Revista Gestão & Tecnologia
e-ISSN: 2177-6652
revistagt@fpl.edu.br
http://revistagt.fpl.edu.br/

HOW TO INDICATE THE AREAS FOR IMPROVEMENT IN SERVICE PROCESS - the knowledge management and value stream mapping as the crucial elements of the business approach

COMO INDICAR AS ÁREAS DE MELHORIA NO PROCESSO DE SERVIÇO – o gerenciamento de conhecimento e mapeamento de fluxo de valor como elementos cruciais da abordagem de negócios

CÓMO INDICAR LAS ÁREAS PARA LA MEJORA DEL PROCESO DE SERVICIO: la gestión del conocimiento y el mapeo de valores de valor como los elementos cruciales del enfoque empresarial

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Editor Científico: José Edson Lara
Organização Comitê Científico
Double Blind Review pelo SEER/OJS
Recebido em 20.03.2020
Aprovado em 23.04.2020

Abstract

Building value in the service process requires a lot of involvement of both organizations and customers. The condition for the optimal use of information from customers is the ability to find relationships between these data and elements of knowledge management. The purpose of the paper is to present the possibilities of implementing knowledge management principles in the aspect of service improvement based on value stream mapping and customer satisfaction assessment in order to indicated key quality problems. Authors attempted to assess the service quality in the context of information flows in an organization providing medical services. The customers feedback and the ability to assess customers attitudes is an important factor in building high quality medical services. In paper, the principles of knowledge management in relation to the improvement of 5 areas delineated on the process map have been applied. The results of customer's satisfaction assessment in relation to areas of the values flow map have been presented. The results demonstrate that proper knowledge management and optimal value stream flows have an impact on service quality assessments - as demonstrated by CSI. This study contributes to develop service process management and knowledge management based on the principles of customer value co-creation.

Keywords: customer satisfaction, value adding, value stream mapping, service quality, knowledge management

Resumo

A criação de valor no processo de serviço requer muito envolvimento de organizações e clientes. A condição para o uso ideal das informações dos clientes é a capacidade de encontrar relacionamentos entre esses dados e os elementos do gerenciamento de conhecimento. O objetivo do artigo é apresentar as possibilidades de implementação dos princípios de gerenciamento de conhecimento no aspecto de melhoria de serviço, com base no mapeamento do fluxo de valor e na avaliação da satisfação do cliente, a fim de indicar os principais problemas de qualidade. Os autores tentaram avaliar a qualidade do serviço no contexto dos fluxos de informações em uma organização que presta serviços médicos. O feedback dos clientes e a capacidade de avaliar as atitudes dos clientes são um fator importante na construção de serviços médicos de alta qualidade. Em papel, foram aplicados os princípios de gestão do conhecimento em relação à melhoria de 5 áreas delineadas no mapa do processo. Os resultados da avaliação de satisfação do cliente em relação às áreas do mapa de fluxo de valores foram apresentados. Os resultados demonstram que o gerenciamento adequado do conhecimento e os fluxos ideais de fluxo de valor têm um impacto nas avaliações da qualidade do serviço - conforme demonstrado pela CSI. Este estudo contribui para o desenvolvimento de gerenciamento de processos de serviço e gerenciamento de conhecimento com base nos princípios de co-criação de valor para o cliente.

Palavras-chave: satisfação do cliente, agregação de valor, mapeamento de fluxo de valor, qualidade de serviço, gerenciamento de conhecimento

Resumen
La creación de valor en el proceso de servicio requiere una gran participación de las organizaciones y los clientes. La condición para el uso óptimo de la información de los clientes es la capacidad de encontrar relaciones entre estos datos y los elementos de la gestión del conocimiento. El propósito del documento es presentar las posibilidades de implementar principios de gestión del conocimiento en el aspecto de la mejora del servicio basado en el mapeo de flujo de valor y la evaluación de la satisfacción del cliente para indicar problemas clave de calidad. Los autores intentaron evaluar la calidad del servicio en el contexto de los flujos de información en una organización que proporciona servicios médicos. Los comentarios de los clientes y la capacidad de evaluar las actitudes de los clientes es un factor importante en la construcción de servicios médicos de alta calidad. En papel, se han aplicado los principios de gestión del conocimiento en relación con la mejora de 5 áreas delineadas en el mapa del proceso. Se han presentado los resultados de la evaluación de satisfacción del cliente en relación con las áreas del mapa de flujo de valores. Los resultados demuestran que la gestión adecuada del conocimiento y los flujos óptimos de flujo de valor tienen un impacto en las evaluaciones de calidad del servicio, como lo demuestra CSI. Este estudio contribuye a desarrollar la gestión del proceso de servicio y la gestión del conocimiento basada en los principios de la creación conjunta de valor para el cliente.

Palabras clave: satisfacción del cliente, valor agregado, mapeo de flujo de valor, calidad de servicio, gestión del conocimiento

1. Introduction

Each company must face the emerging changes in the market and look for new strategies. The development of the strategy should concern its development in various ways, e.g. technologies used, products or services offered, technological resources, quality, methods of production organization. It is therefore necessary to look for a variety of tools that will allow to indicate the direction of the strategy and to resolve key operational problems of the enterprise. The information and decision process can be used the instruments such as knowledge management and value stream mapping, which are not so obvious choice, but according to the authors can be very useful (Koren, Wang, & Gu, 2017; Tyagi, Choudhary, Cai, & Yang, 2015; Yen Hsu & Hsu, 2016).

