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THE USE OF LEAN MANAGEMENT INSTRUMENTS TO SHAPE BUSINESS MODELS OF SERVICE COMPANIES

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ABSTRACT

The aim of this paper is to identify lean management instruments used to implement strategic objectives related to the creation and retention of value in the area of value networks while redefining the business model of service enterprises on the example of hotels. In relation to the objective, a survey was conducted using the questionnaire method with the use of Computer Assisted Web Interview technique, using a self-developed questionnaire. The survey was carried out between February and May 2020 among 421 representatives of hotel service companies operating in the three, four and five-star standard. In order to verify the assumptions between the surveyed features, statistical inferences were used using the Statistica programme. The research results may provide inspiration for the implementation of lean management concept in the area of redefining business models conducive to value creation. The issues presented in the paper are an attempt to fill the gap indicating practical experience related to the use of lean management instruments in the hotel services sector and their effectiveness in the process of redefining business models and value creation.

KEYWORDS

Lean management, business model, value creation and retention, value stream mapping, hotel industry.

Introduction

Nowadays hotel companies are seeking modern, more effective methods of functioning. Decisions concerning the scope of their implementation are made by organizations under the influence of constant changes in the internal and external environment, as well as uncertainty regarding the existing trends and scope of subsequent changes. As a result of indicated circumstances, the standard rules of choosing a functioning model, both based on probability theory and deterministic concepts, seem ineffective. Therefore, a typical reaction of enterprises is to use the polarization of management capabilities related also to the implementation of modern management methods.

Currently, on the one hand, it is possible to see a rapid development of management methods aimed at verifying the use of capital employed in the company by means of the process of improving the use of assets. Therefore, lean management (LM) should be identified as a concept aimed at providing the customer with value using a small volume of resources. The use of various types of tools aimed at improving the productivity and efficiency of the enterprise, including primarily LM, is analysed in detail in the subject literature [1–9]. The main aim of tools, techniques and methods (instruments) used in the LM approach is to reduce and eliminate waste and generate value.

On the other hand, the development dynamics of new business management methods is a manifesta-

tion of their orientation to increase competitiveness and effectiveness. The sign of changes resulting from the functioning of enterprises in the competitive and turbulent environment are new directions of their development and created, implemented, redefined business models (BM) [10, 11]. Therefore, in order to meet the changing needs of purchasers, hotel companies should renew the existing business model by identifying and effectively applying instruments affecting the creation and retention of value, including among others LM [12, 13]. From this perspective, the BM is an instrument for increasing the efficiency of company's activity, which enables to achieve and maintain the growth of value. Thus, the generation of value is its key parameter. The reason for growing importance of the issue of value generation in BM is the dynamics of competitive environment, which limits the formation of effective strategies. A situation of this kind determines the need to seek new solutions and to implement instruments that will enable the creation and retention of value.

The paper attempts to identify LM instruments used for the implementation of strategic objectives related to the creation and retention of value in the area of value chain during the redefinition of business model of service enterprises on the example of hotels. In turn, the research problem was to determine: 1) what lean management instruments are used to redefine the business model in hotel companies? and 2) what reasons have led to the use of lean management instruments in business models of hotel companies?

In relation to established objective and research problem, and on the basis of the analysis of the literature on the subject, a hypothesis was adopted, which assumes that hotel companies operating on the Polish market create a new business model meeting the conditions for effective adaptation of the LM concept.

Therefore, a survey was conducted using the Computer Assisted Web Interview (CAWI) technique with the use of a self-developed questionnaire. The source material was data obtained during an empirical study conducted in February-May 2020 among respondents from 421 hotels operating on the Polish market. Then, the research used the method of statistical analysis, which was carried out with the use of statistical package STATISTICA, RStudio and Excel, and built a model for selection of optimal variants of using LM instruments in the BM redefinition process.

The issues discussed in the paper have not been the subject of research so far. Therefore, its aim is to fill the gap that appears in the research on the use of LM instruments in the redefinition of BM adopted by hotels.

Literature review

Lean management instruments in the value creation process

The LM concept was formed in the 1990s, based on assumptions resulting from the methods used in the Toyota Production System (TPS). Nowadays it is considered to be a set of practices, tools and various types of organizational solutions, which have been effectively implemented in the Toyota Motor Company since 1948 [14]. Over the recent years, there has been an invariably growing trend in the implementation and application of transformations according to the LM approach among service companies [15]. On the basis of literature analysis, it should be concluded that LM is a method of company management, which thanks to the use of individual instruments (tools, techniques, methods) contributes to the reduction of waste, elimination of non-value generating activities, thus improving the company productivity. For the needs of this study, it has been assumed that LM is a business strategy and methodology which increases the efficiency of processes carried out in the enterprise, i.e., as a consequence, it influences greater customer satisfaction and more favorable financial results [16]. Therefore, it should be recognized that LM concept is a set of principles, concepts and techniques aimed at eliminating waste as well as implementing and maintaining an effective system of providing value-generating services [17]. The two fundamental principles underlying the lean management concept include the elimination of waste and creation of value [18].

The functioning of an enterprise according to LM principles is based on standards of the organizational process called Lean Thinking. This approach is particularly focused on the economical conduct, which consists in improving the efficiency of activities as a result of eliminating waste, minimizing waste and controlling the flow of added value [19]. The increase in added value may result from the improvement of the company's internal procedures or use of an appropriate set of LM instruments, which affect the value generation. It is created in the value stream and concerns all proceedings (creating, retaining and not creating value) necessary in the process of providing services, i.e. occurring from design to delivery to the buyer (the so-called flows) [20]. Based on the subject literature, two basic variants of value streams occurring in service companies can be distinguished [21]:

- service development value stream (concerns the process from concept to market introduction, i.e. design flow),
- operational value stream (implemented in the process from order to delivery, i.e. material flow and information flow). In this dimension, the operating value stream should be treated from the perspective of service (order) execution.

