

## Article

# Sustainable Development Economics of Enterprises in the Services Sector Based on Effective Management of Value Streams

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**Abstract:** The world's economy has been significantly affected by the ongoing pandemic crisis. Its logical reflection is a deteriorating condition of national and regional economies and their vehicles—enterprises. Negative effects of the crisis have influenced both the manufacturing sector and the services sector, where some segments have been hit fatally. In the corporate sphere in general, including in the services sector, there has been a growing need to change the approach to corporate strategy. The strategy should be generated based on management of value-creating processes with the objective to maximize satisfaction of customers while minimizing costs. This is also the topic of this paper. A representative sample of small and medium enterprises from the services sector have been surveyed about their size, using mathematical statistics and models that have been proposed to maximize profit probability. The objective was to propose models that maximize probability of profit and, at the same time, minimize costs for each combination of value chain activities (input logistics, provision of services, output logistics, marketing and sale, servicing, and other accompanying activities, purchasing material management, science-technical development, human resources management and company infrastructure). The main outcome of this paper is the fact that we have been able to prove the functionality of the tested model, which has demonstrated the growing importance of value stream management in relation to the size of enterprises. Such a universal and structured model provides a practical tool for the definition of economic-financial, investment and personnel policies in enterprises.

**Keywords:** value-creating processes; value for customer; added value; value stream models; sustainability



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## 1. Introduction

The worldwide coronavirus pandemic has fundamentally changed views, approaches and forms of functioning of the currently recognized economic laws and rules. We can see that the worldwide and European economic systems, as well as regional and local economies, have experienced significant disruption of the so far progressive economic growth. Managers of enterprises increasingly look for new methods for management and administration of their businesses, while the integrating requirement is to ensure long-term competitiveness and to maximize the added value [1] or profit margin [2]. This ever more dominating strategic pillar in management of enterprises can be seen as a new direction in the development of businesses in the upcoming era. This trend is universal, and it is expected to be found in all size categories and sectors. According to Huang et al. [3] and Ramani and Lingan [4], the way we look at added value, value streams and processes (Value stream mapping—VSM) has been gradually changing due to the growing need to eliminate

wasting of resources, to reduce production costs and company overheads. A frequently used term is 'sustainability', which in financial terms means that the company can meet its obligations in time while sustainable strategic management on one side creates connection between social and environmental aspects and the company strategy; and on the other side it integrates social and environmental information into knowledge management [5]. Sustainability is a concept which is within the company's responsibility, in the market economy it is critical for the economy, society and the environment, while the basis for sustainable development of an enterprise is the integrity of the company and the concept of maximum effectiveness of the business strategy, which will lead to its long-term financial and market success [6–8].

At the same time, managers more and more intensely look for methods and tools to increase the value for the customer by adding functions to their product or service, or by eliminating unnecessary activities in the production processes [9]. Value stream mapping is a widely used lean technique which generates a diagram of activity streams and other information about the process. It is a standardized technique to record process steps and streams of working items, and then to apply a systematic procedure for analysis of such processes to develop an improvement plan [4].

A value, as defined by customers, includes the ability to deliver the right product or service required by the customer as soon as possible and for a reasonable price. More and more enterprises have analyzed their business processes in a structured way to identify and subsequently to highlight those that are critical for the creation of added value in products and services and, at the same time, to minimize activities that increase costs and thus reduce the final profit margin [10]. Activities with added value directly contribute to the creation of products and services the customers want [9]. It is obvious that the value for the customer (which is a combination of a product/service) is different from what the customer sees as a value, which is a subset of product/service functions, and also different from what the customer is actually willing to pay; for example, the customer may not be willing to pay for a value even though he perceives it as a value [11]. Although the analysis of value streams was originally used to study value streams in extremely big production enterprises, it can also be used in medium and small enterprises in the production and services sectors [12].

A value stream is a process during the manufacturing of a product or provision of a service. It includes activities with added value, necessary activities without added value and wastage. Research has shown that the share of activities with added value is higher in profitable and prospering enterprises, and that in loss-making enterprises the ratio is reversed, with prevailing necessary activities with added value and wastage [13]. The current state map of value streams in the company is the starting point for making changes that will have a particular impact on the corporate strategy—process efficiency, material management, financial management, etc. In creating a process map, it is necessary to have knowledge of supporting resources such as information, know-how, intellectual and professional skills, inputs and outputs, quality and operational risk constraints, level of control and monitoring, etc., [14]. In the past, the issues of added value creation and analysis of value streams focused mainly on the sector of manufacturing and industry, however, in the current worldwide economic crisis, the services sector will be also forced to deal with these issues. Keyte and Locher [15] and Gill [16] explain that the approach using measurement of value streams that has been traditionally used in manufacturing and industry can be used also in the services sector, including administrative processes. The analysis of value streams helps companies identify and reduce their failure rate, losses, production time, wasting in corporate processes and find effective measures to reduce work in progress, in order to increase productivity and thus to increase the added value, which leads to improvement of quality of the product in the long term [2,17,18]. In its current form, the analysis and value stream mapping can be used for systematic identification of weaknesses of an enterprise and for identification of effective measures for improvement, despite the fact that, for the setup of customized production and services