The efficiency of information flow becomes the basis for development in the field of knowledge management in the enterprise. The undisturbed information flow has a positive impact on increasing productivity and competitiveness, even on global markets and complex business environments. Both corporations, large enterprises as well as medium, small and micro enterprises should focus on their high flexibility and sensitivity to the changing market demands. The management of the company's development is directed primarily at high agility

in the aggressive business market, which is often understood as the implementation of the principles of Lean Management (Lean Production, Manufacturing or Service) (Bitkowska, 2017; Dombrowski et al., 2012; Fitriyah, 2019; Hoellthaler et al., 2018; Kadarova and Demecko, 2016; Klimecka-Tatar, 2017).

Based on the literature review in the field of Knowledge Management and Value Atream Mapping, as well as satisfaction assesment it has been observed that so far nobody has undertaken the effort to search for connection between knowledge management areas in the context of real information flows in service enterprises (Ingaldi and Ulewicz, 2019; Nadziakiewicz and Mikolajczyk, 2019).

The purpose of the paper is to present the possibilities of implementing Knowledge Management principles in the aspect of service improvement based on value stream mapping and customer satisfaction assessment in order to indicated key quality problems and to include them in the strategy of the enterprise. In paper, the principles of Knowledge Management in relation to the improvement of 5 areas delineated on the process map have been applied.

Authors attempted to assess the quality of services in the context of information flows in an organization providing medical services. In order to achieve it, the research was divided into three stages (Fig. 1).

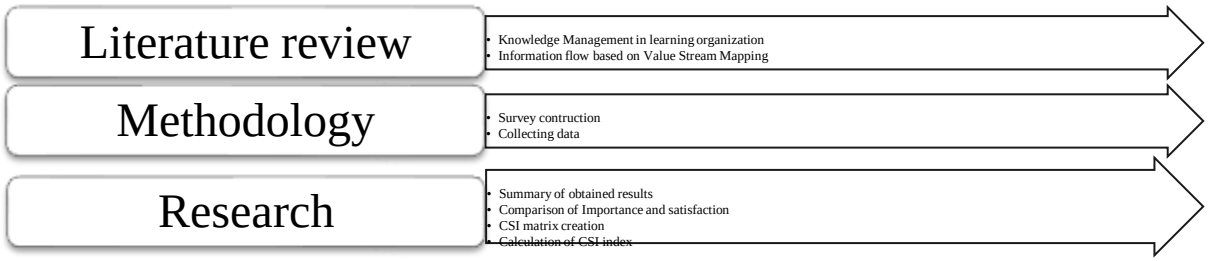


Figure 1. Structure of conducted research.

2. Literature review

2.1 The importance of Knowledge Management in learning organization in the concept of improvement

A learning organization is perceived as an organization that strives for continuous improvement and development, and is defined as an organization demonstrating adaptive abilities. The learning organization, in pursuit of excellence based on observation and lesson learned when solving errors that have arisen in the past (Gagnon et al., 2015). In order to better understand the goals of the learning organization, it is worth paying attention to various factors that influence the course of the process, in accordance with the flow of the stream

value. The main assumption of knowledge management in the learning organization is to build connections and correlations between different types of knowledge and to ensure the flow of information between the company's cells for the implementation of the process (Toszewska-Czerniej, 2015). It should be noted that the specific areas of the process must fully meet the process requirements in terms of quality, time and cost (Serna M. et al., 2017). In this respect, it is necessary to acquire knowledge about the process based on meeting the requirements, thus based on documentation, analysis of process dynamics and variability (Imran, Bilal, Aslam, & Rahman, 2017; Imran, Rehman, Aslam, & Bilal, 2016; Kim, Lee, Chun, & Benbasat, 2014; López-Nicolás & Meroño-Cerdán, 2011; Mohapatra, Agrawal, & Satpathy, 2016).

Knowledge management is also part of the entrepreneurship and innovation management assumptions, which have become the basis for the growth of the economy in the aspect of the industries' development (Lee, Choi, & Lee, 2020; Singh and Gaur, 2018; Singh, 2018; Sasidharan, 2019; Yan Xin, Ville Ojanen, & Janne Huiskonen; Zaim, Keceli, Jaradat, & Kastrati, 2018). Knowledge management is not tantamount to the flow of data, and certainly cannot be considered as equal to the dose of data and information. Knowledge can first and foremost be described as something that enables the data and information management in every enterprise – in this aspect knowledge is characterized by three parameters (uit Beijerse, 2000):

- information – entire set of information that is needed for the functioning of the company,
- capacity – it is the ability to interpret data and transform it into relevant information – in relation to the company, it is mainly the use of the competence and skills of employees,
- attitude – an attitude that makes employees want to think, grow, interpret and act.

In this paper, the basis for the conducted research is a process mapping model starting from its source. According to the assumption, the value stream mapping aims to illustrate all dependencies between the company's cells (Dinis-Carvalho, Guimaraes, Sousa, & Leao, 2019; Narayanamurthy, Gurumurthy, & Moser, 2018; Oberhausen & Plapper, 2017). Graphical representation of the process in the form of a map (big pictures) also gives the opportunity to properly determine the dependencies, benefits and difficulties in the management of the knowledge and information flow (Najda-Janoszka, 2016). The technique

of the process mapping (Value Stream Mapping - VSM) is based mainly on the depiction of the process in its present state (Current State Map) (Dinis-Carvalho et al., 2019). A thoroughly and objectively developed map is the basis for designing changes in the process, by improvement in small steps according to the Kaizen philosophy, implementation of process or organizational innovations, as well as comprehensive process reengineering (Huarng et al., 2018; Lizak, 2016; Kumar et al., 2018).

