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CLASSIFYING CUSTOMERS ACCORDING TO NPS INDEX: CLUSTER ANALYSIS FOR CONTACT CENTER SERVICES

Abstract

The purpose of the study was to discover if, according to the assessment of contact center services quality: (1) customers using contact center services can be grouped into few homogenous items (clusters), (2) if the identified groups cover the classification proposed in the Net Promoter Score (NPS) marketing index (Reichheld, 2003) and (3) which customers belong to each of the clusters, i. e. what is a characteristic of each of the clusters.

In the paper, values of observable variables describing service quality in contact centers were measured on a sample of 1 000 contact centers customers.

The results of the research are of both cognitive and utilitarian character. The first explain the structure of groups (clusters) joining contact centers customers on a basis of their perception of the quality of contact centers services and some descriptive attributes. The second, by specifying characteristics of different groups of customers, can be used to design contact centers services with a special attention paid to the matters of quality to fully meet these customers' expectations.

The results of the research make the behavior of contact centers customers and their perception of the service quality more comprehensible. So the paper contributes into the development of the methods of classifying customers' loyalty on a basis of measuring their perception of quality of services delivered through a distant interface.

JEL Classification Code: C38, M31.

Keywords: contact center, service quality, cluster analysis, NPS index, Net Promoter Score, customer loyalty.

Introduction

The service sector is expanding at an increasing rate and is becoming intensely competitive (Chen, Gupta and Rom, 1994; Johnson, Dotson and Dunlap, 1988). As such, service quality has become a very important issue in marketing and has

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received much attention since the deregulation, and thus increased competition, within many service industries (Upal, 2008). Simultaneously, an intensive research on measuring quality of services continues over the last 30 years (Seth, Deshmukh and Vrat, 2005). Also, technology plays an important role in improving quality of service. Taking advantage on this technology, organizations are seeking contact with their customers to inform them, offer additional services and learn about their behavior. The essential condition for an organization's functioning is having customers and maintaining contacts with them. To reach this, organizations are trying hard to deliver high quality of services, which impacts customers satisfaction and their loyalty (Anton, 1997). Still, a problem of technology-intermediated service quality arises, contradicting a traditional face-to-face relationship during service delivery.

The contact center industry is one of the most rapidly growing industries in the developed world today (Dalrymple and Phipps, 1999; Upal, 2008). The growth has been occurred as many service providers are now seeking to lower the cost of providing services while increasing the time period access is available (Staples, Dalrymple and Phipps, 2001). It also reflects the desire of companies to improve access to their services, in a cost-effective manner, and retain satisfied customers (Bird, 1998). This can be done via a contact center. Contact center can be defined as an office in which large numbers of telephone calls are handled, especially one providing the customer services functions of a large organization, helped by advanced IT solutions.

As an integral part of most organizations, today contact centers play a key role in the service delivery chain. Presently in many industries, contact centers are the primary source of contact for customers. This important role implies that the performance management of contact centers is of critical importance to organizations, especially the delivery of customer satisfaction. Beside the others, it is possible by harnessing information technology into providing services (Gilmore, 2001; Lotko, 2009). Still, the role of people is not to be underestimated (Marr and Schiuma, 2001; Bowen and Lawler, 1992; Wallace, Eagleson and Waldersee, 2000; Bittner, 1990). Other researchers claim, that contact center employees' customer orientation behaviors meaningfully impact service quality (Rafaelli, Ziklik and Doucet, 2007). Some findings show that one bad experience with contact centers might cause customers to stop using a company's product or service (Delorey, 2003). This means that contact centers need to deliver on their service promise all the time if they want to avoid the risk of losing customers. According to other researchers (Bearden, Malhotra and Uscategui, 1998) the benefits of increased quality of the service process will be two-fold: (1) organization will improve the ability to attract new customers and (2) retention rates among current customers will increase.

The purpose of the study was to discover if, according to the assessment of contact center services quality: (1) customers using contact center services can be grouped into few homogenous items (clusters), (2) if the identified groups cover the classification proposed by F. Reichheld in his Net Promoter Score (NPS) marketing index

(Reichheld, 2003) and (3) which customers belong to each of the clusters, i. e. what is a characteristic of each of the clusters.

From such defined a goal, the following research hypotheses were drawn:

H1: customers using contact center services can be grouped into few homogenous items (clusters) on a basis of services quality assessment.

H2: linking customers into clusters covers the Net Promoter Score (NPS) index classification, grouping them into promoters, neutrals and detractors.

H3: clusters are distinguished by some characteristic features according to customers' demographical variables, contact channels and types of services they use.