The strategic management objective according to the LM concept is to produce more and more services with less resources [22]. Therefore, the activities undertaken by hotel companies consist in the use of five main principles according to TPS system, which are [23]:

1) determination of the specified value, can only be established by the final customer and is relevant if it is expressed in relation to a specific service that meets the needs of hotel guest at a specific price and time. Customer values are primarily quality, functionality, price, appearance, availability at a given place and time, additional services or on-time delivery;

2) identification of value stream consists in determining a set of all activities necessary to provide a specific service in the process consisting of three critical tasks from the management perspective that occur at the stage of product design, information flow management and service process implementation [24]. The key tool to determine a value stream is Value Stream Mapping (VSM), which means that all activities in the stream must be analysed from the moment of placing an order to the execution of service;

3) shaping a continuous flow, the action is to continuously and smoothly add value in the value chain, eliminating unnecessary interruption of the process, breakage, artificial clustering of wasteful activities. As a consequence, organizational barriers that limit the flow should be eliminated and available methods and techniques of "slimming down" the process of customer service and service provision should be applied;

4) use of pull system, indicates the production of products only in the amount for which there is demand. Thus, the flow of value stream occurs by means of an order placed for a specific product/service by an external customer. The order flow for products is opposite to the value stream flow;

5) pursuit perfection, consists in the use of two ways resulting from continuous improvement (kaizen) and radical change (kaikaku). The first solution focuses on individual activities in the value chain, while the second focuses on improving the entire value chain.

The LM concept uses characteristic instruments that provide assistance at every stage of MB development as well as the hotel company's development. They are also designed to support the process of MB redefinition and are a motive for making decisions related to the implementation of further changes in the organization's activities. Nevertheless, the use of LM instruments obliges to implement them in an orderly and systematic way and to adapt them to the conditions of the company's functioning [25]. The subject literature indicates many instruments used today in the LM concept, which depending on the area of application, may adopt different configurations.

For the purpose of this paper, only the instruments which were used in the MB redefinition within the hotel companies surveyed and which relate to the LM concept will be listed. In particular, a distinction should be made: 1) Value Stream Mapping (VSM), the essence of which is primarily to find those enterprise elements that do not function properly [26], 2) Workstation standardization concept – 5S, which is a set of five steps leading to systematic and organized maintenance of order and cleanliness in the workplace [27], 3) Poka-Yoke, which is a method to prevent mistakes during the performance of tasks [28], 4) Total Productivity Maintenance (TPM), the essence of this tool is implementation of services in accordance with the failure-free service system [21], 5) Just in Time (JiT), i.e. implementation of tasks exactly on time by eliminating from the service process all activities which do not increase the value of the service/product [29], 6) Kaizen, i.e. the concept of continuous improvement, systematic search for improvements. The essence of this method results from the use of common sense and low-cost solutions, thus progress is gradual and the benefits appear after some time [27], 7) Kanban system allows to ensure the proper flow of raw materials, materials and finished products depending on the customer's orders [30], 8) Total Quality Management (TQM) the essence of this concept is economic production of products and services meeting the requirements of hotel guests [31]. The main goal of the company operating in the TQM model is to satisfy the buyers' needs in accordance with the value system, 9) Visual Management (VM), the aim is to show information about a given area in the shortest possible time. The essence of this approach is to recognize problems, waste, but also the effects of optimization activities. In turn, the aim of its application is to organize the working environment in such a way that any deviation from the standard can be detected in it easily and quickly, which will translate directly into reduction of losses and waste [32], 10) Six-Sigma is

based on collecting as much data as possible, which is used later to achieve the best quality. Thus, the method focuses on the definition of customer value, enabling a systematic reduction of hotel cycle time [33], 11) Hoshin Kanri relies on a systematic process of planning and achieving long-term goals by developing the organization's strategy for all its departments and units. The tool refers to four key elements of business management: vision and creation, development and control of the strategy [34], 12) Pull system indicates the production of products in the quantity that is needed and only when they are necessary. Therefore, the value stream flow is triggered by an order placed for a product from an external customer, and the direction of the order flow for products from individual operations is opposite to the value stream flow [35], 13) Spaghetti diagram illustrates the movements performed by an employee at the workplace. It allows to trace the route travelled, as well as to calculate the exact number of steps needed for its execution [36], 14) Jidoka allows to detect defects in the processes and stop them in order to avoid faults [32], 15) Work standardization consists in a detailed description of each of the activities related to the service process (hotel guest service), taking into account time cycles, sequence of particular activities and the minimum number of elements needed to perform the operation [26], 16) PDCA system (plan, perform, check, act), its essence is to develop an action plan in which objectives should be defined and possible obstacles to their achievement should be anticipated. After the execution (To) of the planned actions, the results obtained should be checked. If the results are positive, the planned changes are permanently (Act) introduced into the process, constantly seeking further improvements [37], 17) FIFO (first in, first out) this process means that the products produced in the first place go in a certain sequence to the next operation as first [18].

Depending on the area of application, LM instruments may be implemented by hotel companies to create and retain value in the value chain area when redefining the business model.

Value in redefining the business model

Nowadays, effective functioning of enterprises requires the use of various methods and instruments of strategic, operational and crisis management. Among the key concepts that affect the effective implementation of intended objectives, it is necessary to mention enterprise strategies and BM. In the subject literature there are many explanations of BM, which in a non-uniform way define its individual categories [38–43]. Usually in most studies the authorial definitions of business model are adopted. For the purpose of this analysis regarding the use of LM instruments for BM redefinition, it has been assumed that it is a model by which organizations transform strategic choices (concerning markets, customers) into values and by which they can create and appropriate value through the use of organizational architecture [40, 44]. Thus, the key element of BM is value.

The growing importance of the issue of value creation results from the dynamics of competitive environment of the hotel company, which makes it difficult to create effective strategies. This type of situation determines the need to identify new relations which will allow to gain a competitive advantage and indicate the directions of an entity's development. Therefore, the issue of using appropriate instruments contributing to the creation and retention of value and BM redefinition becomes an important area of scientific knowledge.

Hotel companies operate according to different BMs. However, each of them is focused on the creation and generation of value and value chains. Their different types consist of different categories, which, thanks to a complete list, shape the characteristic plan of hotel enterprise [46]. The subject literature presents different components of BM. On the basis of analysis of twelve definitions, forty-two separate elements have been determined, which according to their systematic occurrence (at least twice), have been grouped into four key BM categories (see Fig. 1). It consists of the following elements [12]:

- strategic choices that integrate with the basic nature of business activity and indicate the rationality of an entity,
- value networks, which present the interdependence of network relationships due to network potential,
- value creation, which occurs as a consequence of rational disposal of resources and business processes,
- value capturing, which is shaped by achieving economic efficiency as a result of capital employment.

These BM categories are integrated primarily in the area of value creation for the market success of hotel companies. The model chosen for the purpose of this study is considered to be a source of strategic decisions, on the basis of which only the resources and skills considered necessary for the effective implementation of the creation, delivery and capture of value are configured. On the other hand, the ability to define and redefine the BM should be considered a key competence of the company, which strengthens the process of creating its value.