It is worth noting that the current state map is the starting point for the implementation of changes that will have a special impact on the company strategy - efficiency of the process, material management, financial management etc (Nowacki and Bachnik, 2016). When generating a process map, it is necessary to have knowledge of resource support such as information, know-how, intellectual and professional skills, inputs and outputs, quality and operational risk constraints, moderation, level of control and monitoring, as well as taking into account when using the operational knowledge of experts and project participants operating within one of the five areas defined on the map (Gromoff et al., 2016). Therefore, the map of the present state should also be armed with information on the competences of the process participants (in accordance with the position requirements), in correlation with the external knowledge used (Smoląg and Kot, 2018; Tseng, 2012).

2.2 Freamwork of Knowledge Management in process value stream mapping

Knowledge management is described as the entirety of activities used to identify, preserve, disseminate and use the knowledge of the company's employees. Knowledge in the explicit or implicit form is necessary to redirect actions to the goal of improving the efficiency and effectiveness of employees' activities (Azmi, Nawawi, Latif, & Ling, 2015; Brown & Duguid, 2001; Criado-García, Calvo-Mora, & Martelo-Landroguez, 2019; Ganguly, Talukdar, & Chatterjee, 2019; Yee, Tan, & Thurasamy, 2019). The concept of knowledge management is perceived by contemporary enterprises as one of the most important elements of management strategy. According to the observations of the development of the largest enterprises, the methods and strategies of gaining a competitive advantage (e.g. launching new products) have become less and less effective. The weak impact of product volatility on the competitiveness of enterprises results from the fact that both products and processes are easy to copy (Mardani *et al.*, 2018).

In order to create the right framework for knowledge management in the process and in the enterprise, the use of a model relating to the imaging of material and information flows in the enterprise is conclusive (Hellebrandt *et al.*, 2018).

The basis for developing the knowledge management model is the current state map (CSM) of the process divided into five basic areas. Each process map consists of areas that are responsible for a series of collected data, information, knowledge focuses on the selected elements. Areas from 1 to 5 are focused on knowledge, respectively: defining customer requirements identification of information flows, identification of material flows, determining the relationship between material and information flows, analysis and estimation of added value (Ali *et al.*, 2016; Klimecka-Tatar, 2017; Kowalik and Klimecka-Tatar, 2017).

Area 1 (Figure 2a): The specification of customer requirements includes:

- determining the object for analysis,
- customer requirements, service standards (quantity, frequency of deliveries, packaging method, delivery times, quality of deliveries),
- inventory level in the analyzed subsystems.

Area 2 (Figure 2b): Identification of information flows is associated with:

- preparing forecasts regarding the volume of orders,
- ongoing analysis of order fulfillment,
- determining the recipients of information regarding order fulfillment and production process,
- studying the time of information flow (it can be expressed by the time of waiting for information to be processed),
- identification of persons responsible for order processing, scope of information exchange between suppliers and recipients.

Area 3 (Figure 2c): Identification of material flows, focuses on:

- defining the company's requirements as to the raw materials and products of the planned deliveries (ie the size of deliveries and the number of suppliers), packaging,
- identifying the components of the process, determining the type of operation, their duration,
- identifying places of errors and waste of resources,
- determining the size of production batches,

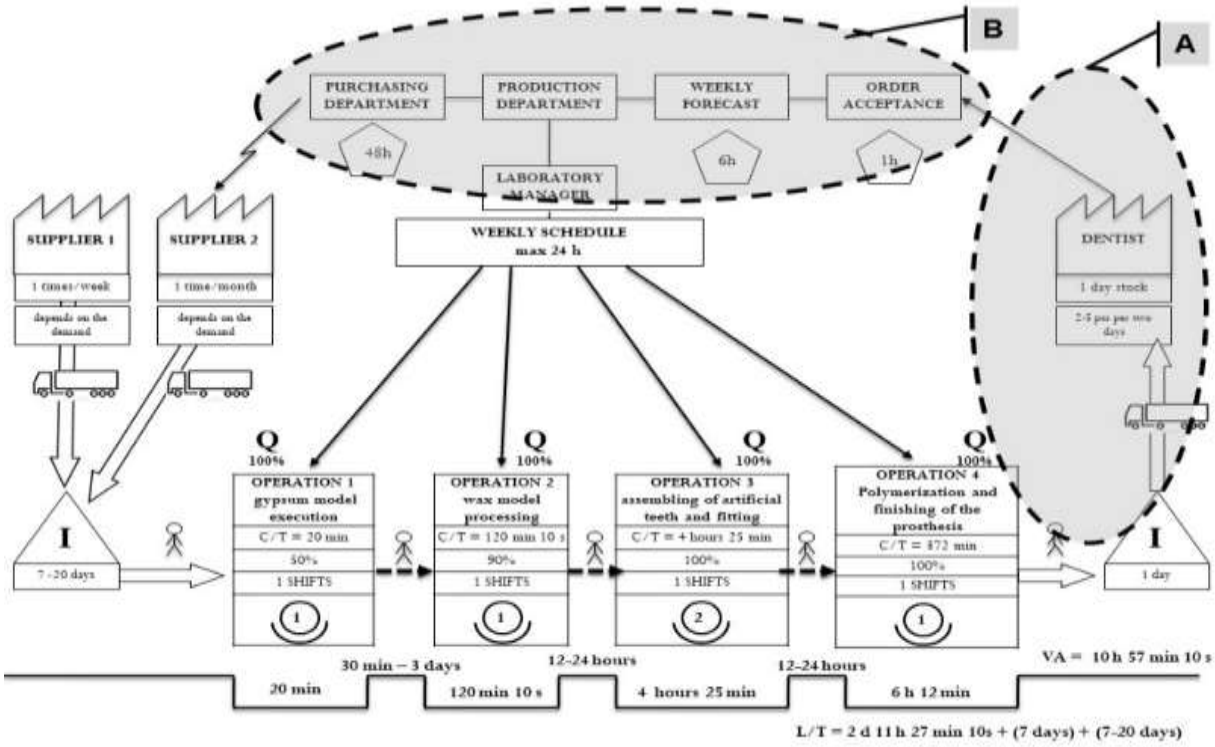
– analysis of the use of workplaces' load.