Hypotheses were verified sequentially, i. e. hypothesis H3 was verified when the assumptions included in hypothesis H1 and then H2 occurred true.

1. The State of the art

1.1. Customer loyalty and the NPS index

On contemporary markets the phenomena of domination of service sector, multicultural society, mobility, postmodern, hedonistic styles of living and virtual reality can be observed (Griffin, 1997; Mazurek-Łopacińska, 2003). Customers have a high degree of market consciousness, expert knowledge reached thanks to access to different sources of information. Hence they do not trust traditional broadcasting of promotional content (Brogan and Smith, 2011). On the other hand, organizations become „seekers” of the customers. That is why customers' loyalty is of a special value in today's economy. Researchers identify models of loyalty based on customer satisfaction, brand, image, social factors and attitudes (Brogan and Smith, 2011; Dejnaka, 2007; Urban and Siemieniako, 2008).

Along with studies of loyalty impact on business performance, emerged constrains related to the correlation between those two factors. S. Keaveney (Keaveney, 1995) showed that with higher loyalty the company is exposed to more interaction with a client. Therefore company has to have high quality of the whole spectrum of services. Otherwise customers may switch to some other service provider. As the result of that, the improved loyalty will have contrary effect on long term business growth. R. Bolton and his colleagues (Bolton *et al.* 2000) also investigated the condition under which loyalty programs will have a positive effect.

Strength of correlation between loyalty and business performance growth depends on the type of loyalty. Loyal customer driven by external constrains may switch to competitors, when limitation disappear. Therefore, in order to use loyalty as a good indicator of business strength, loyalty has to reflect loyalty based on relation or social impact. In a turbulent market environment, purchases behaviors can easily change. According to P. Korneta, therefore opinions and positive experiences are better foundation for long term business development (Korneta, 2014).

The aspect of opinions and emotional engagement was embraced in definitions of loyalty presented by J. Griffin (Griffin, 1997) or K. Dziewanowska (Dziewanowska, 2007). This approach is in line with current researches. Implications from A. Lotko (Lotko, 2012) paper clearly show that: opinions spread by customers do meaningfully influence on the image of an organization defined as a way the organization is perceived by its real and potential clients. Therefore, it sounds rational to accept this approach to loyalty in this paper.

In due course of studies on loyalty emerged many metrics of customer loyalty based on emotional engagement of a consumer. F. Reichheld introduced Net Promoter Score index (NPS index) based on customers willingness to recommend a company to a friend (Reichheld, 2003). A detailed history of NPS index can be found in a paper by B. Hays (Hays, 2008).

The NPS index is nowadays widely used loyalty metric. The idea behind NPS index is very simple and is based on asking customers just one question: „How likely is it that you would recommend us to a friend or colleague?“ on a 10-point scale. Subsequently, customers are clustered into 3 groups: promoters, passively satisfied and detractors. Customers who will rate 9 or 10 are considered as promoters, 7-8 as passively satisfied (neutrals, fence sitters) and the rest are classified as detractors. Each group is linked with expected customer behavior. Promoters are likely to stay with a company in case of emergence of competitors. Moreover, they are more likely to repeat purchases. Finally, they may have positive impact on other potential customers. Therefore promoters are expected to contribute to growth of company performance. On the other hand, detractors have negative impact on business performance expectations. They are likely to create negative opinions or switch to competitors. NPS is calculated as subtraction between share of promoters and share of detractors ($NPS = P - D$). NPS index above 0 is considered as positive and the value above 50 means excellent situation (Reichheld 2003). The idea of NPS is shown in Figure 1.

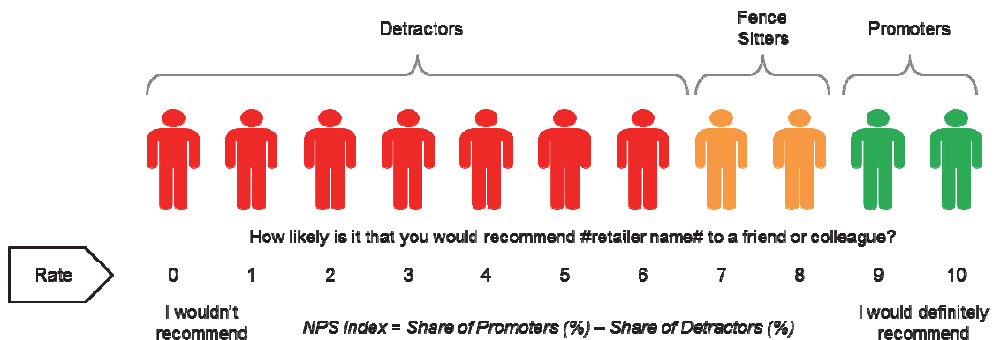


Figure 1. Classification of responders and brief view on NPS calculation method

Source: (Korneta, 2014).

