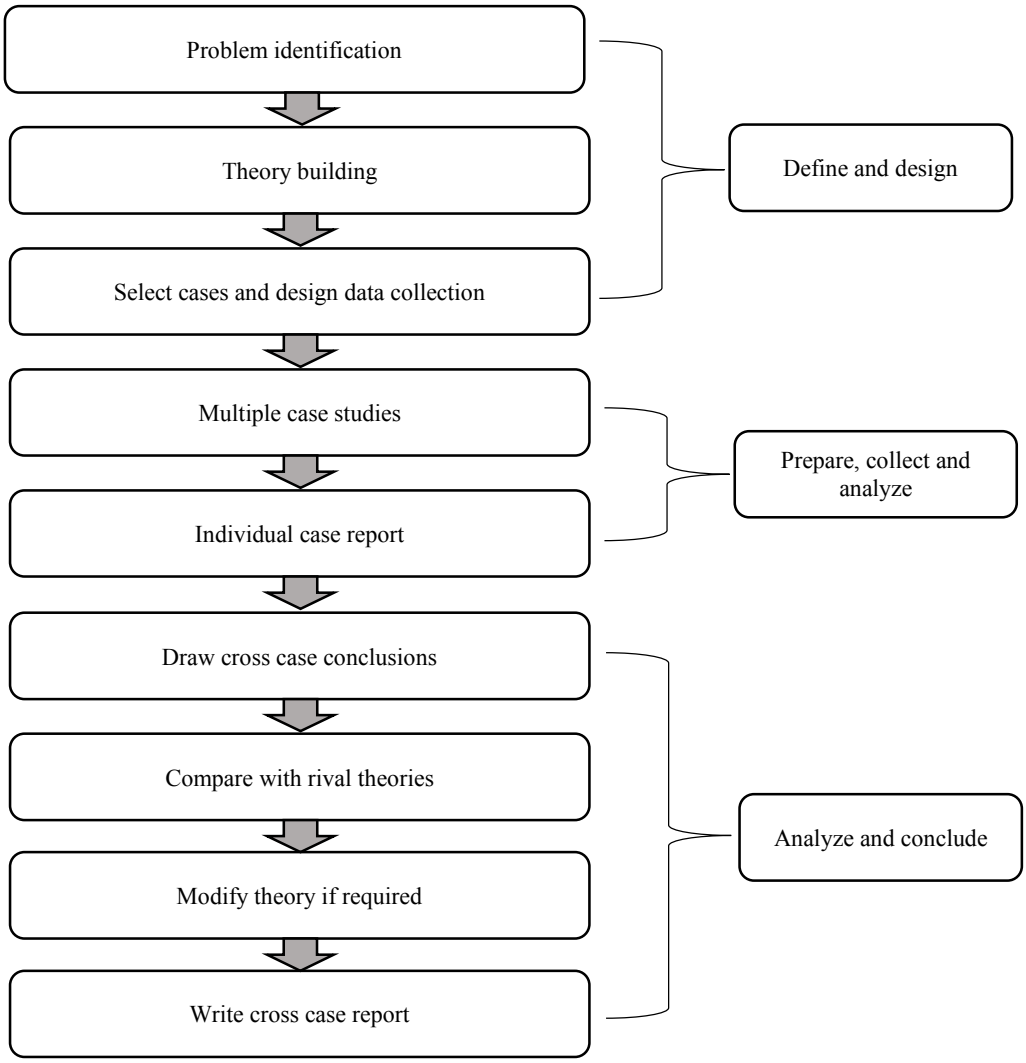

Figure 3. Case study method. Adapted from: "Case study method for design research" by S. Teegavarapu, J. Summers. Copyright 2008 by ASME.

Results of the research are presented in Section 4.

4. Results of conducted research

The main analysis of improvement instruments was preceded by discussion concerning barriers to efficiency in the management systems of the examined universities (Figure 4).

