



TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

ACTA TECHNICA NAPOCENSIS

Series: Applied Mathematics, Mechanics, and Engineering
Vol. 65, Issue Special I, February, 2022

AN ATTEMPT TOWARD SERVITIZATION FOR A ROMANIAN MANUFACTURER

Camelia UCENIC, Claudiu RAȚIU

Abstract: *The implementation of a servitization strategy helps companies to gain competitive advantage. The aim of this study is to provide a scientific based approach for servitization in a manufacturing company from Transylvania. Quantitative and qualitative instruments were used. Kano model was employed as quantitative instrument. Several potential characteristics were considered for the servitization process. The standardized oral questionnaire was used because of its high rate of return and the possibility to reduce the understanding difficulties by direct explanations. The reference dimension was used as a non-statistical method in order to determine the number of respondents. Twenty middle managers participated at interviews. The number was enough because they come from a homogenous segment and is sufficient to determine 90-95% of all viable requirements. Discrete analysis was employed for model interpretation. Three of them are “must-be” features, two are “performance” attributes, three “attractive” and other two “indifferent”. The calculation of satisfaction and dissatisfaction coefficients provided a better ranking of these features. The Agile Logic free access framework was used for Kano model. The company can easily shift from product centric to a product service system by implementing the findings of this study.*

Key words: *Kano model, product service system, result-oriented, servitization, use-oriented.*

1. GENERAL CONSIDERATIONS

The notion of servitization was established in 1988, but the attempts in this direction were older. Servitization appeared as a necessity because the product innovation has overwhelmed over time.

The implementation of a servitization strategy will help the company to gain competitive advantage. The relationship with its clients has to be redesigned as well as the entire organization. The company must shift from product centric to a product service system. It has also to create a more customer centred culture. The added value is obtained by addition of services to the fabricated products. There is a big range of services which can be added, from simple services to the sophisticated ones. Different payment options, extended warranty, installation, and maintenance are among the basic services. Customized service contracts or trainings are listed among advanced services.

Product service systems PSS evolved from value obtained based on product to the value obtained based on service. The transition toward value based on service included three approaches: product-oriented approach, use-oriented approach, and the result-oriented approach. The product-oriented approach is the case when the customer buys the product, has its ownership and has the possibility to pay for a set of basic services at a specific price. Some of these services are distribution, maintenance, recycling. The product represents a reason for service delivery. This method helps the producer to obtain an additional revenue and to transform the customer in a client, increasing the retention index. In the use-oriented approach, the ownership of the product belongs to the manufacturer/ supplier and the client uses it for a specified time and benefits by free services. (Kam, 2018) The most common cases for use-oriented are leasing, sharing and product rental. The customer has to pay for a specific output and

profits by supplementary services as consultancy in the result-oriented approach. The producer provides capability instead of providing the product.

Wang [11] illustrated the transformation path from providing basic service toward offering total service. The company must shift from a transaction-based service to a relationship based service, and to transform a product oriented service in a customer oriented service. Below are listed their characteristics:

- Transaction based service:
 - Product oriented stages provides simple services.
 - Documentation;
 - Product distribution;
 - Installation;
 - Repair.
 - Customer oriented service generates customized service.
 - Customer oriented research
 - Customer oriented development
 - Customer oriented training.
- Relationship based service:
 - Improved service assessment
 - Preventive maintenance;
 - Update;
 - Product recycle;
- Improved customer value – total service:
 - Integrated solutions
 - Supply Chain integration;
 - The management of product lifecycle.

2. DRIVERS AND RISKS OF SERVICITIZATION

There are many drivers toward servitization. They can be classified as internal and external drivers. Dynamic capability is an internal driver. [2] The decrease in the cost of sensors offered a wide range of new services. [6] Some of the most often mentioned are: digitalization, satisfying the customer needs, remote monitoring technology, enhancing performance, obtaining competitive advantage. The usage of technology help to improve products and services. [2]

The servitization of a business does not bring only advantages. It has also many disadvantages. Some of the common risks are the increase of

technological and contractual complexity. [9] The implementation become also more complicated. From the point of view of human resources, very often the company is confronted with a high level of employees' opposition to the changes. Another weak point is the absence of a proper skills set. [10]

Another set of risks is related with the required organizational change management in the process of servitization. Sometime the customers feel uncomfortable when are involved by the manufacturer in its servitization attempt. The customers need to be trained and helped to accept to participate at advanced services. [1] The financial risk can occur in the case of pay per use services because. A negative event can limit the usage of the product and the manufacturer will earn less. [4]

3. METHODOLOGY

The methodology used in this article is KANO model. The model was selected because it is recommended when one wants to develop a set of ideas for planning a process or a service. This study brings as originality element the exchange of customers with internal stakeholders represented by the middle management. The classical Kano model uses the customers. [7]

The performance characteristics of the product-service system are not equal for the managers. The performance of some attributes provides higher degree of satisfaction in contrast with other attributes.