The BM components shown in Fig. 1 have a strategic dimension, their configuration determines the

results during the entire life cycle of a hotel enterprise. Therefore, they should not be considered as unchangeable elements. Transformations of conditions occurring in the process of conducting business activity and changes in the needs of purchasers make the structure of particular components exploitable [45]. Therefore, in order to continue the market functioning, organizations should redefine/renew individual BM categories.
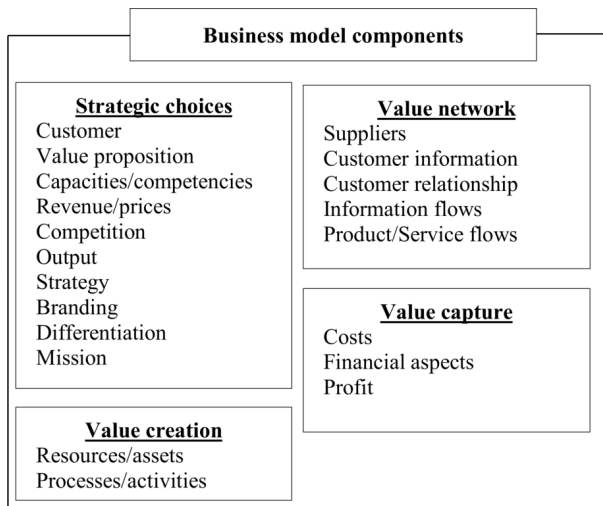

Fig. 1. Business model categories.

The BM redefinition consists in the change of content (types and quality) of value for the client, which results from the analysis of process and the application of transformation of its key components [46]. Therefore, the renewal process defines the conceptual actions used to redefine the current BM components [47]. In relation to the content, the renewal may take a transformational or incremental form. In accordance with the first composition, no significant changes are made to the individual BM categories. However, in the second one, services are characterized by modifications in the area of quality and value [46].

The initial phase of BM redefinition should consist in the reconstruction of the idea for functioning of a hotel company, including the value of services/products offered. Thus, the scope of modifications is made within the structure and intensity of reorientation with the use of appropriate renewal instruments, e.g. LM, the source of which should focus on creating and retaining value.

Research approach and methods

The identification of lean management instruments, which are used by hotels to achieve strate-gic objectives related to the creation and retention of value in the area of value chain during the redefinition of business model, was conducted on the basis of data collected during the empirical study. The research problem addressed in this study concerned the determination: 1) what lean management instruments are used to redefine the business model in hotel companies? and 2) what premises led to the use of lean management instruments in business models of hotel companies? For the purpose of this study a hypothesis was also adopted, which assumes that hotel companies operating on the Polish market create a new business model meeting the conditions for effective adaptation of the lean management concept.

The research objective and hypothesis adopted in this way determined the subject scope of research, which was designed according to a typical scheme of conduct adopted in empirical research. The research process was conducted according to the following stages: The research process was carried out according to the following steps: 1) determination of the research problem and development of research questions, 2) research design: determination of the scope, method of conducting, selection of surveyed population and research sample, 3) construction of a measuring instrument, 4) development of a research schedule, 5) data collection, 6) development of research results and conclusions [48].

The key objective of this study was to compare the theoretical and practical knowledge as well as to present the position of respondents from hotel companies involved in the implementation of LM instruments, which are used to create and retain value in the value chain area. On the basis of a critical analysis of subject literature, the possibilities of using LM instruments to redefine BM were identified.

The quantitative research was carried out with the use of a questionnaire method with a self-developed questionnaire, which was prepared on the basis of BM elements proposed by S. Shafer, H. Smith, J. Lindner [12]. In the diagnostic survey, an Internet questionnaire was used, which was carried out using the Computer Assisted Web Interview (CAWI) technique. The form consisted of 26 questions, including 5 from the questionnaire certificate.

The survey was conducted between February and May 2020 with a research sample of 421 representatives of hotel companies (owners, directors or managers – respondents) operating in the three, four and five-star standard on the Polish market dealing directly with the practical application of LM instruments in the process of BM re-creation. Only one respondent from a hotel of a given category could

participate in the survey. The condition for filling in this survey was the use of LM instruments during the changes made in hotels as well as the creation and delivery of value through the value chain and network, which are carried out, among others, in BM. Therefore, the respondents' answers were varied and depended on their factual and empirical knowledge. Thus, the group of hotels selected for the survey was not selected at random, but on the basis of prior verification and established contacts.

The questionnaire was filled in by 204 hotel companies in total (48.46%). As a result of the assessment of correctness and completeness of the forms, 42 questionnaires were eliminated from further research. Thus, 162 (38.48%) correctly filled in questionnaires were finally obtained, which were classified for further analysis. The answers provided by the respondents were summed up, structured and evaluated in absolute terms. In order to index the obtained statements, descriptive statistics (weighted average) were used to determine the general parameter of a given opinion. Rank categories used provided a precise classification of answers to particular questions (from the lowest to the most important parameters).

The positions presented by the respondents enabled identification of LM instruments used by hotel companies to redefine BM. In the case of analysis with regard to the differences that occurred in answers to the indicated issues as well as to check the hypothesis, a chi-quadrant independence test was applied. The distribution of dependencies was presented in the form of a comparison of the number and percentage structure of answers obtained in the three, four and five-star hotel categories compared (quota tables). The result of such a statistical test is the so-called test probability (p), the low values of which indicate statistical significance of the analysed relation. The value of function was calculated according to the equation [49]:

$$x^2 = \sum_{i=1}^{l} \sum_{j=1}^{k} \frac{(n_{ij} - \widehat{n_{ij}})}{\widehat{n_{ij}}} = \sum_{i=1}^{l} \sum_{j=1}^{k} \left(\frac{n_{ij}^2}{n_{ij}} \right) - n, \tag{1}$$

$$\widehat{n_{ij}} = \frac{n_i \, x \, n_j}{n},$$

where $\widehat{n_{ij}}$ is the theoretical quantities, n_i – number of sample elements corresponding to level x_i of feature X, n_j – number of sample elements corresponding to level x_i of feature Y, n_{ij} – number of sample elements corresponding to level x_i of feature X and Y, n – sum of sample elements corresponding to level x_i of feature X and Y, k – number of columns, l – number of rows.

In the next phase of the first research stage, a model was formulated to indicate the selection of

optimal variants of individual LM instruments used to redefine the BM of hotel companies. Marriott International and Starwood Hotels&Resorts, which are among the top ten largest hotel corporations in the world, were selected to create the model [50]. On the basis of developed case study [32, 51, 52], the average values of instruments in particular BM categories were determined and the standard deviation for participating hotel categories was calculated.