Area 4 (Figure 2d): Determination of the relationship between material and information flows.

– integrates the previously obtained data and allows determining what kind of information is necessary in the individual phases of the production process and what actions should be taken in the event of disturbances.

Area 5 (Figure 2e): Analysis and estimation of added value.

– summary and at the same time a supplement to the previous stages. The full analysis determines the total duration of the production cycle (VA + NVA) and the time creating value added during the cycle (VA).



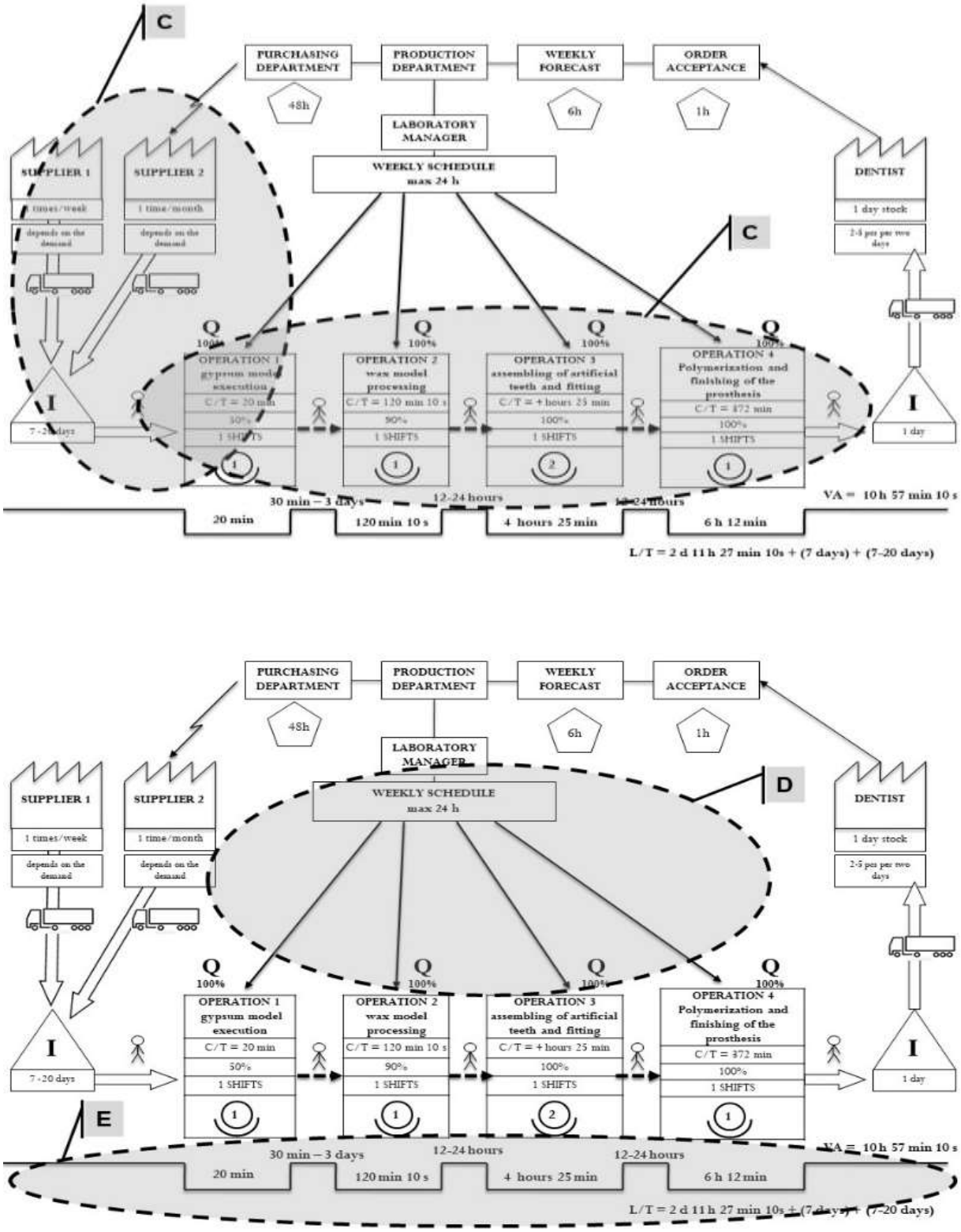


Figure 2. The example – the representative process map - current state map (CSM) with selected five areas for analysis: a) A - Area 1: The specification of customer requirements; B - Area 2: Identification of information flows; c) C - Area 3: Identification of material flows; d) D - Area 4: Determination of the relationship between material and information flows; E - Area 5: Analysis and estimation of added value.