The Kano model is recommended to be used when the company has limited time, limited resources and want to be sure the appropriate mix of features is prioritised. It can be used in different manners, subject to the problem in focus. In order to select the participants, the researchers must have in mind that the respondents have to be selected according with some criteria because the prospect base is not homogenous in majority of cases. The literature review suggests that a number of 20-30 interviews taken in homogeneous divisions are sufficient to determine 90-95% of all viable requirements. [8]

The setting of priorities for development and the easiness of requirement understanding are the main advantages of Kano model. It is

recommended to develop the one-dimensional or attractive conditions because they deliver a greater influence on perceived service. There is no need to invest in must-be requirements because they are by now at a suitable level.

The questionnaire categorizes the requirement. Each question has two components: a functional form and a dysfunctional one. "How do you feel if the characteristic X is present?" describe the functional form. "How do you feel if the characteristic X is absent?" explain the dysfunctional form. There are five possibilities for the answer:

	Dislike	R	R	R	R	Q
--	---------	---	---	---	---	---

The Kano analysis mainly searches to discover the first three categories together with Indifferent. The "Indifferent" shows us that the customer is neither pleased nor displeased when the service is fully functional or dysfunctional.

4. CASE STUDY

4.1 General Considerations

The most important result of this investigation is to discover the enablers for the servitization within a manufacturing Romanian company from automotive industry. Finally, it provides to other companies a potential framework for attaining a higher level of servitization.

This study intends to evaluate how perceive the middle managers from the analysed company the potential manners for increasing the level of servitization. It is an attempt to assist the leaders in evaluating their company in the effort for servitization.

The selected company has as object of activity the manufacturing of parts for automotive industry. The company has more branches located in Transylvania. Not all of them are at the same level in developing a product-service system. Due to confidentiality reasons, the name of company as well as the name and specific position of middle managers involved in the interview are not revealed. The principles of information and consent were also respected.

It was used the standardised oral questionnaire because of its high rate of return and the possibility to reduce the understanding difficulties by direct explanations. The Agile Logic free access framework was used for Kano model.

One of the goals of this study was to reveal the position of middle managers related to the achieving of a higher level of servitization. Twenty middle managers were involved in this study. The reference dimension was used as a non-statistical method in order to determine the representative sample. The number of selected managers is enough to determine 90-95% of the viable characteristics. [8] It is not necessary any statistical calculation regarding the degree of

Table 1
The Kano model Requirements

	Code	Meaning
1	A	Attractive
2	M	Must be
3	O	One-dimensional
4	I	Indifferent
5	R	Reversed
6	Q	Questionable

Table 2
Kano meanings of functional and dysfunctional questions

Code	Meaning
If characteristic "X" is good how do I feel?	1. I like it in this way
	2. It must be in this way
	3. I am neutral
	4. I can live with it in this way
	5. I dislike it in this way
If characteristic "X" is poor how do I feel?	6. I like it in this way
	7. It must be in this way
	8. I am neutral
	9. I can live with it in this way
	10. I dislike it in this way

Table 3
The Kano perception/ evaluation table

		Dysfunctional				
		Like	Expect	Don't care	Live with	Dislike
Functional	Like	Q	A	A	A	Performance
	Expect	R	Q	I	I	M
	Don't care	R	I	I	I	M
	Live with	R	I	I	Q	M

confidence. They belong to the same homogenous segment of management and all of them responded. This situation is very favourable for the analysis, because very often the respondent come from heterogeneous segments. In that case the respondent must be divided in groups with same characteristics in order to decrease the noise of the analysis. Their selection was done using the accessibility method. The discussions covered a time interval of four months in 2021.

4.2 The selection of characteristics

Several characteristics of some activities were considered for the servitization process. The list of characteristics was done after discussions with the middle managers. A characteristic was considered only if it is proposed by at least 20% of the participants. In the second step, they were asked to rank these patterns using the importance coefficients method.

There were proposed twenty-one characteristics and the first ten ranked were selected for the Kano model. They were related with the following aspects: operations, sales, delivery, payment, customers and organization.