The results of the second part of this study, which concerned the indication of motives for the use of lean management instruments in BM, were also subject to statistical analysis. Standard deviation was calculated and the analysis method of main PCA components was used. It allows to reduce the number of factors necessary to describe a significant number of correlated variables, while keeping as much information as possible. Moreover, referring to the condition of entropy minimization in the case of multidimensional data sets, it allows to determine the main components describing the basic features of set, which allow to carry out the reduction of analyzed data set. The set transformed in this way was used to build an empirical diagnostic model [53].

The analysis of the main components is carried out using a covariance matrix, in which the variables characterized by the largest variance among the input data will have a significant impact on the result. The basic PCA equation is as follows [54]:

$$Z_j = b_{j1} S_1 + b_{j2} S_2 + b_{j3} S_3 + ... + b_{jn} S_n, \tag{2}$$

where Z_j – j variable ($j = 1, 2, ..., n$), $S_1...S_n$ – main components, $b_{j1}...b_{jn}$ – main component coefficients.

As a result of conducted analysis, the data obtained during the study showed statistical validity. The calculation of indicated factors was carried out using Statistica 13.1 PL, RStudio and Microsoft Excel package tools. Their values are presented in figures and tables in the next part of this paper (research results).

Sample characteristics

After rejection of incorrectly filled in forms, 162 hotel companies participated in the study. The database of respondents was built on the basis of data obtained from the Hotel Facilities Register kept by the Marshal's Offices and the Central Statistical Office's Local Data Bank database. The selection of research sample was intentional, non-random and depended on the following criteria: 1) enterprise from the accommodation services sector, 2) hotel operating in a three-, four- or five-star standard, 3) facility operating on the market for more than 5 years, 4) enterprise having a category: small, medium or large.

The survey was conducted among 58% of three-star hotels, 29% of four-star hotels and 13% of five-star hotels. A significant group were hotels operating in the market for over 15 years – 64%. On the other hand, 28% of companies have been operating for 8–15 years, while the remaining surveyed objects (8%) have been operating for less than 8 years. The stage of market activity among hotels allows to obtain knowledge from the perspective of understanding the respondents' opinions expressed in the survey, which are based on long-term experience in the implementation of LM instruments and creation of BM.

Due to the research problems, entities operating as business activities of a natural person who does not employ or employs less than 10 people were excluded from the population. Medium-sized enterprises prevailed in the examined sample, which constituted 72% of hotels. In turn, 19% of small enterprises participated in the survey. Whereas large enterprises represented 9% of entities. The group of respondents consisted of persons performing managerial functions: owners (15%), directors (54%) and managers: department managers (31%) in the surveyed hotels.

Due to the complexity of research and its nationwide character, their cognitive potential should be highlighted.

Results and discussion

On the basis of conducted research, in the first stage, LM instruments were identified which are used to redefine BM of hotel companies in the process of creating and retaining value in the area of value chain. Therefore, the respondents were asked to indicate which LM instruments are used in the hotel company? what tangible and intangible assets the hotel has? what activities or processes are undertaken in the enterprise to provide value? in what areas of operation is the hotel profitable? in which areas of activity does the hotel bear the highest costs? what financial outlays are generated by key resources, activities, partners? what LM instruments are used to reformulate the future business strategy? what motives prompted respondents to use LM instruments to deliver value?

The purpose of implementation LM instruments is to improve productivity and efficiency, as well as to reduce and eliminate waste and improve processes that contribute to the generation of value of products/services and processes in hotels. From the perspective of their use, it seems interesting to deter-

mine which of them have a direct impact on BM renewal (see Table 1). The following hypotheses were verified by means of a chi-quadrant independence test for their evaluation:

H0: The use of LM instruments to redefine BM does not depend on the hotel standard.

H1: The use of LM instruments to redefine BM depends on the hotel standard.

Table 1
Results of chi-quadrate test for the use of lean management instruments in the process of business model renewal.

Statistics	Chi^2	df	p
Pearson's Chi^2	33.588	2	.00000
Chi^2 NW	33.956	2	.00000
Fi	0.2496		
Quota support	0.0201		
Cramér's V	0.1765		
Chi-2 =33.588, $p < 0.001 * **$			

where adopted materiality level difference $\alpha = 0.05$; number of freedom levels $df = 2$, materiality level 0.05 as read from tables; critical value of chi-2 test, for $df = 2$ is, according to tables 5.991.

The calculated result of control statistics is 33.588 and thus indicates a higher critical value of 5.991 than the chi-quadrate distribution table. The research procedure carried out on the basis of data obtained from the surveys allowed to conclude that there is a condition for rejecting the zero hypothesis in favour of the alternative one. On the basis of conducted test it can be stated with 99% probability that the use of lean management instruments in the process of creating and retaining value in the area of value chain is determined by the hotel standard. The analysis results are presented in Table 1 and Appendix 1 (online).

In accordance with the presented aim of research, LM instruments were recognized, which are used to redefine the BM of surveyed companies. Figure 2 shows the percentage share of regularly used instruments.

Respondents among the most important LM instruments that are used for BM renewal in the category of value creation for the hotel's resource/asset variant indicated: VSM (21 objects 5*, 44-4*), pull system (19-5*, 43-4*), work standardization (19-5*), Poka-Yoka (91-3*), TPM (83-3*). In terms of processes/activities, according to respondents from five-star hotels the most frequently used instruments are 5S (20 objects), work standardization (20) and four- and three-star hotels: VSM (47-4*, 94-3*), work standardization (47-4*, 92-3*).
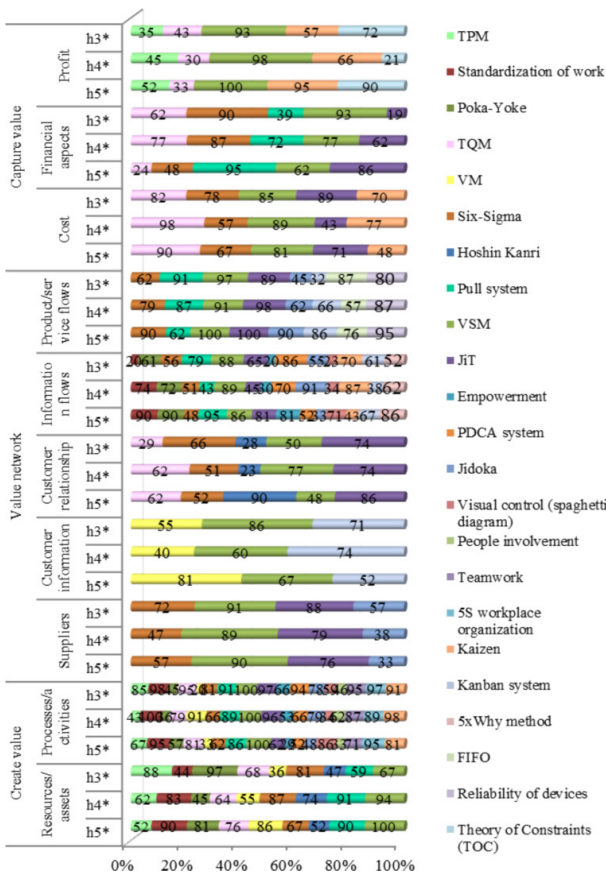
Fig. 2. Lean management instruments used in redefining the business model.

