ISSN 1816-6075 (Print), 1818-0523 (Online)
Journal of System and Management Sciences
Vol. 6 (2016) No. 1, pp. 39-53

Application of Kano Model to the Service Quality Measurement in Road Transport: a Research Concept

Dorota Leończuk

Faculty of Management, Bialystok University of Technology
E-mail: d.leonczuk@pb.edu.pl

(Received 12 October2015; accepted 2 Jan 2016)

Abstract: Customer requirement analysis is an important issue in service development. The Kano model is a tool to classify and prioritize customer needs based on how they affect customer satisfaction. The model identifies basic types of product or service attributes: must-be, one-dimensional, attractive, indifferent, and reverse. It can be used not only for the quality assessment of services but also as a tool to improve service quality.
The article presents the concept of using the Kano model in evaluation of service quality in road transport of goods. According to the model attributes of the quality of transport services were identified and assigned to five categories. This approach can be used by carriers to diagnose customer requirements and adapt the offer to their needs.

Keywords: freight transport, Kano model, measurement, road transport, service quality

1. Introduction

The basic service on the logistics market, resulting from the need to move goods from location to location, is the transport service. Carriage of cargo requires providing appropriate conditions for its transportability: natural, technical and economic. The constantly growing customer requirements regarding the quality of transport services create a need for the analysis of their needs, for the service providers to adapt the offer.

In the literature we can find many proposals for methods of measuring the quality of services. Two main approaches to the quality of service are specified: the first assumes that it is a set of features that should characterize a service in order to fully meet the needs of the client; the second one, on the other hand, describes the quality as the difference between the expectations in relation to the service and the subjective opinion of the customer after its implementation (Gajewska et al, 2012). Often the

price is an indicator of quality, which means that the client determines the quality of the services, the features accompanying the basic service, being aware of the dependence between higher quality and higher prices.

Currently, due to oversupply on the market of road transport, quality is starting to become crucial to stay competitive. Globalization, technological developments, deregulation resulting in an increase in the level of competition between carriers in terms of prices and services, has increased the level of demands for the quality of service. It is also important that the quality is assessed on the basis of the final purchased benefits and the manner of provision of services (e.g. staff qualifications). The greater importance of quality as an instrument of competition can be observed also in international transport. The factors of qualitative competition include: modern, eco-friendly fleet; developed network of services; multi-directionality of transport (Rosa, 2013).

The issue analyzed in this article is the method for measuring the quality of transport services in the road transport of goods. The main goal of this work is to develop the concept of application of the Kano model to evaluate the quality of transport services in the road transport of goods on the Polish market. The interest in road transport results from the unwavering popularity of this mode of transport. Currently, about 80% of cargo is transported via road transport. Poland does not deviate in this respect from the standards of European transport. Although the European Union's policy, for environmental reasons, tends to shift cargo flows from roads to railroads, creating amenities for combined transport, no break in the upward trend of road transport has been observed. This mode of transportation is especially popular for short and medium distances. Moreover, the average length of the routes is extended, among others, as a result of liberalization, the introduction of free movement of goods, the abolition of the system of transport contingents (the need to obtain permits for transit journeys).

The problem of assessing the quality of transport services and, thus, comparing the services provided is important because of the development of the electronic market, transport exchanges and tender platforms that brings together commercial entities on the transport market.

The article presents a review of literature related to the concept of quality of transport services and the ways of measuring them, as well as the applications of the Kano model. Subsequently, the concept of the application of the Kano model to evaluate the quality of transport services in the road transport of goods has been presented. The limitations of the proposed approach and the conclusions related to the topic have also been described.

2. Previous research

A. The quality of transport services

The ability to measure the quality of service is the first step in ensuring customer satisfaction. Customer preferences can be represented by an ordered set of criteria that describe how to meet a given need of the creators of the so-called model of preferences. For example, the Likert scale is used, with which you can measure the absolute level of customer satisfaction.