Nevertheless, NPS index was criticized by N. Morgan and L. Rego (Morgan and Rego, 2006) and by T. Keiningham and colleagues (Keiningham *et al.*, 2007). In their papers, NPS index was set against company total growth measured by total profitability or revenues. Revenues growth of company may come not from like-for-like sale, but for example new stores opening or high investments. On mature markets role of loyalty and its link with overall company performance is much stronger (Korneta, 2014). Reichheld presented rational; standing behind NPS index, which make NPS index so useful and successful (Reichheld, 2006).

Knowing importance of NPS index, arise two questions: what drives positive NPS index and how to build customer loyalty and in a consequence receive positive NPS. A. Lotko showed that NPS index depends on various factors, e.g. type of offer or time for how long a customer has been with a company, and companies can undertake numerous of activities to improve customers loyalty measured by NPS index (Lotko, 2012). Research on NPS index drivers conducted also D. Jeske and others (2011). They didn't provide the answer regarding drivers, but their paper demonstrates how statistical classification model can be used to identify key drivers of NPS. E. Chang and X. Fan examined NPS index in online environment to present what aspects of e-stores are the most influential on this index (Chang and Fan, 2013). The need to conduct quantitative analysis based on consumer survey presented R. Owen and L. Brooks (Owen and Brooks, 2008). They connected this analysis with a decision making process. The quantitative studies to identify roots of NPS index have not been performed to our knowledge and the question regarding roots of NPS index is still opened for a discussion (Korneta, 2014).

1.2. Role of a contact center in modern organizations

The essential condition for an organization's functioning is having customers and maintaining contacts with them. This task is very difficult on strongly competitive markets. Hence, the main aim of an organization should be building and improving a relationship with a customer. Currently, stress is put on the importance of loyalty, responsibility and emotions, particularly satisfaction (Mazur, Jaworska and Mazur, 2001). This concept requires a departure from the traditional (i.e. transactional) attitude towards the customer. According to the classification of encounters proposed by V. Zeithaml and M. Bittner (Zeithaml and Bittner, 2000), which are: (1) the remote encounter (e.g. ATM, WWW, where there is no direct human contact between organization and the customer), (2) the phone encounter and (3) the face-to-face encounter (e.g. cashier's desk, where the customer physically interacts with service provider or his personnel), contact center encompasses the two first types.

One of the methods that can be used by the organization to gain advantage over its competitors is providing the client with a wide range of services connected with the product, forming a relationship in which the client feels respected, appreciated and

important for the organization, as well as treating the client in the most individualized manner possible (personalization of contacts). To do so, organizations have been implementing a single central contact point (organizational unit) whose task is to deal with calls, inquiries, problems and other matters connected with customer service. This contact point is most commonly named a contact center. It can be said that contact center is „an organization or organizational unit in which each contact with a customer (phone call, personal contact) may be dealt with by one or many employees with access to common information” (Kostecki, 2002). So contact center is a centralized office used for the purpose of receiving or transmitting a large volume of requests by telephone or other method of distance communication. According to Oxford Dictionary, contact center is an office in which large numbers of telephone calls are handled, especially one providing the customer services functions of a large organization. Trying to come up with a concise and precise definition of the term one may say that the contact center is a team of people, equipment and technology facilitating contacts between the supplier and the customers via all available means of communication (Lotko, 2003).

Nowadays the contact center industry expands powerfully. According to Deloitte (Deloitte, 2013):

- 77% of organizations expect to maintain or grow in size within 12-24 months,
- all contact channels expect growth of volume within 12-24 months,
- 62% of organizations view customer experience provided through contact centers as a competitive differentiator,
- 56% of organizations believe cost and quality management are equally important.

Summing up, the global call center industry is set to continue witnessing strong growth moving forward. This growth should be driven primarily by increasing focus on providing efficient customer service as a part of business development. However, industry players will need to continue investing in technology, human resources and quality of services to differentiate themselves from competitors.

1.3. Service quality in contact centers

Research on service quality began in the beginning of the eighties of the 20th century. Two trends are noticeable in this research: (1) elaboration of conceptual models and (2) elaboration of measurements scales. They are connected with each other and the first trend very often triggers the second one (Seth, Deshmukh and Vrat, 2005).