Among the LM instruments used in the category of BM value networks, respondents indicated for the variant: 1) implementation of processes with VSM suppliers (19-5*, 42-4*, 86-3*), 2) acquisition of customer information: Six-Sigma (17-5*), Kanban system (35-4*), VSM (81-3*), 3) establishing and maintaining customer relations: Hoshin Kanri (19-5*), JiT (35-4*, 70-3*), 4) ensuring information flow: pull system (20-5*), work standardization (19-5*), Jidoka (43-4*), VSM (42-4*, 83-3*), PDCA system (81-3*), 5) coordination of product/service flow: TQM (19-5*, 46-4*, 77-3*), VSM (17-5*, 42-4*, 80-3*).

On the basis of conducted research it should be stated that according to the respondents the most popular LM instruments used in the retention category are for plane: 1) costs: TQM (19-5*,46-4*, 77-3*), 2) finance: pull system (20-5*), JiT (18-5*), Six-sigma (41-4*, 85-3*), VSM (36-4*, 87-3*), TQM (36-4*), 3) profit: kaizen (20-5*, 31-4*), VSM (46-4*, 87-5*), TOC (19-5*, 68-3*).

The results indicate that hotels, depending on the standard, skillfully use different types of LM instruments to redefine BM in terms of generating and retaining value in value networks. This conclusion was

also confirmed by a regression analysis (see Figs 3 and 4). Nevertheless, among the respondents' indications there were also concepts and methods that go far beyond the functions of instruments used in LM. It should be concluded that the subjective answers depended on the respondents' experience and knowledge of LM concepts.
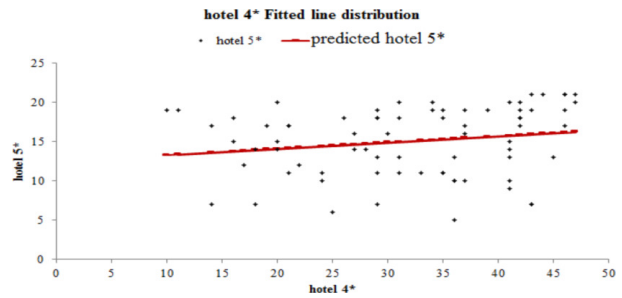
Regression statistics	
R multiple	0.183144702
R square	0.033541982
Matched R square	0.020118954
Standard error	4.350372852
Observations	74

Fig. 3. Relation between the selection of LM instruments by hotels 5* and 4*.
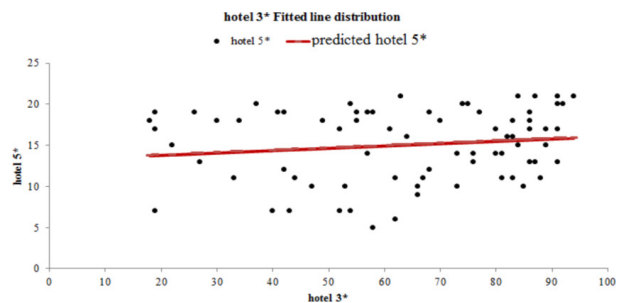
Regression statistics	
R multiple	0.141894
R square	0.020134
Matched R square	0.006525
Standard error	4.380446
Observations	74

Fig. 4. Relation between the selection of LM instruments by hotels 5* and 3*.

During the next phase of the first research stage, a model (Rm) for the selection of optimum variants of individual LM instruments was created on the basis of data obtained from the survey and case study of Marriott International and Starwood Hotels&Resorts hotel corporations, which are successfully used to redefine BM. The standard deviation

in Rm model for hotels is: 5*- 0.5087, 4*-1.9291, 3*-1.8530. The higher value means a greater difference in the proper implementation of LM instruments and considerable uncertainty in BM redefinition. The deviation of participating hotels from the benchmark is shown in Fig. 5. On this basis it should be concluded that the hotels should implement LM instruments at the level of the optimal choice ratio equal to min. 0.7 max. 0.8 depending on individual BM categories.
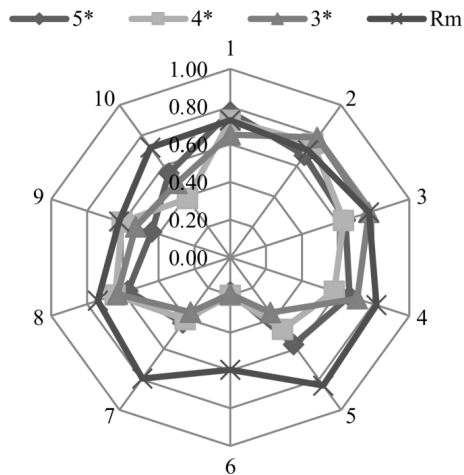
where category: *value creation* – 1) resources/assets, 2) processes/activities, value networks: 3) suppliers, 4) customer information, 5) customer relations, 6) information flows, 7) flows of products and services, value retention: 8) costs, 9) financial aspects, 10) profit

Fig. 5. Model for selection of optimal variants of lean management instruments used in the BM redefinition process.

The LM instruments indicated by the respondents should allow for qualitative and type change of the generated values in renewed BM. Consequently, the selection of appropriate tools and methods by hotels contributes to changes in the area of their functioning. The process of redefining BM is dictated by various business conditions. Among them, the key factors are the increasing speed of changes taking place in the surrounding area, the growing competition in hotel sector and the continuous creation of a more attractive offer for the client [42].