Quality is an interdisciplinary category, defined in various ways. The quality of transport services is defined as a degree of severity of characteristics interdependent on their practical value. The intangible character of the transport service makes the consumer buys primarily a vision of satisfaction with the choice of carrier. Therefore, the concept of quality can be considered in terms of (Rosa, 2013) :

postulated quality that expresses the expectations of recipients in relation to transport services, determined as transport postulates (e.g. security, immediacy of delivery, timeliness, comprehensiveness of the transport service, etc.);

the quality offered, linked to the offer of the carrier (should be higher than the expectations of the recipients to create a demand for new services and solutions);

the realized quality, determined after the completion of the service (which is usually lower than the quality offered, due to the occurrence of unexpected circumstances, e.g. congestion on the route).

The key to ensuring customer satisfaction is to reduce the gap between perception of the perceived quality and the expectations associated with the desired level of quality. This approach is implemented using the SERVQUAL method, which indicates the need for analyzing and comparing customer expectations regarding a service and its implementation by the relevant company. The SERVQUAL scale (Service Quality Scale, presented in 1985 by Parasuraman, Zeithaml and Berry) takes into account 10 dimensions the quality of service. The basis for the construction of this scale is the quality of service model, which assumes that the perceived service quality is a function of discrepancy between customer expectations and their perceptions of the service received, arising from its actual receipt. The paper [4] presents an example of the use of the SERVQUAL scale method and factor analysis to examine the relationship between the expected, and the perceived quality of urban transport services.

In the paper (Baki et al, 2009), testing the quality of transport services, was based on a combination of three methods: the SERVQUAL scale, the Kano and QFD – Quality Function Development models, transforming customer requirements regarding technical characteristics. The authors analyzed 27 attributes, the developed method was used to study the services of a single company. This approach can be used to improve service quality of a company, not to compare the offers of different companies.

For the evaluation of carriers and their comparison, made by shippers, transport

managers have also used scorecards that contain a list of key attributes and the evaluation of each of the carriers with respect to these attributes. The manager selects the attributes of performance, assigns importance, or a severity indicator to them, and assigns a score for each attribute (Table 1). In this approach, the card is used as a diagnostic tool. If the service quality of a specific carrier is assessed below a certain predetermined level, he may be placed on a probation period. In addition, if the result is not satisfactorily improved during the probationary period, it may constitute grounds for resignation from the use of the services of that carrier (Murphy, 2011).

TABLE I
CARRIER REPORT CARD (SOURCE: [13])

No	Key performance indicator	% Value	Gross score (0-5)	Net score
1	Service performance improvement	25%	4,5	1,125
2	Continued cost savings	20%	3	0,6
3	Driver performance	15%	5	0,75
4	Sales rep responsiveness	15%	3,5	0,525
5	Loss-damage claims	10%	4,5	0,45
6	Customer complaints	10%	4,5	0,45
7	Inbound deliveries by 9 a.m.	5%	3	0,15
		100%	28	4,05
				81,00

The comparison of the quality of transport services is also carried out in the study of logistics journals that publish the results on websites – in Poland, such rankings are

presented, among others, in the "Eurologistics" magazine ((Murphy, 2011)).

B. Application of the Kano model

When undertaking the subject of the quality of service, it should be noted that the higher level of quality characteristics does not always lead to higher quality perception by customers. This correlation in customer satisfaction surveys was observed by Noriaki Kano, who defined five types of quality attributes related to the issue of the attractiveness of quality (Fig. 1): attractive, one-dimensional, indifferent, reverse and must be (Kano et al, 1984). The Kano model is used to study the attributes of the product/service from the point of view of their possible impact on the perceived quality. Customer satisfaction, according to the model is defined as the degree of fulfillment of customer needs.

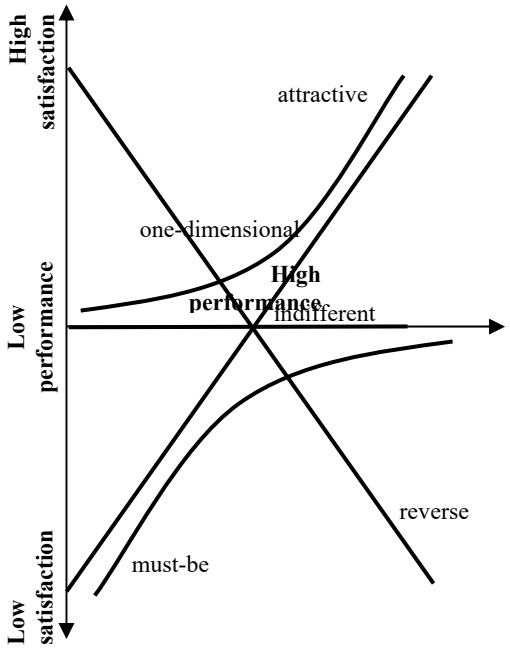

Fig. 1. Kano model (Source: prepared on the basis of [20])

The characteristics of the different types of quality attributes specified in the Kano model have been presented in Table 2.