Early attempts (Grönroos, 1982; Lehtinen and Lehtinen, 1992) aimed at identification of factors composing the quality of services from the point of view of the customers. A conclusion was reached that the opinions concerning quality are derived from the comparison made between customers' expectations towards that what should be offered by organizations and the perception of provided services (Zeithaml, Parasuraman and Malhotra, 2000). The quality of a service may be de-

terminated as a difference between customers, expectations and perception of a given service. It is justified to discuss the perceived quality of services. This term was introduced by Ch. Grönroos (Grönroos, 1982). The expected service is a consideration that a customer is about to receive, whereas the perceived service – a real experience of a customer. Grönroos proposed a service quality model based on a difference between the quality and provided quality and expected quality. He claimed that the quality observed by the customer has two sources: (1) technical quality – final effect of operational processes and (2) functional quality – shaped in the course of the process of providing service. One of the most important conclusions drawn up on the basis of this model is the fact that the functional quality is more important than the technical one.

This attitude is strictly connected with a definitely most popular model of service quality – service gap model SERVQUAL which includes 4 internal gaps existing between (1) customers' expectations, their perception by the management, (2) perception of expectations by the management and service specification, (3) service specification and provision of a service, (4) quality of consideration and information, (5) – between expected service and supplied service (Parasuraman, Zeithaml and Berry, 1985). SERVQUAL is an analytical tool, which can help managers to identify the gaps between variables affecting the quality of offered services (Seth, Deshmukh and Vrat, 2005). This model is the most frequently used by marketing researchers and scientists, although it is an exploratory study and does not offer a clear measurement method for measuring gaps at different levels. The model has been refined during the years and some believe that only the performance needs to be measured as the SERVPERF model in order to find the perception of service quality (Cronin and Taylor, 1992). This model is also known as performance only model.

A. Parasuraman, V. Zeithaml and L. Berry distinguished 5 dimensions of service quality on the SERVQUAL scale (Parasuraman, Zeithaml and Berry, 1985): tangibles, reliability, responsiveness, assurance, empathy. Ch. Grönroos (Grönroos, 1988) added the sixth dimension to the model's measurements – „refinement”, which includes the ability owned by an organization to solve and fix problems (Hill and Alexander, 2003). The SERVQUAL scale became an inspiration for other authors. R. Johnston expanded them to the number of 18 factors determining the quality of services. Armistead (Armistead, 1990) made a division of service quality into „hard” and „soft”. The first group includes the time, correctness, flexibility, whereas the second group includes style, possibility of control and safety.

The SERVQUAL model was with time subject to modifications to a multilevel attribute and overall affect model (Dabholkar, Thorpe and Rentz, 1996) as well as a hierarchical model (Brandy and Cronin, 2001). Similar to all measurements, hierarchical model differs in respect of the factors and importance of sub-dimensions regarding such services as health care (Dagger, Sweeney and Johnson, 2007) or phone service subscribers (Pollack, 2009). This model will enable the companies to

recognize problems in primary stage of their delivered services - interaction quality, physical environment quality and outcome quality.

Gummesson's model of partial qualities is of great significance. It constitutes an expansion of Grönroos's model and introduces four elements, the so-called 4Q partial qualities. They include: (1) project quality, (2) quality of performance, (3) quality of deliveries, (4) quality of relations (Rogoziński, 2000).

The next model – J. Haywood–Farmer's attribute service quality model is based on the features and is strictly connected with the high quality of a company providing services together with the satisfaction of customers' requirements and expectations. The features of the service were divided into three groups within this model (Haywood-Farmer, 1988; Bielawa, 2010): (1) physical: facilities and processes, (2) behavioral aspects and (3) professional judgment. Each feature of a given service depends on different factors, which exert impact on its quality.

Synthetic model of quality service was formulated by A. Brogowicz (Brogowicz, 1990). He claims that the gap of service quality may exist even then when the consumer has never used a given kind of service but he became familiar with it on the basis of: opinions expressed by other users, advertisements and communications in mass media. This model refers to the factors which influence functional and technical expectations of a customer towards a given service. They include the image of an enterprise, influence exerted by external factors and traditional marketing activity.

The next model is the model of perceived quality and satisfaction developed by R. Spreng and R. Mackoy (Spreng and Mackoy, 1996). This model describes the effects of perception and expectation of qualities dependent on the degree of customer's satisfaction. Ten features were used to measure customer's satisfaction. (Stoma, 2012).