(job shop, low volume and high variety production), this standard approach does not address critical target criteria, control parameters and methods [2]. Companies operating in networks with intercompany values face various challenges. The main problems are significant deviations when it comes to analysis and evaluation of value streams data, which may lead to difficulties that prevent efficient and customer-oriented cooperation in globalized manufacturing, trade or services [19]. Another obstacle is the fact that a large amount of important information about value streams is hidden and not accessible for a comprehensive analysis and evaluation within the entire supplier chain [20,21].

Since lean methods have been derived, i.e., borrowed and modified, from manufacturing enterprises, it is necessary to make sure that the tools are also useful in organizations focused on services [22]. When using the principles of lean methods to improve services, the primary focus is on optimization of processes and services, i.e., more efficient services with fewer resources. It can be achieved through professionalization of working functions, which will make it possible for employees to adapt to the changes [23]. Several research institutions addressed the challenge to increase labor productivity and the role of human resource management in services [24–30]. The methods were diverse, often non-systematic and incomprehensive; moreover, many research projects were performed in isolation [23]. The fact is that the services sector still misses scientific works that systematically integrate all variables associated with uncertainty sources contained in value streams of a service enterprise, regardless of the context of the analysis.

Most studies use a close stochastic approach to define value streams, either because they focus on one specific set of uncertainty sources or because they do not provide a user-friendly solution for their integration into one complex [31–33]. It is necessary to use the principles of lean methods in a logical manner for a specific organization focused on services, rather than apply them in a simplified or mechanical manner because they were created for manufacturing enterprises [23]. According to Ende [34], performance of a services company is based on financial management. Two fundamental categories are defined when defining the company value, specifically the overall value of the enterprise for the customers and the value for the owners. The first value is determined by the rules of financial management of processes, the other value is based on the value management theory [35–39]. This paper focuses on the first category, i.e., the value for the customers.

Gunasekaran and Kobu [40], Gavurová and Delina [41], Chenhall [42], Kaplan and Norton [43] and Kennerley and Neely [44] report that shortcomings of traditional approaches have caused a revolution in the generation of corporate strategies. In corporate practice, it is ever more obvious that traditional approaches of strategic management in business entities fail and that they mainly show the financial side of the performance [45]. According to Jenkins [46], traditional approaches use only a retrospective view of the competitive position of the enterprise. A survey conducted among more than 500 enterprises has shown that over 80% of them refuse to generate a corporate strategy with the use of a situation analysis; while the remaining enterprises see the outputs of such an analysis only as informative [47–50]. Clearly, the future approach for the generation of corporate strategy should be based on an analysis of value streams and on maximization of added value while minimizing costs [51–54].

The research activities focused on development of value models (hereinafter the models) that maximize probability of profit produced by enterprises and, at the same time, minimize costs for each combination of value chain activities (input logistics, provision of services, output logistics, marketing and sale, servicing and other accompanying activities, purchasing/material management, science-technical development, human resources management and company infrastructure).

## 2. Materials and Methods

The beginning of the research dates back to 2016 when the research activities focused on strategic management and the decision making of top managers (or owners in the case of micro and small enterprises). The research performed by our department was further

deepened and made more detailed with partial specific research projects supported by the Technology Agency of the Czech Republic. One of the approved and researched topics is management and analyses of value streams, including secondary processes, which is the topic of this paper.

The following two hypotheses were formulated for the research:

**Hypothesis 1.** *Managers in the sector of services perceive the value creating processes identically in all size categories of enterprises.*

**Hypothesis 2.** *Management of value streams in the sector of services can be expressed with a model for all size categories of enterprises.*

The authors believe that the main limitation of the research is the fact that the data were collected and the behavior of the enterprises was investigated in a period of strong economic growth. For this reason, the authors now continue the research in a different stage of the economic cycle. The need for and the utilization of outputs presented in the article became more urgent with the arrival of the COVID-19 pandemic. In companies, the demand increased for new approaches to the generation of business strategies based on value stream mapping. The results of our solution can be seen as an efficient tool for enterprises afflicted by the COVID-19 pandemic to resume their business activities.