- Sales activities
 - Increasing competence of sales force for services offering
 - Creating sales tools for promotion of sales services
- Delivery
 - Developing infrastructure for service delivery
 - Increasing customer relationship
 - Increasing the visibility of new services offered to consumers
- Payment
 - Development of innovative payment methods (subscription based models, pay per use)
 - Innovative pricing methods, disconnected by the traditional cost based approach
- Customers
 - Design solutions jointly with customers
 - Enhance image and visibility in the market
 - Continuous delivery of value

- Creating a marketing message for each market segment
- Data sharing in order to avoid inconsistency
- Decrease the concern about data privacy
- Increase the ability to express preferences
- Organization
 - Increase internal communication
 - Increase external communication
- Operations
 - More connected devices to provide a faster answer for result-oriented approaches
 - Implementation of digital servitization
 - Expanded product lifecycle due to addition of services
 - Service innovation through deployment of technology for supporting enhanced services
 - Smart manufacturing systems which help for creation of service centred models

The first ten ranked characteristics are: smart manufacturing system, more connected devices, design solutions jointly with customers, help the customers to increase the ability to express preferences, developing new sale services, increasing competence of sales force for offering services, increasing customer relationship, implementation of subscription-based pricing methods, a better internal communication, higher visibility of new proposed services.

4.3 Kano evaluation for servitization characteristics

Table 4

Example of Kano analysis evaluation

Story narrative	How would you feel if this is present?	How would you feel if this is absent?	Priority
Smart manufacturing system	Expected	Dislike	Must be
Connected devices	Don't care	Live it	Indifferent
Design with customers	Like	Dislike	Performance

Customers express preference	Like	Live with	Attractive
New sales services	Expect	Don't care	Indifferent
Competent sales force	Expect	Expect	Questionable
Customer relationship	Like	Dislike	Performance
Subscription based pricing	Like	Live with	Attractive
Internal communication	Like	Don't care	Attractive
Visibility of new services	Don't care	Live with	Indifferent

The second step of the model consist of a discrete analysis. The answer of each middle manager was categorized using the evaluation table 3. The following step is to compute the total number of responses for each category and for each characteristic. The characteristic will be define according with the most frequent response. The ranking which must be considered is the next one:

Must be > Performance > Attractive > Indifferent

Reversed and questionable categories are not considered. The features rated with reversed are not only not wanted, but the customer expect the opposite. The existence of a inconsistency in the customer responses causes questionable scores. This situation is attained when the answer was inaccurate marked, the question was phases incorrect or the manager misunderstood the question.

The “must-be” characteristics for a servitization process are the development of a smart manufacturing system which allows the development of service-based models, a strong and continuous relationship with the customers and an improved level of internal communication.

The category “performance” includes the existence of clients which are able the clearly express their preferences without having any concern about their data privacy, and the jointly design of solutions with customers. This aspect was not fully exploit in the past, very often the proposed solution was more convenient for the manufacturer and not for the customer.

The “attractive” features are more related with the sales area: to develop new and modern sales services and to benefit from a more competitive sales force which is capable to promote the new services, increase the level of service for customers, retain customers and create loyalty through offered enhanced services. The third “attractive” characteristics is the existence of more connected devices. The interconnected devices and the information exchange are specific for industry 4.0. The convergence of industry 4.0 and servitization was underlined in many studies. The European Commission also emphasis the connection between services and manufacturing systems. [3]

The “indifferent” category contains the increase of visibility of new services and the modern method for pricing based on subscription. The managers considered that the higher visibility is the task of marketing and sales department and it will occur as a consequence of a more qualified sales force.

The approach of servitization through pricing methods is in the indifferent category maybe because most interviewed managers have a technical background and do not deal and do not have a minimum knowledge of this topic.

Table 5

Story narrative	Kano requirements						Total	Class
	M	P	A	I	R	Q		
Smart manufacturing system	8	4	2	3	2	1	20	M
Connected devices	4	4	7	3	2	0	20	A
Design with customers	5	10	3	2	0	0	20	P
Customers express preference	5	7	3	3	1	1	20	P
New sales services	2	2	10	4	2	0	20	A
Competent sales force	2	5	8	3	1	1	20	A
Customer relationship	7	5	4	2	2	0	20	M
Subscription based pricing	1	2	4	12	1	0	20	I
Internal communication	9	2	4	4	1	0	20	M

Visibility of new services	2	3	4	7	3	1	20	I
----------------------------	---	---	---	---	---	---	----	---

4.4 Calculus of the satisfaction and dissatisfaction coefficients

The next step in Kano model methodology is the calculation of satisfaction (SC) and dissatisfaction coefficients (DC). The satisfaction coefficient shows if the satisfaction/level of servitization can be increased by meeting a characteristic or accomplishing this feature only avoid the customer to be disappointed. The servitization characteristic can have different importance for different segments. This aspect determines the necessity to know the average effect of the characteristic on the satisfaction of all interviewed persons.