There are few other service quality models, incorporating, besides quality, other features, such as perceived value (Sweeney *et al.*, 1997), customer value and customer satisfaction (Oh, 1999). Some of the models are devoted to a special application, such as internet banking (Broderick and Vachirapornpuk, 2002) and IT-based solutions (Zhu *et al.*, 2002). This direction is important as S. Taylor and T. Baker demonstrate that the service quality relationship will vary from industry to industry (Taylor and Baker, 1994).

The significance of internet technologies in modern economy provokes the phenomenon that the unique quality of service provided in the Internet is beginning to be perceived as a tool of positive distinction from the competition (Zeithaml, Parasuraman and Malhotra, 2000). This being the case, emphasis put on the operationalization and selection of appropriate tools used to improve the quality of services provided in the Internet (O'Neill, Wright and Fitz, 2001). In 2001 Z. Yang, R. Peterson and L. Huang carried out measurements of the way the customers perceive the quality of Internet websites using six dimensions: ease of use, content displayed on the Website, accuracy of the content, timeliness of response, aesthetics and privacy (Yang, Peterson and Huang, 2001). E. Lociaco, R. Watson and D. Good-

hue elaborated the WebQual scale composed of twelve dimensions: informational suitability to the task, interaction, trust, response time, design, intuitiveness, visual appeal, innovativeness, flow, integrated communication, business processes and substitutability (Lociacono, Watson and Goodhue, 2000). V. Zeithaml, A. Parasuraman and A. Malhotra elaborated e-SERVQUAL scale constituting a development of the SERVQUAL scale for the environment of electronic services. It covers the following features (Zeithaml, Parasuraman and Malhotra, 2000): efficiency, reliability, privacy, responsiveness, compensation, contact. The first four dimensions refer to the core of a service, whereas the remaining three dimensions refer to the recovery of a service, as they have the meaning only in the case where the customers make complaints and notify of the problems. Other authors also make their contributions in this subject – J. Santos with his e-service quality model (Santos, 2003).

The works of M. Stoma (Stoma, 2012), A. Ghobadian, S. Steller and M. Johnes (Ghobadian, Steller and Johnes, 1994) and N. Seth, S. Deshmukh and P. Vrat (Seth, Deshmukh and Vrat, 2005) deliver a complete, coherent and synthetic comparison of models and measurement methods of the service quality.

The conducted library query did not demonstrate any sources including comprehensive results of the study of service quality in the centers of contact with a customer and much less their model generalization. The most general model – SERVQUAL and models considering the role of technology played in the service quality, include certain guidelines. Among 19 models appropriately documented in the literature, merely 5 belong to the category considering the role of technology such as IT (Seth, Deshmukh and Vrat, 2005).

In SERVQUAL model the first and fourth gap refer to the communication with customers. The first one refers to the perception of customers' expectations viewed by the management. This gap covers the difference between consumers' expectation and management's perceptions of those expectations, i.e. not knowing what consumers expect. The fourth quality gap is also very important. This gap covers the difference between service delivery and the communications directed to consumers concerning service delivery, i.e. whether promises match the delivery.

J. Haywood-Farmer (Haywood-Farmer, 1988) points out the importance of communication with customers placing it in both behavioral aspects of a service quality (human aspect of communication) and in physical facilities and processes (technical aspect of communication). Communication is also an important attribute as a part of service strategy in IT alignment model (Berkley and Gupta, 1994). This model describes how IT can be used to improve customer service along key service quality dimensions including reliability, responsiveness, competence, access, communication, security and understanding of the customer. As it comes to self-service via technological interface, the attribute and overall effect models are engaged (Dabholkar, 1996). The author proposes two alternative models of service quality for technology-based self-service options. Self-service is becoming popular day by day owing to

high cost of labor in service deliveries. According to this models expected service quality would influence intentions to use technology-based self-service option. Also, IT-based model belongs to a category of „technological” ones (Zhu *et al.*, 2002). This model highlights the importance of IT-based service options. Service providers are using IT to reduce costs and create value-added services for their customers. It proposes a service quality model that links customer perceived IT-based service options to traditional service dimensions. The model attempts to investigate the relationship between IT-based services and customers' perceptions of service quality.