### 2.1. Data Description

The conducted research survey focused on an analysis of value streams, including secondary processes, and it used data previously acquired by the authors in the initial stage of the research (model M1; in their research all value chain activities and economic results of the enterprises were seen as variables), and also new data necessary for the development of models of value streams, including secondary processes (model M2; in this research the data were completed with investments made by managers/owners of small and medium enterprises in the individual activities of the value chain, and weight or significance assigned to them, in an interval of the lowest weight of  $-0.5$  to  $1.5$ ). The original set of data included 456 enterprises (from which 373 were small and medium enterprises (SME), including micro enterprises, while 221 were from the services sector). The group of 221 enterprises (from which the M1 model was developed) has been completed with an additional 65 SME (model M2). A micro enterprise was defined as an enterprise with up to 10 employees, an enterprise with 10–50 employees was classified as small, and an enterprise with 50–250 employees was classified as medium. The input data for the model were based on analyses of corporate processes, both core and supporting.

The authors started collecting the data about the enterprises in 2016, and the first phase of the research was completed in 2019. To ensure a representative character of the tested group, the selection of enterprises was consulted with the Czech Statistical Office. A team of 17 interviewers was set up and trained to ensure quality data collection. The data were acquired by means of contact inquiring. The data set reflected the situation in the business sector in a period of economic growth, and the research now continues in the period of COVID-19 pandemic.

### 2.2. Statistical Methodology

Since we assume that the models differ depending on the size of the companies and their focus, each analysis was treated separately for the size, i.e., micro/small/medium, and for the focus (services). Further, our data are divided into two parts. In the first part we deal with the manager's knowledge of success/lack of success of their companies, and we build up a model to explain success/lack of success with all variables forming the value chain. Here the managers indicate presence or absence of every element of the value chain. The model is built using logistic regression. This model, identified as M1, contains all nine variables of the value chain. The model consists of significant and insignificant variables, and also variables that cannot be estimated by the model, e.g., when

almost all managers claim absence of a certain element in the chain then the variance of the estimated parameter corresponding to such a variable was huge. Often scientific research was such a case. Therefore, we have developed the model M2 which is free of variables that cannot be estimated. The model M2 is a more robust model than model M1, which also considers variables with no contrast. The discarded variables were chosen with respect to the size of standard deviation of the estimated parameter. If it was bigger than 10, it was chosen to be discarded. The models M1 and M2 are based on the subjective opinion of the managers about their companies. We realized that this opinion is more relevant than considering many other numerical characteristics, since the manager considers all the aspects and field specificity at once. Since the manager automatically filter away all these aspects which would have to be treated in order to study numerical characteristics of the company, his/her opinion can be treated as very relevant information about the state of his/her company.

The second part of the data was used to calculate an average price of every element of the value chain and the minimum level of a value chain element needed to run the company. For every company, the second part of the data consists of the fraction  $F$  of usage of the element by the company. The fraction is again recorded by managers in tenths. Further, the data include the price  $P$  spent by the company to run a particular element in fraction  $F$ . Thus, we can calculate  $AP = \text{average}(P/F)$ , expressing the average price of a certain element for its maximal usage. The  $MF = \min(F)$  is then taken as an estimate of the minimum fraction needed to run the company.  $AP$  and  $MF$  were calculated for every category of companies and every element separately.

In the next step we used the continuous fraction  $F$  in the model M2 in order to determine the probability of the company success with different combinations of element fractions. For this purpose, we need to relate the scale of absence/presence in the first part of data with the scale 0–1 in the second part of the data. Therefore, we rescale the fraction  $F$  between 0–1 to a factor  $RF$  between  $-0.5$ – $1.5$ . Then, rounding  $RF$  corresponds to the absence/presence of the element, i.e., up to 50% of the element usage corresponds to absence, and above or equal to 50% corresponds to presence of the element in the company strategy. The rescaled values  $RF$  can then be set in the model M2, and thus probability of success of the company can be determined from M2 for any combination of element fractions. Additionally, thanks to the estimated  $AP$ , it is possible to compute the price of every combination the company has to pay in order to run the company under such a combination of elements.

The aim of the company is to maximize probability of its success while minimizing the costs. Therefore, we have calculated combinations that minimize the price for several intervals of probability of success, while the probability of success remains in the chosen interval. The chosen intervals are 0–0.1; 0.1–0.2; 0.2–0.3; 0.3–0.4; 0.4–0.5; 0.5–0.6; 0.6–0.7; 0.7–0.8; 0.8–0.9; 0.9–0.95; 0.95–0.975; and 0.975–1.0. The minimum was simply calculated by brute force, i.e., by calculating the price and the probability for each combination, which give the probability of success in the chosen interval, and which satisfies the condition that all the elements have the fraction greater than or equal to the minimum fraction  $MF$ .

This model simply reveals which combinations should be invested in to increase the success while minimizing the price.

Usually, models only include significant variables, and consequently, the investments go only to significant variables. However, our model is different since it also takes into account the price of each element (variable) and it tells us which element influences the probability for the minimum price. For example, our model can tell us to invest in an element which is less significant but, nevertheless, cheaper than another, more significant element. This is the reason why our model M2 includes both significant and insignificant variables.