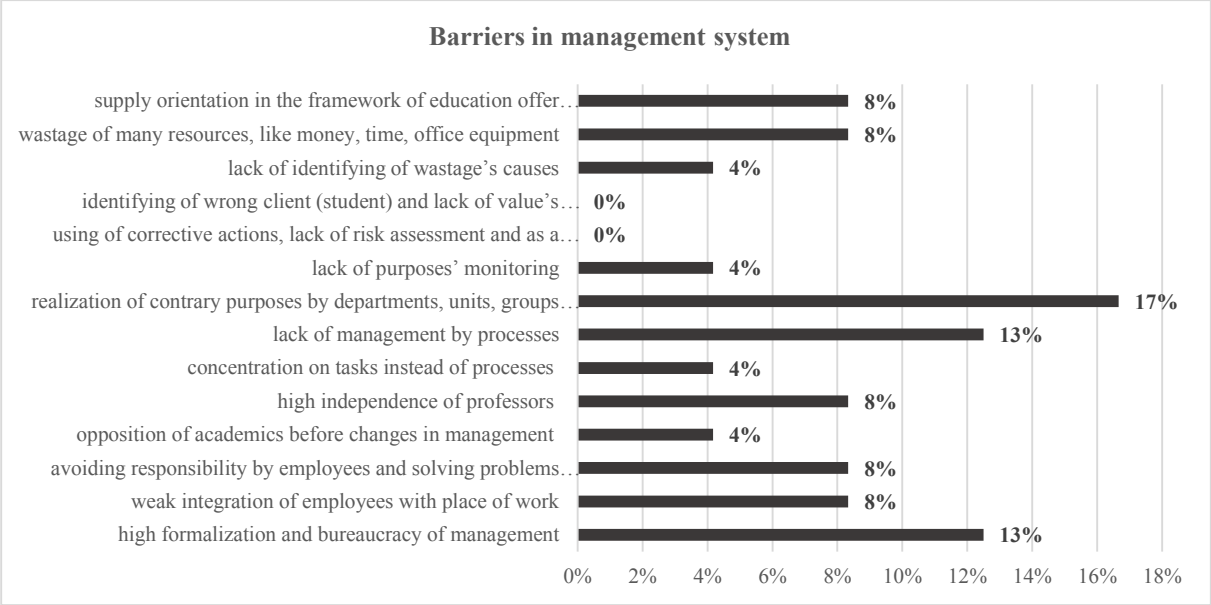

Figure 4. Barriers in the management system of the examined universities. Note: Personal elaboration based on the research.

The main barriers to unit efficiency were defined as:

- high formalization and bureaucracy of management,
- weak integration of employees with place of work,
- avoiding responsibility by employees and independent problems solution,
- opposition of academics to management changes,
- high independence of professors,
- concentration on tasks instead of processes,
- lack of management by processes,
- realization of contrary purposes by departments, units, groups of employees,
- lack of purpose monitoring,
- use of corrective actions, lack of risk assessment, and as a result, lack of preventive actions,
- identification of wrong client (student) and lack of value creation for clients,
- lack of identifying of wastage causes,
- wastage of many resources - money, time, office equipment,
- supply orientation in the framework of education offer (concentration on resources instead of market requirements).

According to the interviewees, the most evident barriers are: realization of contrary purposes, lack of management by processes and high formalization and bureaucracy of management.

Table 4 provides a complex analysis of use of selected improvement instruments in the examined universities. The analysis concerned 28 instruments, according to knowledge of them, their use and assessment of effectiveness. The representatives of the analyzed universities

mainly declared that they had knowledge, but the use of them was less satisfying, although some specific to the particular university are used. In the management systems of the examined universities the following instruments exist: management by processes (similar to solutions from ISO 9001), standardization, benchmarking, reengineering, brain storming, block diagramming, checklisting, SWOT analysis, knowledge management, intellectual capital management, trainings, motivation systems, corrective and preventive actions. Instruments relating to Lean concept, such as value stream mapping, Kaizen, 5S, methods – FMEA or QFD – were not in use by the represented universities. This outcome could be due to the organizational structure of the specific university, and due to the internal and external circumstances of their existence. It must be said that changes in regulations concerning the area of science and higher education encourage centralization of management, but this way of managing does not support improvements and the elements connected with this. The instruments used were assessed in a 5 grades scale (Table 4).