The changes occurring as a result of the above mentioned circumstances cause that following the originally adopted BM is a problematic issue. Their effectiveness does not ensure satisfactory results in terms of value creation and retention. For this reason, hotel companies decide to use appropriate LM instruments to improve the processes in the renewed BM. In the course of conducted research, the respondents indicated motives for their implementation, which result mainly from the improvement of
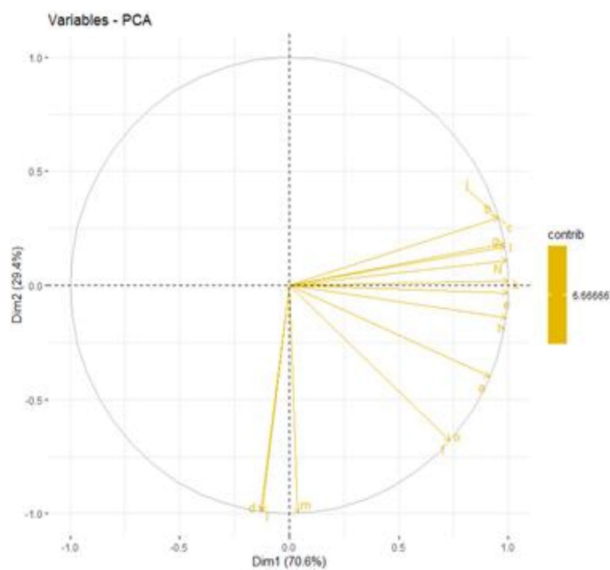
value creation process in the economic, personnel and strategic area. A method of analysis of the main components was used to describe the premises that led to the use of LM instruments in redefined BM.

The analysis allowed to transform the set of mutually correlated variables obtained during the survey into a new set of features (the so-called main components) uncorrelated to each other, which was compared to the initial set. Thus, the PCA analysis simplified the structure of received data. The first stage of analysis was to create a correlation matrix between the original features and preliminary analysis of obtained data (Appendix 2 – online). If the correlation coefficients assume low values (>0.3), further PCA studies should be discontinued. However, if the value of variables in the correlation matrix reaches high values (<0.3), the main components should be determined [55]. In case of obtained data the correlation is greater than 0.3, and therefore it is justified to apply the procedure consisting in determining the way of separating the main components and their further analysis.

The majority of data in matrix has a high absolute value, which indicates higher correlation between the following variables: minimization of the employee rotation process – increase of knowledge and competence, providing value for the customer – long-term development, involvement of employees in the lean process – implementation of the adopted strategic objectives, modification of the hotel operation strategy – implementation of a new management model, improvement of work safety – selection of the optimal time of tasks to be performed, increase in the effectiveness of service provision – keeping new customers, standardization of services – providing value for the customer, acquiring new customers – long-term development, modification of the organizational structure – ensuring the availability of services within a specified time, improvement of work organization – minimization of the time of service provision, improvement of the quality of guest service process – increase of hotel prestige, company restructurization – cost minimization.

The relationships between primary variables and the resulting main components are shown in Fig. 6. It should be noted that each variable has a vector assigned to it, the direction and distance of which indicate to what extent individual features affect the main components. In the case of motives analysed for using LM in the BM redefinition process, almost all the input variables are located near the circle. This type of situation indicates that most of the information contained in variables under analysis is carried by the main components. The following features

should be distinguished: involvement of employees in the lean process, standardization of services, implementation of the adopted strategic objectives, acquisition of new customers, long-term development and increased efficiency of service provision. On the other hand, a situation in which two variables are set side by side signals a strong positive correlation, as in the case of e.g.: implementation of adopted strategic objectives – selection of the optimal time of tasks to be performed, building a competitive advantage – modification of the hotel operation strategy.

where a – minimization of the employee rotation process, b – increase in knowledge and competence, c – involvement of employees in the lean process, d – implementation of the adopted strategic objectives, e – modification of the hotel operation strategy, f – implementation of a new management model, g – improvement of work safety, h – building a competitive advantage, i – selection of the optimal time of tasks to be performed, j – increase in the effectiveness of service provision, k – retention of new customers, l – standardization of services, m – acquiring new customers, n – providing value for the customer, o – long–term development, p – modification of the organizational structure, r – improvement of work organization, s – ensuring the availability of services within a certain period of time, t – improvement of the quality of services offered, u – minimization of the time of providing services, w – improvement of the quality of guest service process, z – increase in the hotel's prestige, x – company reorganization, y – cost minimization, $a1$ – improvement of the control process.

Fig. 6. PCA chart for the motives for using LM instruments in the BM redefinition process.

In the hotel services sector the use of LM instruments in the process of BM redefinition has not yet been analysed. The motives of their application to create and retain value in the area of value chain have not been defined either. On the basis of conducted research it should be concluded that their use in the analysed processes requires from the hotels proper

adaptation and taking into account specific features resulting from the implementation of offered services. The model created on the basis of conducted research will contribute to the optimal selection of individual LM instruments in the BM renewal process.

The next research directions on the use of LM in BM should focus on improving the methods of measuring the effects of the implemented instruments in particular categories of BM and in the situation of its redefinition.

In conclusion, it should be stated that the results of conducted research confirmed the hypothesis that hotel companies operating on the Polish market create a new BM that meets the conditions for effective adaptation of the LM concept.

Conclusions

The paper attempts to show that LM instruments can be successfully used to achieve the strategic objectives of hotel companies, which are related to the creation and retention of value in the area of value chains in the process of redefining the business model. The research results presented in the second part of this paper indicate that LM instruments used for BM renewal are very popular among hotels operating on the Polish market. The activities undertaken by the entities within the scope of LM concept focus on the application of a wide set of instruments, which influence the identification and elimination of waste and are oriented at the improvement of processes carried out in the BM of enterprises.

It should be concluded that the majority of respondents participating in the survey represented hotels belonging to global chains which successfully use such instruments to achieve strategic objectives. Nevertheless, the facilities managed by the native managers can effectively implement the practices identified by the chains. Therefore, they should use benchmarking to identify malfunctioning processes in order to improve them and redefine BM. In the implementation of individual instruments, a model for the selection of optimal LM options to be used in the BM redefinition process may also be developed on the basis of these studies.

The practical conclusions drawn from the empirical research indicate that all hotel sectors use the same tools, but in different configurations. Most often the facilities for BM redefinition in its individual categories use VSM, which consists in mapping the logic of service and information flow. As a result, hotels obtain a distribution of all activities carried out during the preparation of service/product, i.e. those that generate and do not generate value. Another

frequently used instrument at the operational level is Six-sigma. This method is based on TQM and continuous improvement aimed at reducing defects in the implemented processes or in designing new processes occurring, among others, in case of creating a new BM. Among other instruments the respondents distinguished: 1) organization improvement: Hoshin Kannri, 5S, Just in Time, pull system, Kanban, Kaizen, FIFO, Jidoka, team work, work standardization, 2) problem solving: Poka-Yoka, PDCA, visualization and spaghetti diagram.