The Kano model is used in many industries, both in the studies concerning the products, as well as services (Gouthier, et al, 2012). In the article (Mikulić, 2007), Mikulić analyzed 46 articles, and indicated a variety of applications of the model in marketing research, including the application in the following areas: IT industry, tourism, services of supermarkets, banking services, health care, etc. This model is treated in different ways: as a model of quality, of satisfaction a model of customer requirements, and needs.

The (Gajewska, 2013) paper analyzed the relationship between the tools of promotion in supermarkets and customer satisfaction – using the Kano model as a research tool. 15 closed questions were applied with 5 response options, divided into positive and negative statements (i.e. the sheet contained a total of 30 questions).

Another example of the application of the Kano model is a customer satisfaction survey and the indication of the priorities of the elements of the product in e-banking (Alroaia et al, 2011). In the first instance, on the basis of literature (books, articles) and the knowledge of experts, 16 factors affecting customer satisfaction were identified. According to the decision tree, and the AHP methods, factors have been divided into four categories: social, cultural, economic, and physical. Then, these factors have been divided into groups according to the Kano model: fundamental, functional, and motivating.

TABLE 2
CHARACTERISTICS OF THE TYPES OF QUALITY ATTRIBUTES (SOURCE: PREPARED ON THE BASIS OF [6, 20])

Type of attribute	Importance of the attribute	Indications regarding the development of the attribute
attractive	the lack of the attribute does not cause customer dissatisfaction, higher level of the attribute affects customer satisfaction	the client does not expect to receive them so they arouse admiration; aim to differentiate the offer; select several of these features and ensure their maximum level, this will allow for offer distinction
one-dimensional	the higher the status of the fulfilment of the attribute, the higher the customer satisfaction; if the level falls below a certain value, it causes dissatisfaction	customers are aware of these needs; their level should not depart from what the competition offers
indifferent	the attribute does not affect the satisfaction or the dissatisfaction of the customers	unnecessary, avoiding them will reduce costs
reverse	lack of the attribute causes customer satisfaction, higher level of the attribute increases dissatisfaction	the client is even willing to pay extra for a certain feature of the service to be absent
must-be	that which is obvious in the eyes of the customer, lack of the attribute causes customer dissatisfaction, higher state of fulfillment of the attribute does not increase customer satisfaction	there is a danger that the customers, questioned about this type of attributes, will not mention them; a product or service should contain them, but their excessive levels are undesirable

The authors of the paper (Eversheimed, 2009) used the Kano model to classify the attributes of the dryer (tumble dryer). Client requirements are divided into three categories: basic requirements (obvious features), performance requirements (one dimensional), exciting characteristics (unexpected, but when they appear they

increase satisfaction). The key is to balance these components.

The Kano model was also used for the classification of the elements of home delivery services – growing mainly because of the increase in the number the products, purchased via TV and the Internet – and their impact on customer satisfaction. It is noted that the perception of individual elements was affected, among others, by the client's sex (Chen et al, 2003).

Another example of the application of the Kano model is the interior design of trains (Lanzotti et al, 2009). In turn, in the (Peng et al, 2008) paper, the authors applied the described model to the customer satisfaction survey of the Light Rail Transit (LRT) system for the diagnosis of the current situation and the identification of the attributes that should be developed in order to increase passenger satisfaction in order to encourage the use of LRT as an alternative means of transport. Two groups of attributes have been listed: related to the railway station and the interior of the train. The study also used the Penalty Reward Contrast Analysis (PRCA), used for the classification of attributes, as well as the Adequacy Importance Model (AIM) allowing for measuring the overall level of satisfaction, taking into account the level of satisfaction and the importance of each attribute.