Recommendations concerning organization of the work of contact centers and an exemplary general classification of the dimensions of the service quality perceived by the customers (Anton, 1997) were found in the literature together with the results of the study in customers' satisfaction of the used contact channels (Kostecki, 2006). J. Horovitz (Horovitz, 2006) and N. Lake and K. Hickey (Lake and Hickey, 2006) discuss the issue of the quality of customers' attendance, however they do not distinguish the attendance through the telecommunication interface. K. Mazurek-Łopacińska gives some of the solutions improving the quality of the remote customers' attendance, however without pointing out the use of centers of contact with the customer (Mazurek-Łopacińska, 2003). P. Kotler observes the issue of providing high quality of services within the scope of customers attendance (Kotler, 1994). A broad comparison of the most popular tools of the measurement customers satisfaction and service quality is presented by Hill and Alexander, however there are no tools dedicated to the measurement of the quality of services provided by the telecommunication interface (Hill and Alexander, 2003).

Some results of researches performed with the use of traditional service quality models are available (Gilmore, 2001; Upal, 2008), but these seem lacking the specificity of contact centers. It is underlined, that there is a need for accurate measurement of service quality in contact center and it should be treated as a priority (Gilmore, 2001). Some authors measure customers' expectations of contact centers staff (Burgers *et al.*, 2000), still expectations are something different than quality. They influence quality, but are not identical. The suggested expectations are self-efficacy, adaptability, empathy, time, communication style, reliability, commitment, empowerment, self-attitude, explanation, competence, security, knowing the customer. They should be taken into consideration when designing services (Bearden, Malhotra and Uscategui, 1998). Then the expectations model was reduced to 4 dimensions: (1) adaptiveness - the customer clearly expects contact center employees to adjust their behavior to the customer and adapt to various situations, (2) assurance - employees are expected to provide security and explanation, (3) empathy - customers expect employees to empathize with their emotions and/or situation and (4) authority - customers expect that contact center employees have the authority to deal with their various problems or questions. Some of those findings were used by the author when building a measurement scale for a model presented in this study. Some

clues on measuring customer satisfaction and managing service quality in contact centers can be concluded in works by R. Feinberg, K. de Ruyter and L. Bennington (Feinberg, de Ruyter and Bennington, 2005) and S. Bartsch (Bartsch, 2012), in both books based on case studies. Other researches underline that the quality of contact center services is highly influenced by personal engagement and attitudes of the staff (Bowen and Lawler, 1992; Wallace, Eagleson and Waldersee, 2000; Bittner, 1990).

In the face of the stated research gap, author took an effort to build own model measuring service quality in contact centers.

2. Remarks on methodology

The empirical part of the study was carried out with the use of infrastructure and human resources of the company Call Center Poland S.A. The method of Computer Assisted Telephone Interview (CATI) was applied. Telephone base was selected by means of the RDD method (*Random Digit Dialing*). Customers using any call center were examined.

To prepare a questionnaire, firstly, on the basis of literature analysis, a set of observable variables composed of sixteen elements was elaborated. Three potential suggested dimensions of service quality were derived directly from the literature: availability (Dalrymple and Phipps, 1999), quality of the answer (Anton, 1997) and empathy (Parasuraman, Berry and Zeithaml 1988; Burgers *et al.*, 2000). Among information quality attributes mentioned in the literature (Stefanowicz, 2004), the following were selected: comprehensibility, completeness, accuracy and relevance (variables from 9-12). Variables number 5, 6 and 8 are derived from the analysis of the literary output (Anton, 1997). Four variables (13-16) originate from the SERVQUAL scale (Parasuraman, Berry and Zeithaml, 1988). The analysis of other literature positions (Anton, 1994; Horovitz, 2006; Kostecki, 2006; Burgers *et al.*, 2000) and sessions with the managers allowed for the creation of the supply of the remaining variables.

Subsequently a questionnaire for the measurement of the values of 16 latent variables was built. 10-point Likert scales were used to register the results. Also, other features were examined. These are of demographical character (age and sex), as well as connected with the way and reason of using contact center (contact channel and type of service).

The sample was random and the sample size was 1000. For the reliability coefficient $1-\alpha = 0,95$ ($z_{\alpha} = 1,64$) an acceptable level of error – $d = 2,59\%$ was reached.

To analyze data, one of the multidimensional exploratory techniques popular in psychometry – cluster analysis was used. To identify items describing quality of contact center services, cluster analysis was applied. The term cluster analysis was introduced by R. Tryon (Tryon, 1939) and then developed by R. Cattell (Cattell, 1944). The use of cluster methods has increased dramatically in the last 30 years (Gore,

2000). Cluster analysis encompasses a number of different algorithms and methods for grouping objects of similar kind into respective categories. A general question facing researchers in many areas of inquiry is how to organize observed data into meaningful structures, that is, to develop taxonomies. In other words cluster analysis is an exploratory data analysis tool which aims at sorting different objects into groups in a way that the degree of association between two objects is maximal if they belong to the same group and minimal otherwise (StatSoft, 1997). Thus, the purpose of the analysis is to arrange objects into relatively homogeneous groups based on multi-variate observations. cluster methods are used to group people (or other objects) together based on their scores across a set of variables (Gore, 2000).