3. Methodology

The research carried out concerned on the determination of the selected specialist services features, in the aspect of improving knowledge management in the service provision process. The main purpose of the conducted research was to identify the areas that, according to customers, require improvement, which in turn translates into changes in knowledge management in selected areas. The survey has been conducted in the form of an online questionnaire. The questions in questionnaire have been created for the needs of these surveys, however, the questions were created in such a way as to be a universal tool for improving other types of services.

The survey has been carried out on a group of patients in a clinic specializing in dentistry and dental prosthetics. Customers/patients were asked to express an opinion on the specialist services that was offered and provided to them. The survey had a paper form and was handed to customers/patients only after the service was provided. Customers/patients, after completing it, were asked to put it into the prepared wood-box, so that they could feel free when filling and returning it and ensure anonymity. It was assumed that the analysis will require min. 150 properly completed surveys. It should be remembered that specialized services were analyzed, so this is a very specific situation, not all customers decide to use them. The survey was conducted in November 2017 - June 2018.

The survey has been completed by 203 customers that used the selected specialist service, but only 189 correctly completed surveys were taken into consideration for further analysis. Customers/patients were supposed to indicate the importance of individual features of a selected specialist service, as well as to assess their satisfaction with the fulfillment of a given service feature (evaluate it). Both validity and satisfaction have been assessed on a scale of 1-5, as described in Table 1. Validity means how important a feature is for the patient when it comes to the specialized services. While satisfaction means how the patient assessed the feature of the service after it was provided.

Table 1. Scale of validity and satisfaction ratings

Marks on the left side of the table show how important the aspects of the service are to you, according to the following scale:
5 - very important
4 - important
3 - indifferent
2 - unimportant
1 - completely unimportant
On the right side, however, how you assess the service (satisfaction) according to the following scale:
5 - very good
4 - good
3 - neither bad nor good
2 - bad
1 - very bad

Importance					**Aspect of service**	**Satisfaction**				
5	4	3	2	1		5	4	3	2	1
					1. Question/Feature					

All features included in the survey are divided into 5 areas: requirements, information flow, material flow, process management and add value. In each group there are 4 features regarding the service:

Area 1. Requirements:

1. Did the proposed range of services meet your requirements?
2. Did you have the option of choosing the service parameters yourself?
3. Did you have the option of choosing materials for the service yourself?
4. Did you have the opportunity to determine the time of the service?

Area 2. Information flow:

5. Did communication with employees take place in a pleasant atmosphere?
6. Did the employees use an intelligible language?
7. Were the employees able to advise on the choice of service parameters?
8. Were the employees able to advise in the selection of materials?

Area 3. Material flow

9. Did you have sufficient choice of materials?
10. Were the materials that you selected available?
11. Was it possible to change the materials during the order realization?
12. Were the materials used during the service provision of high quality?

Area 4. Process Management:

13. Have all selected parameters been included in the finished service?
14. Have all selected materials been included in the finished service?

15. Did the service comply with the service ordered?
16. Did you participate directly in the process of providing services?

Area 5. Complement - price of implementation, time of value adding:

17. Was the price of the service completion adequate for the services ordered?
18. Did the price of the service comply with the price when placing the order?
19. Did the time of the service comply with the order?
20. Did the finished service meet your expectations?

The elements of the Customer Satisfaction Index (CSI) method were used to develop of the obtained results. The CSI index is constructed on the basis of a customer satisfaction model and expands connections and dependencies between three groups of factors: perceived quality, expected quality and perceived price-to-quality ratio. This approach allows measuring and analyzing the level of customer satisfaction in terms of every feature that is important from the point of view of customer satisfaction as well as total satisfaction with the purchase and consumption of a product/service. It also allows analyzing changes in preferences and the assessment of the level of satisfaction with the products of competitive enterprises.

The value of the CSI index achieved for a given product or service of the company can be compared with the competition. In the literature devoted to the issue of satisfaction, the so-called the theory of two factors, which assumes that certain product or offer attributes affect only the prevention of the impression of dissatisfaction, while others shape customer satisfaction.

Based on the analysis of dependencies from previously collected data, two groups of factors can be distinguished - factors affecting dissatisfaction and factors affecting satisfaction. Factors influencing dissatisfaction are those that are important and poorly rated in the group of dissatisfied. Assuming the necessity to provide basic features of the service that create a certain standard (minimum), the management staff should not count on customer satisfaction, but only on the lack of dissatisfaction. Satisfaction appears only when the requirements for secondary features are met.

It was calculated how many times each rating had been noticed for each feature in the case of validity and satisfaction. Based on these data average scores have been calculated. Average ratings have been used to create a radar chart, on which average validity and

evaluation of individual features, as well as the difference between average validity and ratings were placed. Next, using the average of validity and evaluation, a CSI matrix had been created, on the basis of which areas for improvement were indicated. Average ratings of individual criteria (features) in the case of validity and satisfaction can be used to create the CIS matrix. The CSI matrix is shown in Figure 3. Both axes start at point 1 (minimum rating). The maximum values for both variables are 5. However, the auxiliary lines marking individual fields are in point 3.

The most important features of the CSI matrix are those that are located in the upper left field of the matrix, meaning "Features that requires improvement in the shortest possible time". As elements requiring quick improvement, they should be included as important points in the company's strategy being developed. Because the improvement of these features will greatly improve the quality of services provided, and thus increase the satisfaction of customers.