Rosa, 2013	availability and variety of services offered by carriers (types of transport operations, types of transported cargo); handling capacity, throughput; offered infrastructure (good condition of the rolling stock, load capacity, its type, additional equipment); meeting environmental restrictions; distribution of services (journey time from and to, place of loading and unloading); promotion (participation in trade fairs, advertising, the Internet); personnel (competence, communication skills, flexibility, pace of work); the process of service provision (the ability to track shipments); image and credibility of a company
	subject of transport (mass character; security; ability to increase the size of the transport services provided; the carrier's flexibility to adjust to the requirements of the recipients); transport route (accessibility to the transport network; the continuity of the transport network; the flow capacity of the transport network; the immediacy of transport; extension of the transport route; security of transport; spatial flexibility); manpower (culture of service; operability; safety of carriage); working tools (quantitative and generic availability of vehicles and loading facilities; safety related to the technical condition of the rolling stock; spatial accessibility to the means of transport); the organization of the transport process (the degree of coordination and synchronization of the phases of the transport process; reliability of the execution of shipping orders; diligence of the transport service; the efficiency of the documentation operations); transport time (the speed of delivery of cargo; availability; frequency; reliability; rhythmicity; regularity; punctuality)

3. Methods / Theoretical Framework

Recognizing the demands of the customers on the market of transport services ensures the appropriate level of customer satisfaction. Use the Kano model for this purpose allows taking into account both the positive and the negative aspects associated with the experience of a service and the impact on customer satisfaction (Pugna et al, 2009). The proposed concept applies to the road transport of goods. The aim of the study is to analyze the impact of the attributes of the transport service on the quality as perceived by customers. It should answer the following questions: 1) What features of the service are mandatory? 2) What features attract customers? 3) What features are undesirable?

The first step is to identify all elements of the transport service based on the review of literature. The table 3 presents the examples of the criteria taken into account when choosing a carrier, that is the attributes of quality of transport services. Qualitative characteristics of transport services in literature are also presented with an assignment to the selected elements of transport: subject of transport, transport route, workforce, working tools, the organization of the transport process and the transport time.

Then, using the literature and the knowledge of experts, select the most important of the identified attributes that will be examined. The next step is the design of a Kano questionnaire, which includes both positive and negative aspects of the reception of services, and the impact on customer satisfaction. Example questions divided into positive and negative statements with five variants of responses, which are used to classify attributes in accordance with the algorithm (Fig. 2) are shown in the table 4.

TABLE 3
EXAMPLES OF ATTRIBUTES OF THE QUALITY (SOURCE: OWN)

Source	Attributes
Murphy, 2011	steady, reliable transit time; competitive prices; notification of disruption of services; knowledge and problem-solving; reputation as an honest carrier providing high-quality services; active monitoring of scheduled deliveries; ability to handle all transportation needs; traditional electronic data interchange capabilities; Online proof of delivery; service of sending cargo online; accuracy in invoicing; response to complaints relating to services; availability of equipment; professionalism of drivers, contact staff; financial stability; possibility of providing expedited services; satellite tracking and communication technologies; tracking via the Internet; possibility of introducing a fuel surcharge; Internet price fixing
Rydzkowski ed, 2011	innovation; computerization; comprehensiveness of services; response time to offer inquiry; disputes and complaints; executive potential; flexibility of deliveries; the geographic scope of deliveries; experience and credibility; circulation of information on the state of deliveries; speed of deliveries; price corresponds to quality; completeness of deliveries; accuracy of deliveries; timely deliveries

TABLE 4
FUNCTIONAL AND NON-FUNCTIONAL QUESTIONS IN KANO'S SURVEY (SOURCE: OWN)

Functional form of the question: How do you feel if the vehicle does have an additional equipment, like hydraulic car-mounted crane?	1. I like it in this way 2. It must be in this way 3. I am neutral 4. It is acceptable in this way 5. I don't like it in this way
Non-functional form of the question: How do you feel if the vehicle doesn't have an additional equipment, like hydraulic car-mounted crane?	1. I like it in this way 2. It must be in this way 3. I am neutral 4. It is acceptable in this way 5. I don't like it in this way

In addition, the questionnaire should include a specification, as well as assigning significance to individual elements of the transport service.