The presented use of LM approach was related to the renewal of BM in the initial phase, when the initial processes of shaping its individual categories for value creation are taking place and in the mature phase, during which it should ensure a constant ability to generate value for shareholders. In the first phase, the focus is primarily on the configuration of individual BM components, which should enable the hotel company to achieve its strategic objectives. In the second stage, on the other hand, management instruments are indicated which enable a rational combination of different approaches to value management and strategic management of a hotel enterprise.

The conducted critical analysis of the literature on the subject and the statistical analysis of the obtained research results made it possible to confirm the hypothesis. On this basis, it should be stated that hotel companies operating on the Polish market create a new BM that meets the conditions for the effective adaptation of the LM concept.

The issues presented in this paper do not cover all the matters related to the use of LM instruments, which influence the shaping of value in the redefined BM. The composition of methods, tools and techniques shaping the LM concept and the categories that make up the BM under the influence of environmental conditions is constantly subject to change and modification. For this reason, it is necessary to continue the analysis of the issues addressed in the paper.

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The results of the chi-square test for the application of lean management instruments in the process of business model renewal

Lean management instrument used in the business model	h5*	h4*	h3*	Chi²	df	p
Category / - Value creation:						
Function: Resources/Assets						
Total Productive Maintenance (TPM)	11	29	83	68,48780488	2	p < 0,01
Work standardization	19	39	41	8,96969697	2	p=0,011
Poka-Yoke	17	21	91	80,55813953	2	p < 0,001
Total Quality Management (TQM)	16	30	64	33,23636364	2	p < 0,001
Visual Management (VM)	18	26	34	4,923076923	2	p = 0,085
Six-Sigma	14	41	76	44,25954198	2	p < 0,001
Hoshin Kanri	11	35	44	19,4	2	p < 0,001
Pull system	19	43	55	17,23076923	2	p < 0,001
Value Stream Mapping (VSM)	21	44	63	20,734375	2	p < 0,001
Function: Processe/Activities						
5S workplace organization	20	42	91	51,80392157	2	p < 0,001
Kaizen	17	46	86	48,33557047	2	p < 0,001
Total Productive Maintenance (TPM)	14	20	80	70,10526316	2	p < 0,001
Value Stream Mapping (VSM)	21	47	94	50,7037037	2	p < 0,001
Six Sigma	13	31	76	52,65	2	p < 0,001
Visual Management (VM)	7	43	19	29,2173913	2	p < 0,001
Poka-Yoke	12	17	42	21,83098592	2	p < 0,001
Visual control (spaghetti diagram)	18	16	55	32,51685393	2	p < 0,001
People involvement	7	29	43	25,01265823	2	p < 0,001
Teamwork	15	41	89	58,31724138	2	p < 0,001
Work standardization	20	47	92	49,9245283	2	p < 0,001
Total Quality Management (TQM)	17	37	89	57,95804196	2	p < 0,001
Jidoka	10	37	73	49,95	2	p < 0,001
Pull system	18	42	86	48,87671233	2	p < 0,001
Just in Time (JiT)	13	45	91	61,90604027	2	p < 0,001
Empowerment	6	25	62	52,32258065	2	p < 0,001
PDCA system	11	31	88	73,67692308	2	p < 0,001
Category: Value network						
Function: Suppliers						
Just in Time (JiT)	16	37	83	51,80882353	2	p < 0,001
Jidoka	7	18	54	45,89873418	2	p < 0,001
Six Sigma	12	22	68	52,47058824	2	p < 0,001
Value Stream Mapping (VSM)	19	42	86	47,30612245	2	p < 0,001
Function: Customer information						
Kanban system	11	35	67	41,91150442	2	p < 0,001
Value Stream Mapping (VSM)	14	28	81	60,92682927	2	p < 0,001
Six Sigma	17	19	52	26,34090909	2	p < 0,001
Function: Customer Relationship						
Six Sigma	11	24	62	43,44329897	2	p < 0,001
Just in Time (JiT)	18	35	70	34,29268293	2	p < 0,001
Total Quality Management (TQM)	13	29	27	6,608695652	2	p = 0,037
Hoshin Kanri	19	11	26	6,035714286	2	p = 0,049
Value Stream Mapping (VSM)	10	36	47	23,29032258	2	p < 0,001
Function: Information flows						
Pull system	20	20	74	51,15789474	2	p < 0,001
Just in Time (JiT)	17	21	61	35,87878788	2	p < 0,001
Work standardization	19	35	19	7,01369863	2	p = 0,030
Six-Sigma	10	24	53	33,17241379	2	p < 0,001
Spaghetti diagram	15	16	22	1,622641509	2	p = 0,444
Empowerment	17	14	19	0,76	2	p = 0,684
Poka-Yoke	19	34	57	19,98181818	2	p < 0,001
Kaizen	9	41	66	42,22413793	2	p < 0,001
Value Stream Mapping (VSM)	18	42	83	45,32867133	2	p < 0,001
Jidoka	7	43	52	33,35294118	2	p < 0,001
PDCA system	11	33	81	61,504	2	p < 0,001
Metoda 5xWhy	18	29	49	15,4375	2	p < 0,001
Kanban system	14	18	57	38,04494382	2	p < 0,001
Function: Product / service flows						
FIFO	16	27	82	60,016	2	p < 0,001
Reliability of devices	20	41	75	33,98529412	2	p < 0,001
Value Stream Mapping (VSM)	21	43	91	49,6	2	p < 0,001

Function: Customer information

Kanban system	18	31	30	3,974683544	2	p = 0,137
Jidoka	19	29	42	8,866666667	2	p = 0,012
Pull system	13	41	86	58,12857143	2	p < 0,001
Just in Time (JiT)	21	46	84	39,98675497	2	p < 0,001
Six-Sigma	19	37	58	20,05263158	2	p < 0,001

Category: Capture value

Function: Costs

Just in Time (JiT)	15	20	84	74,63865546	2	p < 0,001
Six-Sigma	14	27	73	50,57894737	2	p < 0,001
Kaizen	10	36	66	42,07142857	2	p < 0,001
Value Stream Mapping (VSM)	17	42	80	43,43884892	2	p < 0,001
Total Quality Management (TQM)	19	46	77	35,5915493	2	p < 0,001