Importance		
	Features that requires improvement in the shortest possible time	Features that should be maintained and monitored
	Features that requires improvement in longer period of time	Non-essential features that do not require any input
	Satisfaction	

Figure 3. CSI matrix

Also the CSI index has been calculated according to the formula (Hall, 2013):

$$CSI = \sum_{j=1}^{n} \left(\frac{\sum_{i=1}^{c} (w_{ij} \times o_{ij})}{\sum_{i=1}^{c} (w_{ij} \times m_{ij})} \right) / n \qquad (1)$$

where:

c - number or satisfaction criteria (specialist services features);

n - number of interviewed people;

w - importance of the satisfaction criterion (w_{ij} is the importance of the *i*-th criterion for *j*-th respondent's);

o - assessment of the satisfaction criterion (w_{ij} is the assessment of the *i*-th criterion for *j*-th respondent's);

m - maximum assessment of the satisfaction criterion (m_i is theoretically the highest assessment of i-th satisfaction criterion).

The CSI value can be given in numbers or percent. Percentage interpretation of the CSI index is presented in Table 2.

Table 2. Criteria for assessment of the CSI index (Woźniak & Zimon, 2016)

Value of CSI [%]	Assessment
0-40	Very bad – an extremely dissatisfied customer.
40-60	Bad – a dissatisfied customer.
60-75	Average - there are some problems in terms of customer satisfaction.
75-90	Good - there are few problems with customer satisfaction.
90-100	Very good – an extremely satisfied customer.

The results collected during the survey were analyzed with use of above mentioned method. At the beginning it had been calculated how many times each rating had been noticed for each feature in the case of validity and satisfaction. Based on these data average scores for individual features and groups of features had been calculated. Average ratings had been used to create a radar chart, on which average validity and evaluation levels of individual features (to compare the level of ratings of individual features) had been presented. To see level of customers' satisfaction bar graph had been created, in order to show different between satisfaction and validity. Positive results means satisfaction of customers cause by individual feature, while negative results means dissatisfaction. Next, the CSI matrix has been created on the basis of average ratings of validity and satisfaction. As the last element of analysis, using the average of validity and evaluation, a CSI matrix had been created, on the basis of which areas for improvement were indicated.

4. Results and discussion

In this paper the customer/patient satisfaction with the service has been evaluated in the aspect of improving knowledge management in the service process. The research has been conducted in accordance with the framework of knowledge management in process – in accordance to 5 areas of process goals and responsibility. Regarding the answers collected

during the survey, data in Table 3 present all numerical results. Whereas, in Table 4 the average scores for the individual areas are presented

Table 3. Data set

Average importance	*Importance*					*Aspect of service*	*Satisfaction*					Average satisfaction
	VERY IMPORTANT	IMPORTANT	INDIFFERENT	SMALL MEANING	NOT RELEVANT		VERY SATISFIED	RATHER SATISFIED	INDIFFERENT	RATHER DISSATISFIED	VERY DISSATISFIED	
	5	4	3	2	1		5	4	3	2	1	
4.36	104	54	26	5	0	*1*	27	79	65	9	9	*3.56*
4.01	61	88	22	16	2	*2*	19	68	63	22	17	*3.26*
4.15	81	73	21	11	3	*3*	26	67	62	21	13	*3.38*
3.80	43	78	56	11	1	*4*	34	83	51	16	5	*3.66*
4.70	137	48	3	1	0	*5*	87	72	18	9	3	*4.22*
4.77	148	39	2	0	0	*6*	61	78	39	7	4	*3.98*
4.19	81	76	22	7	3	*7*	56	78	41	5	9	*3.88*
4.30	92	71	19	5	2	*8*	32	59	54	38	6	*3.39*
4.16	81	67	18	14	2	*9*	9	61	44	42	33	*2.85*
4.48	99	83	5	2	0	*10*	15	58	49	39	28	*2.96*
3.74	48	54	77	9	1	*11*	21	44	59	49	16	*3.03*
4.56	116	62	11	0	0	*12*	11	39	49	56	34	*2.67*
4.62	125	57	7	0	0	*13*	32	64	56	28	9	*3.43*
4.61	119	66	4	0	0	*14*	28	62	54	32	13	*3.32*
4.74	142	44	3	0	0	*15*	33	56	51	31	18	*3.29*
3.62	44	61	54	28	2	*16*	18	57	71	26	17	*3.17*
4.03	63	74	47	5	0	*17*	0	31	34	77	47	*2.26*
4.83	157	32	0	0	0	*18*	3	29	52	52	53	*2.35*
4.73	138	51	0	0	0	*19*	2	8	34	79	66	*1.95*
4.86	162	27	0	0	0	*20*	11	10	42	77	49	*2.24*

Table 3. Average validity and average content for individual areas

Validity	Area	Satisfaction
4.079365	Requirements	3.4669312
4.490741	Information flow	3.8677249
4.231634	Material flow	2.8756614
4.396825	Process Management	3.3042328
4.612434	Add value	2.1997354

Customers/patients, as the most important features, indicated (in order from the most important): 20. Did the finished service meet your expectations?, 18. Did the price of the service comply with the price when placing the order?, 6. Did the employees use the

intelligible language?, 15. Was the service compliant with the service ordered?, 19. Did the time of the service comply with the time specified during the service?

Customers/patients paying for a specialist service expect to meet all their requirements, at a pre-agreed price, at specific times and that the service should be carried out in a predefined manner. It is also important because it is a specialist service, so that employees can use an intelligible language, because the customers/patients do not have to be familiar with the given service.