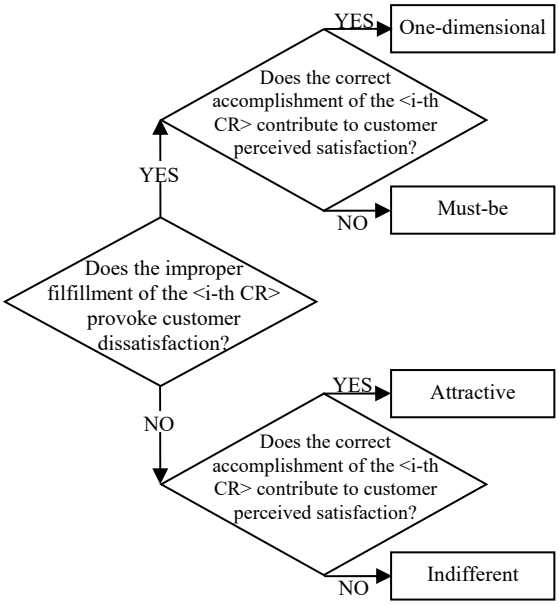

Fig. 2. Algorithm for the classification of the product/service attributes according to the Kano model (Source: [17])

Then, the results are checked and assigned to five categories based on the Kano Evaluation Table (Table. 5). If the aim of the study is the overall assessment of services by a larger test sample of respondents, the categories are determined based on the amount of the prevailing of responses.

TABLE 5
KANO EVALUATION TABLE (SOURCE: [1, 19])

		Non-functional question				
		1	2	3	4	5
Functional question	1	Q	A	A	A	O
	2	R	I	I	I	M
	3	R	I	I	I	M
	4	R	I	I	I	M
	5	R	R	R	R	Q

O – one-dimensional
M – must-be
A – attractive
R – reverse
I – indifferent
Q – questionable

4. Results, discussion and limitations

Examples of characteristics making a transport service more attractive can be tracking cargo, using electronic data exchange. Among the one-dimensional attributes it is possible to indicate the technical condition of the vehicle, the qualifications of the staff. The geographic scope of the operation of the carrier was regarded as a neutral factor. An example of a reverse quality is the possibility of consolidation of cargo, while must be includes e.g. timely deliveries, low frequency of losses and damage to cargo (Fig. 3).

The creator of the model, Noriaki Kano emphasized that the elements of quality are differently perceived by customers, therefore, the examples are not the final assignment of quality elements to individual groups of attributes. This model is dynamic, with time the features defined as raising attractiveness are becoming one-dimensional (they are intercepted by the competition and distributed), while the one-dimensional attributes become evident (mandatory).

The proposed concept can be used for the evaluation of the carrier company's offer by the client after the completion of a service, or to determine the requirements of the customers regarding the quality of transport services, and thus to compare the offers of companies in the Transport, Forwarding and Logistics (TFL) sector and the selection of a suitable carrier for specific carriage requirements of the client. The use of properly formulated specifications may allow the identification of factors that

influence the perception of the importance of individual attributes (e.g. depending on the type of goods transported). The questionnaire should also be complemented by the significance assigned to each of the attributes that allow ranking of the importance of various elements of the quality of transport services.

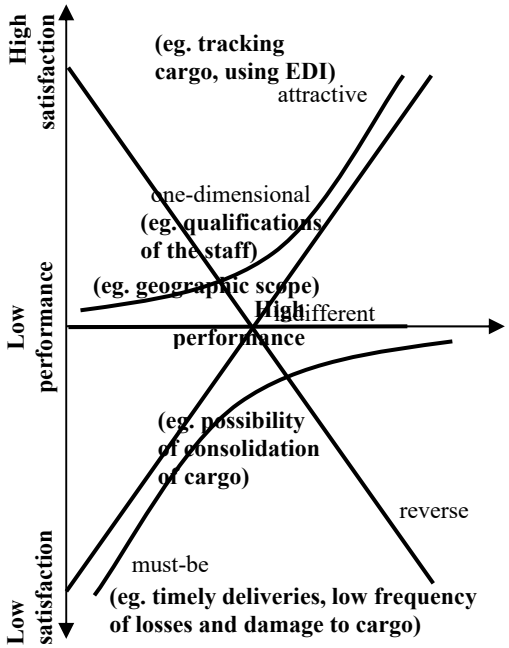

Fig. 3. Examples of attributes of transport services based on Kano model (Source: own)

The main limitation of the use of the model in analyzing the quality of transport services is the need to select the appropriate set of attributes included in the study. It is essential to reduce their number because of the way the questionnaire is constructed, in which each attribute is evaluated with the division into positive and negative statements (adding one quality attribute increases the size of the questionnaire by two questions).