### 3. Results

#### 3.1. Micro Enterprises

##### 3.1.1. Logit Regression of Value Creating and Secondary Activities of an Enterprise

Results of the logit regression shown in Table 1 indicate that for the size category of micro enterprises in the services sector, statistical significance of value chain activities in relation to profitability, although negative, has been proved only for input logistics. The explanation can be due to both insufficient provision of storage and handling premises, and a low standard of a digitalization process in this size category. For some of the enterprises, this activity may be provided through outsourcing which, however, often does not meet an adequate standard.

**Table 1.** Value creating and secondary business activities from the viewpoint of their significance.

	Estimate	Std. Error	Z Value	Pr (> z )
(Intercept)	0.6744	0.6034	1.118	0.2637
Input logistics	−1.3135	0.6622	−1.983	0.0473 *
Provision of services	0.2368	0.7451	0.318	0.7506
Output logistics	0.1221	0.7487	0.163	0.8705
Marketing and sale	0.6564	0.5522	1.189	0.2345
Servicing and other accompanying activities	0.8165	0.6369	1.282	0.1998
Purchasing	0.6227	0.7124	0.874	0.3821
Science-technical development	−0.9672	1.1994	−0.806	0.42
Human resources management	−0.1649	0.7417	−0.222	0.8241
Company infrastructure	−0.8196	0.8422	−0.973	0.3305

Signif. codes: \*:  $p/z < 0.05$ . Source: own research.

##### 3.1.2. Model for Probability of Profit in Micro Enterprises

The model for maximization of profit probability with minimization of costs shown in Table 2 suggests possible combinations of value chain activities and their profit probability in the probability intervals (0–0.1; 0.1–0.2; 0.2–0.3; 0.3–0.4; 0.4–0.5; 0.5–0.6; 0.6–0.7; 0.7–0.8; 0.8–0.9; 0.9–0.95; 0.95–0.975; 0.975–1.0). The second column shows average prices, i.e., how much the tested enterprises invest on average in individual components of the value chain. The values 0.1, 0.8, 0.1, 0.5, 0.4, 0.3, 0.1, 0.1, 0.2 represent minimum coefficients for all value chain activities, i.e., the significance (weight) assigned to them by the approached managers/owners of enterprises.

The model shows that if the managers/owners want to increase probability of profit in their enterprises they should focus particularly on investments in servicing and other accompanying activities where the profit is maximized already in the 95% probability interval of profit. For purchasing, the maximization of profit was achieved only at 97.5% of probability. Overall inputs into value chain activities account for 4060 of price units, and respective significance coefficients can be used to specify and to model different investment variants in individual activities of the value chain in response to changes in the corporate environment, particularly in the internal and mezzo environments. Less significant, i.e., less financially demanding, were the following activities: input and output logistics, science-technical development, human resources management and company infrastructure. The relatively important activity was marketing and sale which can be considered, along with provision of services, dominant and decisive activities in this size category.



**Table 2.** Model for maximization of profit probability while minimizing costs.

<b>Probability interval of profitability in enterprises</b>	<b>0</b>	<b>0</b>	<b>0–0.1</b>	<b>0.1–0.2</b>	<b>0.2–0.3</b>
Minimum price achieved in the respective probability interval	0	0	$4.15 \times 10^3$	4014.009	3897.361
Achieved profitability at the minimum price in a given probability interval of profitability	0	0	$9.16 \times 10^{-2}$	0.191339	0.297989
Input logistics	493.75	0.1	$8.00 \times 10^{-1}$	0.6	0.4
Provision of services	1755.741	0.8	$8.00 \times 10^{-1}$	0.8	0.8
Output logistics	1478.8	0.1	$2.00 \times 10^{-1}$	0.2	0.2
Marketing and sale	1737.486	0.5	$6.00 \times 10^{-1}$	0.6	0.6
Servicing and other accompanying activities	207.1854	0.4	$4.00 \times 10^{-1}$	0.4	0.4
Purchasing	743.9626	0.3	$4.00 \times 10^{-1}$	0.4	0.4
Science-technical development	271.7491	0.1	$1.00 \times 10^{-1}$	1	0.8
Human resources management	884.4841	0.1	$2.00 \times 10^{-1}$	0.2	0.2
Company infrastructure	182.2619	0.2	$1.00 \times 10^{-1}$	0.8	1
<b>Probability interval of profitability in enterprises</b>	<b>0.3–0.4</b>	<b>0.4–0.5</b>	<b>0.5–0.6</b>	<b>0.6–0.7</b>	<b>0.7–0.8</b>
Minimum price achieved in the respective probability interval	3843.012	3762.159	3707.809	3635.562	3598.452
Achieved profitability at the minimum price in a given probability interval of profitability	0.384613	0.499087	0.59465	0.696173	0.796851
Input logistics	0.4	0.2	0.2	0.2	0.2
Provision of services	0.8	0.8	0.8	0.8	0.8
Output logistics	0.2	0.2	0.2	0.2	0.2
Marketing and sale	0.6	0.6	0.6	0.6	0.6
Servicing and other accompanying activities	0.4	0.4	0.4	0.4	0.4
Purchasing	0.4	0.4	0.4	0.4	0.4
Science-technical development	0.6	0.8	0.6	0.2	0.6
Human resources management	0.2	0.2	0.2	0.2	0.2
Company infrastructure	1	0.8	0.8	1	0.2
<b>Probability interval of profitability in enterprises</b>	<b>0.8–0.9</b>	<b>0.9–0.95</b>	<b>0.95–0.975</b>	<b>0.975–1</b>	
Minimum price achieved in the respective probability interval	3489.752	3531.189	3614.064	4060.441	
Achieved profitability at the minimum price in a given probability interval of profitability	0.894776	0.921803	0.957723	0.97952	
Input logistics	0.2	0.2	0.2	0.2	
Provision of services	0.8	0.8	0.8	0.8	
Output logistics	0.2	0.2	0.2	0.2	
Marketing and sale	0.6	0.6	0.6	0.6	
Servicing and other accompanying activities	0.4	0.6	1	1	
Purchasing	0.4	0.4	0.4	1	
Science-technical development	0.2	0.2	0.2	0.2	
Human resources management	0.2	0.2	0.2	0.2	
Company infrastructure	0.2	0.2	0.2	0.2	