The customers/patients also indicated the features of the specialist service, which are the least important (in the least important order): 16. Did you participate directly in the process of providing services? 11. Was it possible to change the materials during the order? Did you have the option of determining the time of the service? These features are least taken into account when using the service.

Customers assessed the features, indicating which of them gave them the highest satisfaction. These features were (in order from the most important): 5. Did communication with employees take place in a pleasant atmosphere?, 6. Did the employees use a comprehensible language?, 7. Have the employees been able to advise on the choice of service parameters? These are features related to direct contact with employees, and in particular with information flow. This is an area that from the point of view of customers does not require improvement.

The lowest satisfaction has been noted for the following features (in the least satisfactory order): 19. Was the service time compliant with the time set for the service ?, 20. Did the finished service meet your expectations?, 17. Was the service price adequate to the ordered service?. These are features from the 5^{th} area, which requires the greatest improvement.

As the most important area, clients participating in the study have just indicated the fifth area, which refers to price of implementation, time of value adding. These are features related to the final performance of services, i.e. price, delivery time and ready service. On the other hand, the area was rated the lowest from the point of view of customer satisfaction. This is an area that first needs to be improved. Managers should immediately take actions aimed at proper knowledge management in this area as well as in areas that correlate with the features indicated here.

High requirements were also noted for the information flow area. This is an area related to the flow of information from employees to the customer. Customers pay special attention to the behavior of employees, but also to the language they use or professional help. At the same time, this group was rated the highest in terms of customer satisfaction. However, it should be emphasized that the requirements for specialist services are very specific, hence the fact that they are also very important for customers. The reception of such services is also specific, the clients are very demanding, and so they can also be very rigorous in their assessment, which explains the low ratings of customer satisfaction. Figure 4 shows a radar chart, showing the average validity and ratings obtained by the individual features of the service being tested. In contrast, Figure 5 presents the differences of these averages.

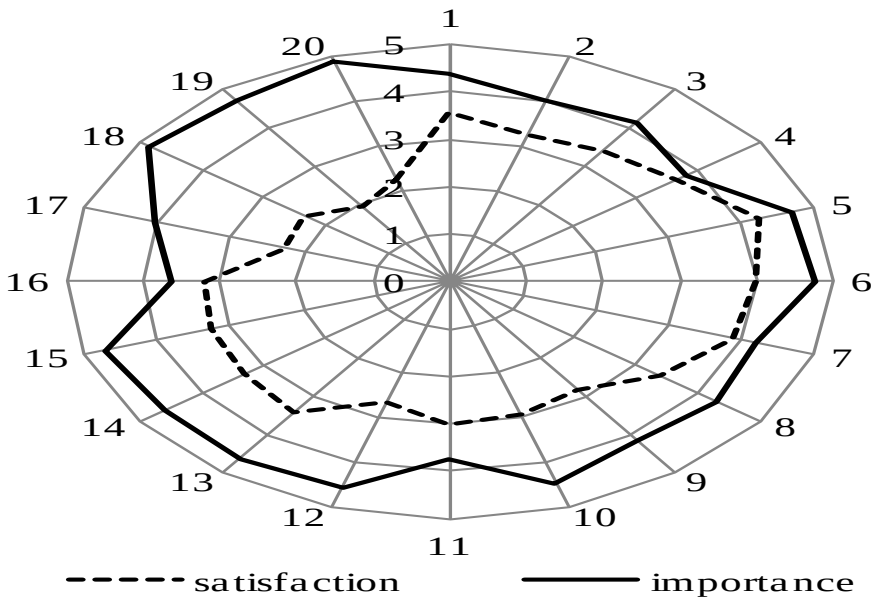


Figure 4. Average validity and evaluation of the characteristics of a specialist service

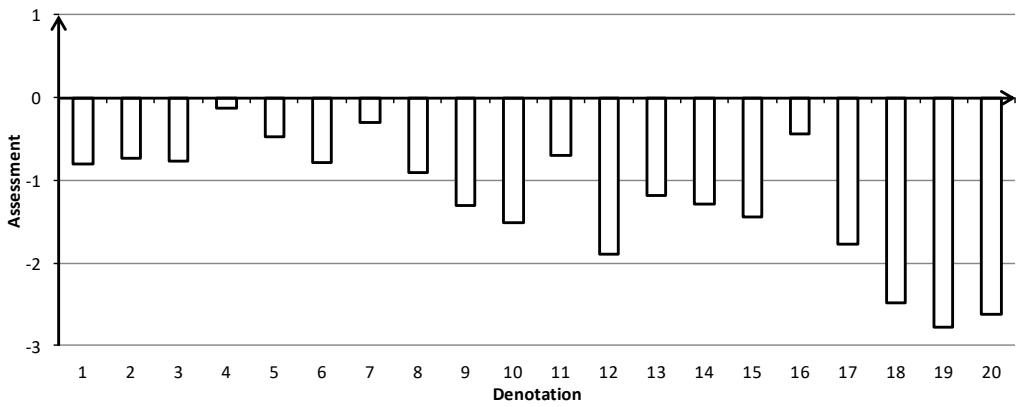


Figure 5. Differences in the average of validity and assessments of the characteristics of a specialized service

Figure 4 shows the differences between the importance and satisfaction of individual features of a specialized service. This chart can also be seen as a preliminary check of customer/patient satisfaction. Fields marked with a solid line are the importance of individual features of a specialist service for customer/patient. The field marked with a dotted line is customer satisfaction. It can be seen that the satisfaction field is much smaller than the validity field, which means that the specialist service examined does not fully meet the expectations of customer/patient. Analyzing the data presented in Figures 4 and 5, it can be seen that in all cases the validity of the feature is higher than customer/patient satisfaction. The difference between the elements in all cases is negative. Large differences, have been noted in the case of the last four features (add value area). This result, unfortunately, means customer/patient dissatisfaction with all the features of the specialist service. Therefore, it can be concluded already at this stage of the research that customers/ patients were dissatisfied with the specialist services they were provided in the research clinic specializing in dentistry and dental prosthetics.