The satisfaction coefficient shows how a characteristic may influence the satisfaction level. The absence of this characteristic will generate customer dissatisfaction.

$$SC = \frac{A+P}{A+P+M+I} \quad (1)$$

A satisfaction coefficient included in the interval [0; 1] shows a positive relation of the characteristic. If the satisfaction coefficient is in the interval [-1; 0], the impact on satisfaction is high in the absence of that feature.

$$DC = \frac{P+M}{(A+P+M+I) \times (-1)} \quad (2)$$

The values of satisfaction and dissatisfaction coefficients are listed in the next table.

Table 6

Satisfaction and dissatisfaction coefficients			
	Characteristic	SC	DC
1	Smart manufacturing system	0,35	-0,7
2	Connected devices	0,61	-0,44
3	Design with customers	0,65	-0,75
4	Customers express preference	0,55	-0,66
5	New sales services	0,66	-0,22
6	Competent sales force	0,72	-0,38
7	Customer relationship	0,5	-0,66
8	Subscription based pricing	0,31	-0,15
9	Internal communication	0,31	-0,57
10	Visibility of new services	0,43	-0,31

The satisfaction coefficient is illustrated in the next figure.

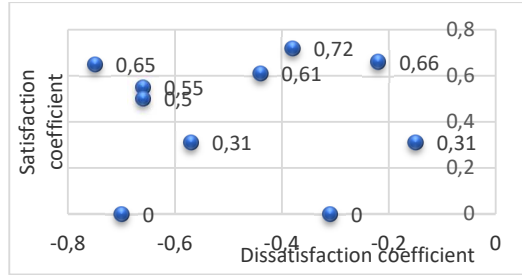


Fig. 1. Satisfaction coefficient

The higher impact to servitization is given by the existence of a competitive sales force (SC=0.72), followed by the development of new sales services and jointly design of solutions together with the customers.

The lowest satisfaction coefficient corresponds to the improving the internal communication and implementation of new pricing methods, disconnected by the cost theory. Both features obtained the 0.31 value. As we can see from the results, not involving the customers in the design of solutions and the lack of a smart manufacturing system will decrease the most the customer satisfaction.

No characteristic obtained the zero value. This means that all considered features have influence on satisfaction if they do not occur. This fact proved a correct selection of the features.

5. CONCLUSION

The issue of servitization in manufacturing gained a high level of attention. Many studies were done at theoretical and practical level. The top managers choose to invest in outcomes generated by the servitization. The competitive advantages are given by long term contracts, customer retention and loyalty. The Romanian manufacturing firms understand that the servitization is a path toward competitiveness. Some attempts were done in this direction.

Quantitative and qualitative instruments were used in this study to provide a scientific based framework for servitization in a manufacturing company from Transylvania. Kano model was employed as quantitative instrument. Twenty middle managers were selected according with the reference dimension non-statistical method in order to participate at the interviews. They belonged to the same homogenous managerial

group and all of them responded. The selected number of managers was great enough according with literature review and no statistical calculation was required in order to establish their number. The literature review suggests that a number of 20-30 interviews taken in homogeneous divisions are sufficient to determine 90-95% of all viable requirements. [8] Discrete analysis was used for model interpretation. Ten features which can increase the level of servitization were selected. Three of them are “must-be” features, two are “performance” attributes, three “attractive” and other two “indifferent”. The calculation of satisfaction and dissatisfaction coefficients provided a better ranking of these features.

Further development of the model can be done by adding supplementary characteristics. Another step forward is to involve more managers from different hierarchical levels in the study. The validation can be done by applying it in other manufacturing companies as well as in other types of firms. Another improvement is the replacement of discrete analysis with continuous analysis.

Last but not least, can be implemented questions related to the cost – which percentage of cost increase is willing to pay in comparison with nowadays costs.

The company can easily shift from product centric to a product service system by implementing the findings of this study. The next step is the transition from product-service system to the total service.