Source: own research.

### 3.2. Small Enterprises

#### 3.2.1. Logit Regression of Value Creating and Secondary Activities of an Enterprise

From the results of the logit and reduced logit regression (after removing inestimable activities) indicated in Tables 3 and 4, we can conclude that for the size category of small enterprises in the services sector, statistical significance was not proved for any of the value chain activities. This is a significant signal of underestimation of creation of added value by managements of small enterprises in the services sector and it cannot be explained by the fact that the research was conducted in a period of strong economic growth. The result is in fundamental conflict with the theoretical principle of value creation in the corporate environment and with the principle of financial management of corporate processes.

**Table 3.** Value creating and secondary business activities from the viewpoint of their significance.

	Estimate	Std. Error	Z Value	Pr (>  z )
(Intercept)	0.897	0.6655	1.348	0.178
Input logistics	0.4261	0.8027	0.531	0.596
Provision of services	−0.4207	0.6385	−0.659	0.51
Output logistics	−0.2456	0.6679	−0.368	0.713
Marketing and sale	0.4808	0.5414	0.888	0.375
Servicing and other accompanying activities	−0.224	0.5667	−0.395	0.693
Purchasing	0.5013	0.7457	0.672	0.501
Science-technical development	17.0545	3442.695	0.005	0.996
Human resources management	−0.4204	0.649	−0.648	0.517
Company infrastructure	17.5571	1819.745	0.01	0.992

Source: own research.

**Table 4.** Reduced logit regression after elimination of insignificant variables.

	Estimate	Std. Error	Z Value	Pr (>  z )
(Intercept)	1.09512	0.617	1.775	0.0759
Input logistics	0.44983	0.78215	0.575	0.5652
Provision of services	−0.63425	0.62305	−1.018	0.3087
Output logistics	−0.29241	0.64571	−0.453	0.6507
Marketing and sale	0.44358	0.52385	0.847	0.3971
Servicing and other accompanying activities	−0.16035	0.54877	−0.292	0.7701
Purchasing	0.54472	0.72068	0.756	0.4497
Human resources management	−0.08797	0.58864	−0.149	0.8812

Source: own research.

### 3.2.2. Model for Probability of Profit in Small Enterprises

The Table 5 shows possible combinations of value chain activities and their profit probability in small enterprises in the probability intervals (0.3–0.4; 0.4–0.5; 0.5–0.6; 0.6–0.7; 0.7–0.8; 0.8–0.9; 0.9–0.95). Managers of small enterprises assigned the following minimum coefficients (weights) to the individual components of the value chain: 0.2, 0.5, 0.2, 0.2, 0.1, 0.6, 0.4. Outputs from the model for small enterprises suggest to their managements (from the viewpoint of added value creation) that they should focus on and financially support activities like marketing and sale (from the original minimum of 20% to 80–100%, with the objective to achieve up to 90–95% profitability of the enterprise while minimizing costs). This applies similarly to input logistics (from the original minimum of 20%, it has been recommended to increase investments to at least 80% in order to achieve 90–95% profitability of the enterprise, while the other activities are distributed at the probability level of 90–95%). The model also recommends increasing investments up to 60% in purchasing (this activity is constant with regard to probability intervals of profitability) and in provision of services. On the contrary, lower financial investments have been reported for human resources management (40%), output logistics and servicing and accompanying activities (20%). In a period of economic growth, one can expect certain inertia in provision of those activities, while in the case of economic decline it will be necessary to look for other rational provision of those activities.