In Figure 6 the CSI matrix for the examined feature is shown. It will indicate the features that most significantly affect customer/patient dissatisfaction and at the same time which should be improved as first.

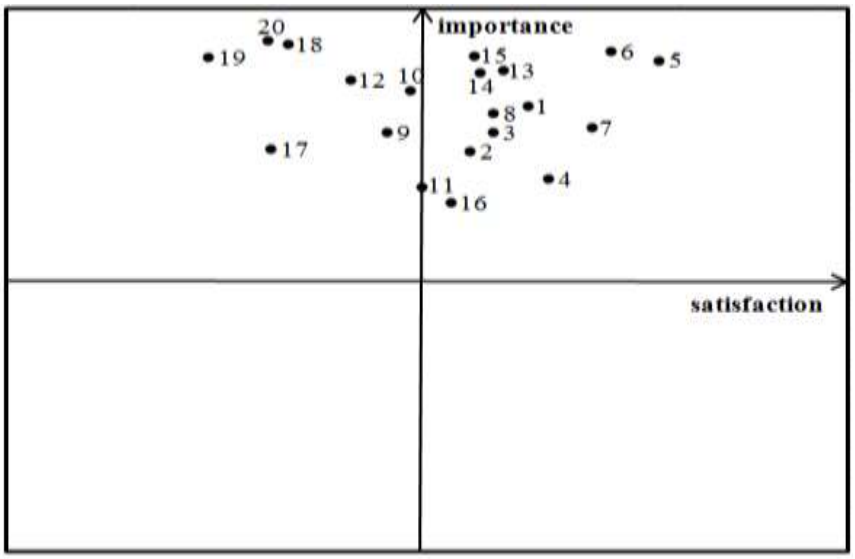


Figure 6. CSI matrix for the studied characteristics of the examined features of a specialized service

Figure 6 shows the high importance of all features of the specialist service being examined from the point of view of the customer. All points in the CSI matrix are located above the X axis. Many features are in the first quadrant of the Cartesian system, which according to Figure 2 means that the features should be maintained and monitored. Summarizing that requires improvement in the shortest possible time. Improvement should therefore be subject to the following features:

9. Did you have sufficient choice of materials?
10. Were the materials that you selected available?
12. Were the materials used during the service provision of high quality?
17. Was the price of the service completion adequate for the services ordered?
18. Did the price of the service comply with the price when placing the order?
19. Did the time of the service comply with the order?
20. Did the finished service meet your expectations?

The above features should be carefully analyzed in order to be able to indicate the directions of improvement of knowledge management in the process area and therefore, should be included in the strategy of the analyzed enterprise.

In addition, one feature is on the border of the first and second quarters, that is 11. Was it possible to change the materials during the implementation of the contract?. Also in this case, the improvement is necessary, because a small change in satisfaction will cause shift of point 11 to the second quadrant of the matrix. For the presented data, the CSI index has been calculated and it is and is equal: CSI = 62.71%.

The result obtained for the CSI index indicates average level of customer/patient satisfaction (according to Table 2). It confirms the previously described problems. Research clinic specializing in dentistry and dental prosthetics should be careful about its specialist services and try to better meet the requirements of its customers/patients. Because this result is unsatisfactory, and a slight decrease (below 60%) will mean a poor level of service and customer/patient satisfaction. And with the huge competition on the market, no company can afford it.

5. Conclusions

In the paper, the possibilities of implementing Knowledge Management principles in the aspect of service improvement based on value stream mapping and customer satisfaction

assessment in order to indicated key quality problems and to include them in the strategy of the enterprise were presented. To achieve it, the principles of Knowledge Management in relation to the improvement of 5 areas delineated on the process map have been applied. The results of customer satisfaction assessment that correlate to the value stream map have been presented.

By using the CSI methodology, it was possible to identify aspects of service requiring improvement, e.g. sufficient choice of material, availability of selected materials, high quality of materiel during the service provision, price adequate for the services ordered, price of the service complied with the price when placing the order, time of the service complied with the order, finished service that meet customer's expectation.

Analyzing the obtained numerical results, it can be concluded that the level of satisfaction of customers/patients using the specialist services is at an average level. As demonstrated, there are some problems in customer satisfaction. However, it should be emphasized that this result is close to 60%, which means that a small decrease in satisfaction (below this value) will cause the satisfaction level to be at the low level, which means trouble for the company and clients leaving for the competition. The research clearly indicated features that should be improved (areas of improvement). In case of specialized service (dental and prosthetic service), it was clearly indicated that the way of knowledge management in the area of adding value is not adequate. It is recommended to change the approach to the interpretation of data and information and the attitude of employees whose skills and competences are used in this area. The results of customer satisfaction assessment that correlate to the value stream map have been presented. The flow of value streams in service processes is closely related to the Knowledge Management. Therefore, Knowledge Management in an operating environment can be crucial for the quality of services and business strategy.

Limitations in the experimental research results from the specificity of the service. Assuming the use of this type of methodology requires very careful selection of a set of questions. Questions should be tailored to the type of service process including knowledge, information set at every stage of the process.

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