Clustering techniques have been applied to a wide variety of research problems. Whenever it is needed to classify a large amount of information into manageable meaningful piles, cluster analysis is of great utility. A review of the development, applications, methods and problems of cluster analysis is provided by P. Gore (Gore, 2000). Interesting examples of cluster analysis applications are discussed by T. Hastie, R. Tibshirani and J. Friedman (Hastie, Tibshirani and Friedman, 2009) as well as P. Guidici and S. Figini (Guidici and Figini, 2009) and J. Hartigan (Hartigan, 1975).

3. Discussion on the results

Observable variables considered in the study and are presented in Table 1.

Table 1. Observable variables

Var. no.	Statement
1	Contact data of contact center are easily accessible
2	Contact center offers convenient ways of contact
3	Contact center is available in convenient hours
4	Time for waiting for connection with contact center is short
5	Contact center employees quickly solve my problems
6	Contact center employees are interested in my problems
7	Contact center employees' behavior builds trust
8	Contact center employees have knowledge allowing to give an answer
9	Contact center gives comprehensive answers
10	Contact center gives complete answers
11	Contact center gives precise answers
12	Contact center gives relevant answer
13	Contact center employees treat me individually
14	Contact center employees give special attention to me
15	My matters are close to contact center employees' hearts
16	Contact center employees understand my special needs

Source: autor's own study.

In the presented research, clustering variables by rows (cases) was performed. Firstly Ward's method was used as an example of joining (tree clustering). Secondly a k-means method was used to characterize clusters in detail. The aim was to examine the research hypothesis H1 stating that customers using contact center services can be grouped into few homogenous items (clusters) on a basis of their assessment of services quality. A vertical tree graph (icicle plot) drawn in Figure 2 shows clusters for service quality obtained in another steps, while graph in Figure 3 shows the growth of linkage distance in another steps (iterations).

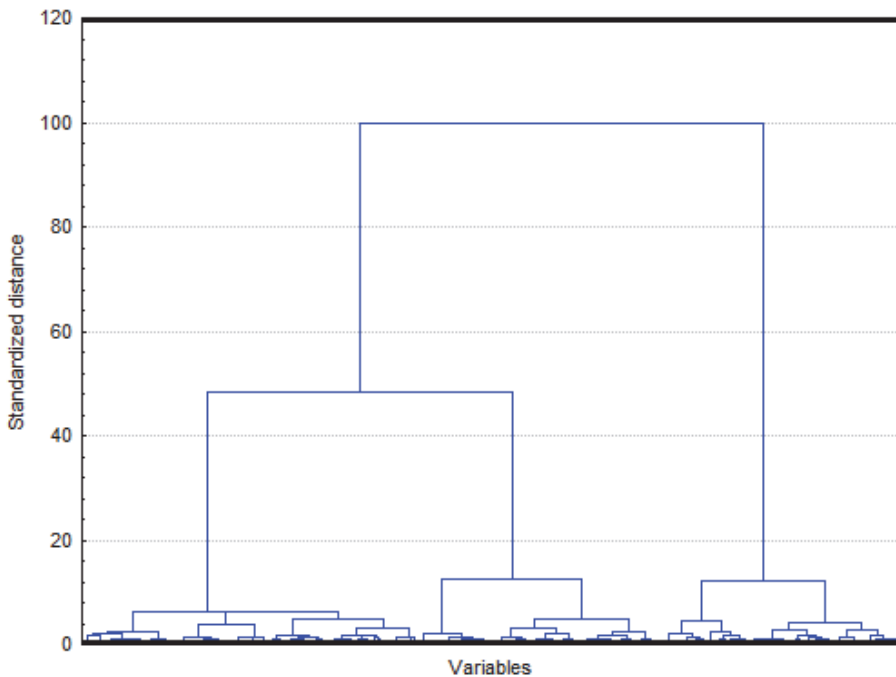


Figure 2. Icicle plot for service quality assessment cluster analysis (analysis by cases, k-means method)

Source: author's own study.

From Figure 2 it can be clearly read, that by cutting the plot at any value of standardized distance above e.g. 15 the three formed clusters are clearly visible and there is a substantial increase in linkage distance. So this solution was taken as satisfactory. Then, Figure 3 shows that a substantial increase in a standardized linkage distance indeed took place in the last few iterations.