**Table 5.** Model for maximization of profit probability while minimizing costs.

Probability interval of profitability in enterprises	0	0	0.4–0.5	0.5–0.6
Minimum price achieved in the respective probability interval	0	0	$1.08 \times 10^4$	8430.38
Achieved profitability at the minimum price in a given probability interval of profitability	0	0	$4.91 \times 10^{-1}$	0.596392
Input logistics	1850.661	0.2	$2.00 \times 10^{-1}$	0.2
Provision of services	2773.479	0.5	1.00	1
Output logistics	3398.791	0.2	$6.00 \times 10^{-1}$	0.2
Marketing and sale	1315.377	0.2	$2.00 \times 10^{-1}$	0.2
Servicing and other accompanying activities	1668.849	0.1	1.00	0.4
Purchasing	4675.132	0.6	$6.00 \times 10^{-1}$	0.6
Human resources management	2178.29	0.4	$4.00 \times 10^{-1}$	0.4
Probability interval of profitability in enterprises	0.6–0.7	0.7–0.8	0.8–0.9	0.9–0.95
Minimum price achieved in the respective probability interval	7541.914	6987.219	17776.445	9149.917
Achieved profitability at the minimum price in a given probability interval of profitability	0.670024	0.723521	0.816721	0.901279
Input logistics	0.2	0.2	0.2	0.8
Provision of services	0.8	0.6	0.6	0.6
Output logistics	0.2	0.2	0.2	0.2
Marketing and sale	0.2	0.2	0.8	1
Servicing and other accompanying activities	0.2	0.2	0.2	0.2
Purchasing	0.6	0.6	0.6	0.6
Human resources management	0.4	0.4	0.4	0.4

Source: own research.

### 3.3. Medium Enterprises

#### 3.3.1. Logit Regression of Value Creating and Secondary Activities of an Enterprise

Results shown in Tables 6 and 7 (after performing the logit regression) have proved significance for the company infrastructure. The result can be seen as positive, in agreement with the theory of categorization of enterprises based on the size, because requirements for company infrastructure increase with the size. The authors expected a completely opposite result in this size category, i.e., a significant increase in the perception of value chain activities. This can be attributed to managerial illiteracy in value streams management and in strategic management, and also to the time when the research was conducted.

**Table 6.** Value creating and secondary business activities from the viewpoint of their significance.

	Estimate	Std. Error	Z Value	Pr (>  z )
(Intercept)	0.06661	1.07835	0.062	0.9507
Input logistics	−0.17942	1.00452	−0.179	0.8582
Provision of services	0.8112	1.11446	0.728	0.4667
Output logistics	0.62282	1.05479	0.59	0.5549
Marketing and sale	0.59613	0.97205	0.613	0.5397
Servicing and other accompanying activities	0.78332	0.79277	0.988	0.3231
Purchasing	0.52585	1.00189	0.525	0.5997
Science-technical development	15.82982	2163.375	0.007	0.9942
Human resources management	0.70832	0.93882	0.754	0.4506
Company infrastructure	−1.49457	0.85898	−1.74	0.0819

Source: own research.

**Table 7.** Reduced logit regression after elimination of insignificant variables.

	Estimate	Std. Error	Z Value	Pr (>  z )
(Intercept)	0.1794	1.0321	0.174	0.862
Input logistics	−0.1529	1.0135	−0.151	0.8801
Provision of services	0.7791	1.0812	0.721	0.4711
Output logistics	0.6634	1.057	0.628	0.5303
Marketing and sale	0.4814	0.9347	0.515	0.6065
Servicing and other accompanying activities	0.8705	0.795	1.095	0.2736
Purchasing	0.5313	1.003	0.53	0.5963
Human resources management	0.7391	0.942	0.785	0.4327
Company infrastructure	−1.5938	0.8558	−1.862	0.0625

Source: own research.

### 3.3.2. Model for probability of profit in medium enterprises

When commenting on results of small enterprises, we observed that value stream activities are insufficiently used in the creation of added value, and that managers in that size category lack the relevant knowledge and skills. In the category of medium enterprises, the situation is similar from the viewpoint of statistical significance, however, Table 8 suggests that managers of those enterprises proactively work with the individual value chain activities. This provides opportunities for scientific and research institutions, including universities, to transfer new findings to corporate practice in the form of an integrated complex of theoretical and particularly practical procedures and instructions on how to manage value streams in a specific corporate environment and, at the same time, to minimize procedural and overhead costs.