5. Conclusions

The Kano model is used in many industries, in research relating both to products and services. It can also be used to study the transport market. The problem of assessing the quality of transport services is in fact important because of the development of the electronic market, transportation exchanges, and tender platforms that bring together commercial entities on the transport market. The proposed concept of using the Kano model to assess the quality of transport services in the road transport of goods can be used in the comparison of tenders under the above mentioned services.

References

Y. V. Alroaia, M. Hemati, K. Abdi. (2011). Priority of Factors Affected on Customer's Satisfaction in the E-Banking by Using Kano Model and Analytical Hierarchy Process: A Case of Iranian Commercial Bank, *Journal of Modern Accounting and Auditing*, 7(10), pp. 1097-1105.

B. Baki, C. S. Basfirinci, I. Murat, Z. Cilingir. (2009). An application of integrating SERVQUAL and Kano's model into QFD for logistics services: A case study from Turkey, *Asia Pacific Journal of Marketing and Logistics*, 21, pp. 106-126

M. Chen, K. Chang, Ch. Hsu, I.(2011).Understanding the relationship between service convenience and customer satisfaction in home delivery by Kano model, *Asia Pacific Journal of Marketing and Logistics*, 23(3), pp. 386-410.

K. Chleba. (2011). The measurement of expected and perceived quality of transport services, *Quantitative Methods in Economics*, 12(2), pp. 112-121.

W. Eversheim ed. (2009). Innovation Management for Technical Products, *Springer-Verlag*, Berlin.

P. Gajewska. (2012). Metoda Kano w ocenie jakości usług gastronomicznych", Zeszyty Naukowe. T*urystyka i Rekreacja*, 9(1) , pp. 113-128

P. Gajewska, I. Szewczyk. (2013). Analiza związku narzędzi promocji z satysfakcją nabywcy – model Kano, *Zeszyty Naukowe Wyższej Szkoły Humanitas*. *Zarządzanie*, 2, pp. 183-207.

M. Gouthier, A. Giese, Ch. Bartl. (2012). Service excellence models: a critical discussion and comparison, *Managing Service Quality: An International Journal*, 22(5), pp. 447-464.

A. M. Jeszka.(2013). Sektor usług logistycznych w teorii i praktyce, Difin, Warszawa.

N. Kano, S. Nobuhiku, T. Fumio, T. Shinichi.(1984). Attractive quality and must-be quality", *Journal of the Japanese Society for Quality Control*, 14(2), pp. 39-48

A. Lanzotti, G. Gironimo, G. Matrone, S. Patalano, F. Renno. (2009). Virtual concepts and experiments to improve quality of train interiors, *International Journal on Interactive Design and Manufacturing*, 3(2), pp. 65–79.

J. Mikulić. (2007). The Kano Model – A Review of its Application in Marketing Research from 1984 to 2006, *Proceedings of the 1st International Conference Marketing Theory Challenges in Transitional Societies*, pp. 87-96.

P. R. Murphy, D. F. Wood. (2011). Nowoczesna logistyka, Helion, Gliwice.

N. Y. Peng et al. (2008). Customer satisfaction of light rail transport, *WSEAS International Conference on URBAN PLANNING and TRANSPORTATION* (UPT'07), pp. 87-95.

A. Pugna et al.(2009). Kano's Tridimensional Model for Quality Evaluation, *Buletinul AGIR*, no. 2-3, pp. 10-19

G. Rosa, (2013). Konkurencja na rynku usług transportowych, *Wydawnictwo C.H.* Beck, Warszawa.

F. Rotini et al. (2012). Re-engineering of Products and Processes, Springer-Verlag, London.

W. Rydzkowski ed.(2011). Usługi logistyczne. Teoria i praktyka, Biblioteka Logistyka, Poznań.

E. M. Tuuli, J. S. Junnila. (2014). Applying the KANO model to analyse the value of green FM, *Property Management*, 32(4), pp. 312-325

W. Urban. (2013). Jakość usług w perspektywie klientów i organizacji. W kierunku zintegrowanej metodyki pomiaru, Oficyna Wydawnicza Politechniki Białostockiej, Białystok