In the process of analysis and discussion, after complex presentation of improvement instruments, the interviewees suggested possible ways of creating change in the management systems of the examined universities. These included:

- implementing management by processes,
- current monitoring of purposes,
- setting up responsibility for processes,
- flattening of organizational structure – creation of teams to solve current problems,
- implementing Continuous Improvement and instruments of Lean,
- bringing about better identification of the requirements of internal and external clients,
- including external clients in the realization and improvement of processes,
- identifying causes of wastage,
- limiting resource wastage,
- decreasing bureaucracy,
- managing by quality – orienting management towards being a learning organization.

The catalogue of improvement instruments is very wide. The presented constitutes only a part. Still, what is suggested gives solid fundament for further improving actions in the processes and systems of Poland's universities.

Table 4.
Matrix of instrumental use analysis

Instruments	Economic University of Katowice			Economic University of Krakow			Economic University of Wroclaw			Economic University of Poznan		
	Knowledge	Use	Assessment	Knowledge	Use	Assessment	Knowledge	Use	Assessment	Knowledge	Use	Assessment
TQM	X	-	-	X	-	-	X	-	-	X	-	-
ISO 9001:2015	X	-	-	X	-	-	X	-	-	X	-	-
Management by processes	X	-	-	X	-	-	X	X	5	X	X	5
Standardization	X	X	3	X	-	-	X	-	-	X	X	4
Value Stream Mapping	X	-	-	X	-	-	X	-	-	X	-	-
Kaizen	X	-	-	X	-	-	X	-	-	X	-	-
PDCA	-	-	-	X	-	-	X	-	-	X	-	-
5S	-	-	-	X	-	-	X	-	-	X	-	-
FMEA	-	-	-	X	-	-	-	-	-	X	-	-
QFD	-	-	-	X	-	-	-	-	-	X	-	-
Benchmarking	X	X	4	X	X	5	X	X	5	X	X	5
Reengineering	X	X	4	X	-	-	X	X	4	X	-	-
Audit	X	X	4	X	X	5	X	X	5	X	X	4
Brain storm	X	X	5	X	X	3	X	X	5	X	X	5
Block diagram	X	-	-	X	-	-	X	-	-	X	X	5
Ishikawa figure	-	-	-	X	-	-	X	-	-	X	-	-
Pareto diagram	-	-	-	X	-	-	X	X	4	X	-	-
Control charts	X	-	-	X	-	-	X	-	-	X	-	-
Checklist	-	-	-	X	X	3	X	-	-	X	X	4
Process Decision Programme Chart	-	-	-	X	-	-	-	-	-	X	-	-
5Why	-	-	-	X	-	-	X	-	-	X	-	-
SWOT	X	X	5	X	X	4	X	X	5	X	X	4
Knowledge management	X	X	4	X	X	5	X	X	5	X	X	5
Intellectual capital management	X	X	4	X	X	5	X	X	5	X	-	-
Trainings	X	X	5	X	X	5	X	X	5	X	X	5
Motivation system	X	X	3	X	X	5	X	X	5	X	X	4
Corrective actions	X	-	-	X	X	5	X	-	-	X	X	5
Preventive actions	X	-	-	X	X	5	X	-	-	X	X	5

Note. Personal elaboration based on the research.

5. Summary

Improvement instruments constitute all ways of enhancing systems, processes and tasks. They are categorized as the rules, concepts, normalized systems, methods, tools and ways of best practice. In this form, they were presented in this article. The instruments of improvement, in general, have been applied in forward thinking businesses and enterprises. The present catalogue of improvement instruments, tailored to the needs of the examined universities and in universities in general is not complete.

The article consists of two parts: theoretical and empirical. The first was a literature analysis, and presented improvement instruments that could be applied in the examined universities. In the empirical part of the article, following methods were applied: case study, standardized questionnaire, documents analysis and deduction. The analysis concerned: knowledge about instruments, their usage, assessment of the effectiveness of such instruments and directions of possible improvements in the management systems of the examined universities. The presented research constitutes a part of wider empirical studies, concerning analysis and assessment of conditions of use of the Lean concept in Poland's academic universities and has a pilotage character.

The author is conscious of constraints in the article. For one, they derive from a limited list of universities. As presented above, the empirical analysis will be continued as a part of wider research and results will be presented in further papers.

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