**Table 8.** Model for maximization of profit probability while minimizing costs.

Probability interval of profitability in enterprises	0	0	0.2–0.3	0.3–0.4	0.4–0.5	0.5–0.6
Minimum price achieved in the respective probability interval	0	0	7768.96	7633.851	7180.79	6592.62
Achieved profitability at the minimum price in a given probability interval of profitability	0	0	0.282873	0.397705	0.427335	0.585354
Input logistics	1132.653	0.2	0.2	0.6	0.2	0.2
Provision of services	1307.672	0.6	0.6	0.6	0.6	0.6
Output logistics	2528.571	0.2	0.2	0.2	0.2	0.2
Marketing and sale	673.4788	0.3	0.4	0.4	0.4	0.4
Servicing and other accompanying activities	820.3704	0.3	0.4	0.4	0.4	0.4
Purchasing	4931.482	0.4	0.4	0.4	0.4	0.4
Human resources management	1852.822	0.3	0.4	0.4	0.4	0.4
Company infrastructure	2940.851	0.3	1	0.8	0.8	0.6
Probability interval of profitability in enterprises	0.6–0.7	0.7–0.8	0.8–0.9	0.9–0.95	0.95–0.975	0.975–1
Minimum price achieved in the respective probability interval	6684.041	6004.449	6303.219	6631.367	7289.132	8164.957
Achieved profitability at the minimum price in a given probability interval of profitability	0.68973	0.727567	0.820989	0.901984	0.954144	0.978525
Input logistics	0.8	0.2	0.2	0.2	0.2	0.2
Provision of services	0.6	0.6	0.6	0.6	1	1
Output logistics	0.2	0.2	0.2	0.2	0.2	0.2
Marketing and sale	0.4	0.4	0.6	0.6	0.8	1
Servicing and other accompanying activities	0.4	0.4	0.6	1	1	1
Purchasing	0.4	0.4	0.4	0.4	0.4	0.4
Human resources management	0.4	0.4	0.4	0.4	0.4	0.8
Company infrastructure	0.4	0.4	0.4	0.4	0.4	0.4

Source: own research.

The presented table shows that the proposed model for medium enterprises is based on possible combinations of value chain activities and their probable profitability in probability intervals (0.2–0.3; 0.3–0.4; 0.4–0.5; 0.5–0.6; 0.6–0.7; 0.7–0.8; 0.8–0.9; 0.9–0.95; 0.95–0.975; 0.975–1.0). Managers of medium enterprises assigned the following minimum coefficients (weights) to the individual components of the value chain: 0.2, 0.6, 0.2, 0.3, 0.3, 0.4, 0.3, 0.3. In order to achieve nearly 100% probability of profitability of enterprises, it is necessary to invest more and fully support the processes of provision of services, marketing and sale, and servicing and accompanying activities. The mentioned activities in this size category can be seen as the main sources of value streams or the main sources of added value. A higher level of significance from the viewpoint of financial provision has also been found for human resources. Activities like purchasing and company infrastructure require lower support; however, their function must be ensured. Input and output logistics need to be ensured so that they function automatically and repeatedly, possibly also through outsourcing.

#### 4. Discussion

We have already mentioned in the methods Section 2 that the primary data were collected at the time of strong economic growth, and this is associated with the fact that SME of all size categories, or their managers in the services sector, failed to appreciate value creation streams and did not perceive them as a tool for the creation of added value and profit. This is an extremely negative finding about the SME managers, and it involves two aspects. The first one suggests shortcomings in economic literacy of SME managers, and the second means a debt of the scientific community to those managers due to the lack of transfer of new scientific findings made by research organizations to the corporate sphere.

The first research hypothesis focused on the perception of value creation processes, including supporting processes in micro, small and medium enterprises. The dominant activities in micro enterprises are marketing and sale, and provision of services. Servicing and other accompanying activities (95% probability level for profit maximization) and purchasing (97.5%) also require increased attention and investment activities. On the contrary, input and output logistics, science-technical development, management of human resources and company infrastructure either demonstrate the required condition or they are underestimated by the managers who do not demand additional investments in them.

In the case of small enterprises, similarly to the case of micro enterprises, statistical significance of value creation streams was not demonstrated for any of the monitored activities. The model prepared for small enterprises shows that, in order to increase the added value and to achieve profit, it would be necessary to increase financial support for marketing and sale by at least 50%, which would be positively reflected in the profit (by ca 20–30%). The same financial effect could be achieved with input logistics where the recommended increase of the investments is by up to 80% and with purchasing by 60%. On the other hand, reduction or limitation of financial investments has been analyzed for human resources (40%), output logistics and servicing and accompanying activities (20%). One can expect that the COVID-19 pandemic will significantly change the value priorities and limit availability of financial resources.