6. REFERENCES

- [1] Baines, T., & Shi, V. G., *A Delphi study to explore the adoption of servitization in UK companies*, Production Planning and Control, Vol. 26(14–15), 1171–1187, <https://doi.org/10.1080/09537287.2015.1033490>, 2015
- [2] Coreynen, W., Matthyssens, P., Vanderstraeten, J., & van Witteloostuijn, A. *Unrevealing the internal and external drivers of digital servitization: A dynamic capabilities and contingency perspective on firm strategy*. Industrial Marketing Management, pp 1-13., <https://doi.org/10.1016/j.indmarman.2020.02.01>, 2018.
- [3] Doni, F., Corvino, A., & Bianchi Martini, S., *Servitization and sustainability actions. Evidence from European manufacturing companies*. Journal of Environmental Management, Vol. 234(January), pp. 367–378, <https://doi.org/10.1016/j.jenvman.2019.01.004>, 2019.
- [4] Gebauer, H., Saul, C. J., Haldimann, M., & Gustafsson, A. *Organizational capabilities for pay-per-use services in product-oriented companies*, International Journal of Production Economics, Vol. 192, pp. 157–168, <https://doi.org/10.1016/j.ijpe.2016.12.007>, 2017.
- [5] Kam, C., Industry 4. 0.: *The Rise of Equipment as a Service (EaaS)*, In Mind Cloud, 2018.
- [6] Kaňovska, L., & Tomaškova, E., *Drivers for Smart Servitization in Manufacturing Companies*. AGRIS On-Line Papers in Economics and Informatics, 10(3), pp. 57–68, <https://doi.org/10.7160/aol.2018.100305>, 2018.
- [7] Kano N. et al., “*Attractive Quality and Must-be Quality*,” research summary of a presentation given at Nippon QC Gakka: 12th Annual Meeting, 1982
- [8] Philips L., *The Kano Model -How to Delight Your Customers?*, Market Research 6 Sigma, www.bussinesmeccanica.blogspot.com, 2021
- [9] Rabetino, R., Kohtamäki, M., & Gebauer, H., *Strategy map of servitization*. International Journal of Production Economics, 192, 144-156, 2017
- [10] Vandermerwe, S., Rada, J., *Servitization of business: Adding value by adding services*, European Management Journal, Vol. 6(4), pp.314–324, [https://doi.org/10.1016/0263-2373\(88\)90033-3](https://doi.org/10.1016/0263-2373(88)90033-3), 1988.
- [11] Wang P.P. et all. *Status Review and Research Strategies on Product-service System*, International Journal of Production Research, Vol.49 (22), pp. 6863-6883, 2011.
- [12] *** Quality Essentials, A Reference Guide from A to Z, ASQ Quality Press
- [13] *** Agile Logic Excel worksheet for Kano analysis, 2021.

O încercare de servitizare pentru un producător român

Rezumat: *Implementarea unei strategii de servitizare ajută companiile să obțină un avantaj competitiv. Scopul acestui studiu este de a oferi o abordare bazată științific pentru servitizarea într-o companie de producție din Transilvania. Au fost folosite instrumente cantitative și calitative. Modelul Kano a fost folosit ca instrument cantitativ. Au fost luate în considerare mai multe caracteristici potențiale pentru procesul de servitizare. Chestionarul oral standardizat a fost utilizat din cauza ratei sale ridicate de răspuns și a posibilității de a reduce dificultățile de înțelegere prin explicații directe. Dimensiunea de referință a fost utilizată ca metodă non-statistică pentru a determina numărul de respondenți. Douăzeci de manageri de mijloc au participat la interviuri. Numărul a fost suficient pentru că provin dintr-un segment omogen. Analiza discretă a fost folosită pentru interpretarea modelului. Trei dintre ele sunt caracteristici „trebuie”, două sunt atribute „performanță”, trei „attractive” și alte două „indiferente”. Calculul coeficienților de satisfacție și insatisfacție a oferit o mai bună ierarhizare a acestor caracteristici. Cadrul cu acces gratuit Agile Logic a fost folosit pentru modelul Kano. Compania poate trece cu ușurință de la un sistem centrat pe produs la un sistem de servicii pentru produse prin implementarea concluziilor acestui studiu.*

Camelia Ioana UCENIC, PhD, Associate Professor, Technical University of Cluj -Napoca, Faculty of Industrial Engineering, Robotics and Production Management, Management and Economic Engineering Department, Camelia.Ucenic@mis.utcluj.ro, +40 264 401 782, Muncii Boulevard 103-105, Cluj Napoca.

Claudiu Ioan RATIU, PhD, Professor, Technical University of Cluj-Napoca, Faculty of Industrial Engineering, Robotics and Production Management, Design Engineering and Robotics Department, Claudiu.Ratiu@muri.utcluj.ro, +40 264 401 741, Muncii Boulevard 103-105, Cluj-Napoca,