Function: Financial aspects

Pull system	20	34	37	5,428571429	2	p = 0,066
Value Stream Mapping (VSM)	13	36	87	63,27941176	2	p < 0,001
Just in Time (JiT)	18	29	18	3,723076923	2	p = 0,155
Six Sigma	10	41	85	62,66176471	2	p < 0,001
Total Quality Management (TQM)	5	36	58	42,96969697	2	p < 0,001

Function: Profit

Kaizen	20	31	54	17,2	2	p < 0,001
Value Stream Mapping (VSM)	21	46	87	43,25974026	2	p < 0,001
Theory of Constraints (TOC)	19	10	68	60,26804124	2	p < 0,001
Total Productive Maintenance (TPM)	11	21	33	11,2	2	p = 0,004
Total Quality Management (TQM)	7	14	40	29,73770492	2	p < 0,001

Appendix 2. The matrix of correlation coefficients between the studied variables

Variable	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	r	s	t	u	w	z	x	y	a1
a	1																								
b	0,682950128	1																							
c	0,673569419	0,999918512	1																						
d	0,719655176	0,99867356	0,997934875	1																					
e	0,273908341	0,889594692	0,895353044	0,864897039	1																				
f	0,630168705	0,997549372	0,998361265	0,992623696	0,919371684	1																			
g	0,199990205	0,852291411	0,858899393	0,824228667	0,997105296	0,886799722	1																		
h	0,4529749	0,960585815	0,964056255	0,944998546	0,987681279	0,977681198	0,964103167	1																	
i	0,380436465	0,935358325	0,93979743	0,915905874	0,993643275	0,957813219	0,982207577	0,996815182	1																
j	0,435777017	0,955072401	0,958778043	0,938545615	0,98499575	0,973467899	0,969022798	0,999815724	0,998162371	1															
k	0,392102502	0,939756941	0,944044307	0,920909223	0,992140017	0,961371384	0,979753843	0,997744045	0,999920018	0,998848922	1														
l	0,410249658	0,946344604	0,950392913	0,928450177	0,989466372	0,966635647	0,97559539	0,998878176	0,999473234	0,999603151	0,999803753	1													
m	0,410249658	0,946344604	0,950392913	0,928450177	0,989466372	0,966635647	0,97559539	0,998878176	0,999473234	0,999603151	0,999803753	1	1												
n	0,171152745	0,836575422	0,843501082	0,807257394	0,994444784	0,872856322	0,999569368	0,955896301	0,97627382	0,961358342	0,973457057	0,968731995	0,968731995	1											
o	0,320451377	0,910796216	0,915992486	0,88833053	0,998811881	0,93745012	0,992215357	0,989665189	0,997948716	0,992235592	0,997059226	0,995345382	0,995345382	0,988133736	1										
p	0,203670025	0,854250629	0,860817526	0,826350354	0,997383925	0,888529837	0,999992942	0,965093986	0,982906229	0,969943862	0,980499128	0,976413481	0,976413481	0,999452063	0,992676245	1									
r	0,114707867	0,803983153	0,811508918	0,772298654	0,98682695	0,843618358	0,996270963	0,937598348	0,96234171	0,944100692	0,958826619	0,953012427	0,953012427	0,998373738	0,977770617	0,995939767	1								
s	0,352762174	0,924424584	0,929217729	0,903562279	0,996551923	0,948841767	0,987358624	0,994002338	0,999557597	0,995918509	0,999101484	0,998065806	0,998065806	0,982282323	0,999411282	0,987947169	0,970001222	1							
t	0,346500612	0,921855149	0,926727265	0,900678578	0,997084193	0,9467103	0,988395896	0,993249256	0,999336495	0,995293048	0,998795918	0,997628038	0,997628038	0,98351289	0,999618259	0,988959628	0,971604277	0,999977666	1						
u	0,324731897	0,912653954	0,917797438	0,890398098	0,998581287	0,939014828	0,991642034	0,990303553	0,99822802	0,992787893	0,997395595	0,995771025	0,995771025	0,987429028	0,999999774	0,992119779	0,976812399	0,999556217	0,999732981	1					
w	0,328767152	0,914390763	0,919484313	0,892333431	0,998344835	0,940474486	0,991082133	0,990887661	0,998472984	0,993290701	0,997694449	0,996154197	0,996154197	0,986745162	0,999961351	0,991575785	0,97588292	0,999674	0,999822529	0,999990885	1				
z	-0,02153443	0,715588672	0,724447634	0,678673266	0,955634316	0,762707863	0,975264013	0,881561975	0,91640012	0,890461734	0,911264506	0,902927282	0,902927282	0,981330359	0,940144564	0,974426641	0,990698737	0,927899498	0,930370525	0,938593866	0,937112196	1			
x	0,111092388	0,801814047	0,809377285	0,769981998	0,986231744	0,841658977	0,995950418	0,936326878	0,961346175	0,942894906	0,957786899	0,951903831	0,951903831	0,998159692	0,977001183	0,995605607	0,999999338	0,969110222	0,970726889	0,976026889	0,975088714	0,991187314	1		
y	0,292918323	0,898473565	0,904004942	0,874676684	0,999803527	0,926988778	0,995402274	0,985103449	0,99567949	0,988223056	0,994425452	0,99214144	0,99214144	0,992162962	0,999581605	0,995755117	0,983426296	0,998000778	0,99840886	0,99944058	0,999288676	0,949607916	0,982760052	1	
a1	0,233657138	0,869821214	0,876048618	0,843264453	0,999134129	0,90220856	0,999405302	0,97268588	0,98809922	0,976962706	0,986074783	0,982586733	0,982586733	0,997963067	0,995919526	0,999527804	0,992703348	0,992236994	0,993045982	0,995501226	0,995087613	0,967061906	0,992258009	0,998113134	1

where: a – minimization of the employee rotation process, b – increase in knowledge and competence, c – involvement of employees in the lean process, d – implementation of the adopted strategic objectives, e – modification of the hotel operation strategy, f – implementation of a new management model, g – improvement of work safety, h – building a competitive advantage, i – selection of the optimal time of tasks to be performed, j – increase in the effectiveness of service provision, k – retention of new customers, l – standardization of services, m – acquiring new customers, n – providing value for the customer, o – long–term development, p – modification of the organizational structure, r – improvement of work organization, s – ensuring the availability of services within a certain period of time, t – improvement of the quality of services offered, u – minimization of the time of providing services, w – improvement of the quality of guest service process, z – increase in the hotel's prestige, x – company reorganization, y – cost minimization, a1 – improvement of the control process.