Additionally, in medium enterprises, no statistical significance of value creation streams was found and the same statement shall apply as for the small enterprises. However, it has been proved that managers of medium enterprises pro-actively work with value creation activities and use them for their management and decision-making processes. This finding only documents the challenge faced by researchers; they should create, verify and transfer to the corporate sphere a new procedure for the development of models of value creation streams with the objective to maximize profit and minimize costs. In this size category, the solution is needed most urgently. For managers in this size category, the recommendation is to invest more in and to support value creation activities such as provision of services, marketing and sale, servicing and accompanying activities, because those activities can be seen as decisive for creation of added value or profit (probability of profit in the range 95–100%). Sufficient financial sources have been also identified as

important for human resources management, which is a supporting activity, but it is critical for proper functioning of value creation processes. Less demanding activities from the viewpoint of financial intensity are purchasing and company infrastructure. Input and output logistics are quite often outsourced.

On the whole, we can state the first hypothesis has not been confirmed and a more detailed analysis of the findings is needed; we also need to evaluate data to be collected in the period of economic decline currently experienced by the enterprises.

The content of the second hypothesis focused on a model of value streams in the services sector in the respective size categories.

The second hypothesis can be fully confirmed; the models have been devised and functionally verified for all size categories.

The outputs from the models have been presented in the previous section. In simple words, the models for micro enterprises can be interpreted as showing the importance of investments in purchasing, servicing and other accompanying services, marketing and sale; models for small enterprises have shown priority of investments in marketing and sale, followed by input logistics, provision of services and purchasing. The model for medium enterprises, which can be called a general “business model for medium enterprises” has shown the importance of provision of services, marketing and sale, and servicing and accompanying activities, including human resources.

After its finalization, the model approach to business models will make it possible to prepare variants of investments in individual value chain activities based on specified investment coefficients, and subsequently to predict the achieved added value, the costs and also the expected margin.

The theoretical contribution is the designed and performed analysis which makes it possible to visualize value streams in order to optimize costs and time of corporate processes, particularly the core (value creation) ones. The practical benefit, i.e., the increase of profitability, has been already demonstrated in selected test companies in the services sector where the proposed procedure has been gradually implemented. Utilization of the newly presented approach requires a functional company information system which should include monitoring of the course of corporate processes.

## 5. Conclusions

The article presents a new approach to value creation processes in SME with regard to individual size categories. With some generalization, we can conclude that the model presented in the article can serve as a basis for development of a corporate/business strategy. For the sake of scientific correctness, it should be noted that only models devised at the industrial branch level (as demonstrated for the sector level) will be able to provide practical, specific, and unique outputs that can be directly used by enterprises in the respective industrial branch.

It is beyond doubt that the ongoing pandemic crisis will bring many negative phenomena and affect the corporate sphere; it will also result in demand for new approaches, methods, and particularly new ways to ensure competitiveness and profitability of companies. In this general context, the following theoretical and practical conclusions can be drawn from outputs presented in the article:

- A significant number of SME managers do not see value creation streams as a tool to achieve profitability and sustainability; however, they intensely and creatively implement them in their decision-making, managerial and regulation activities.
- The research has proved that it is possible to create value creation models for individual size categories or individual enterprises, and such models can serve as a basis for the development of corporate/business strategies.
- A verified procedure for model generation was used to test significance of individual value creation and supporting activities, and their significance coefficients were used to specify financial and investment limits leading to the maximum profit.

- One serious finding, which is critical from practical point of view, is the one about low economic literacy of managers when it comes to management of corporate processes and their analysis with regard to profitability and efficiency; this also means a challenge for the researchers who should create, test and transfer new approaches and methods that will ensure profitability of the enterprises.
- One can only predict that a new theory will be formulated about generation of value (business) models. The theory will be based on an integrated system for management of value creation processes with the view to maximize added value and margin at minimum costs. The generated models will apply an integral approach to the corporate environment and its classification.

The pandemic crisis is gradually and with an increasing intensity affecting the corporate sphere, and an ever-increasing number of enterprises, particularly the bigger ones, have started to consider the described approaches. Those companies are addressing levels of their value creation streams, intensity of added value creation and margin. Many previously declared topics, such as corporate strategy, sustainability, stability etc. are now becoming real tools for survival in the corporate sphere. As we define two fundamental types of value—value for customers and value for owners—we can see a process in which managers of enterprises, jointly with the owners, look for methods and tools to ensure the prosperity and long-term sustainability of the companies in the coming period of decline or stagnation. The authors believe that the topics and outputs presented in this article will start or contribute to a discussion that is desperately needed about the added value creation and maximization of profit in the services sector.

The article presents results obtained in a period of economic growth. The research activities are continuing, and they now include data from the beginning of the COVID-19 pandemic until now. These results will expand the possibilities to use the new findings for the restart of the corporate sphere hit by the pandemic.

The authors will focus their future research activities on investigation of individual corporate processes from the viewpoint of their contribution to the margin. The researchers also want to finalize the methodical procedure for the generation of business strategies based on value stream mapping.

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