In Table 2 distances between clusters are given. It can be seen, that there are quite long Euclidean distances between the identified clusters.

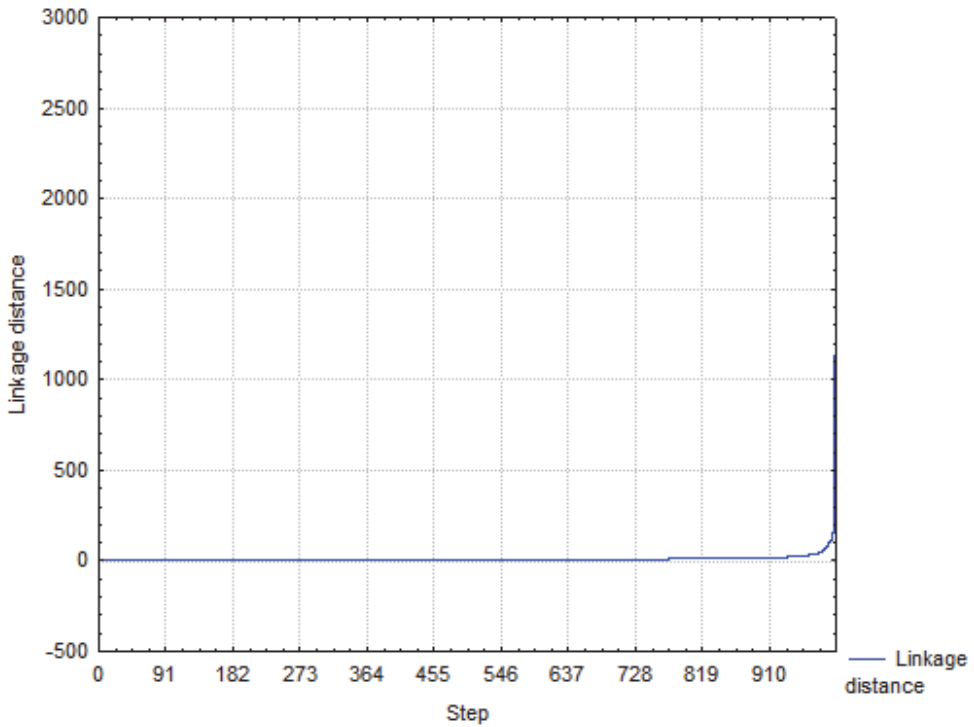


Figure 3. Linkage distance in another steps for service quality assessment cluster analysis

Source: author's own study.

Table 2. Distances between clusters

Distance	Cluster 1	Cluster 2	Cluster 3
Cluster 1	0,000000		
Cluster 2	2,522294	0,000000	
Cluster 3	2,219866	4,703042	0,000000

Source: author's own study.

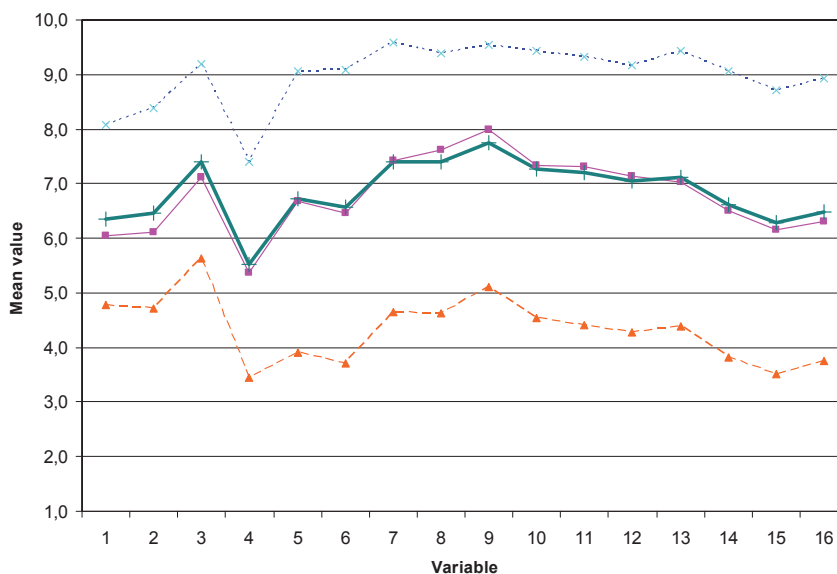
After identifying clusters by linking variables, it is possible to calculate mean values of variables measuring quality of services: in clusters and overall. These are shown in Table 3 and consecutively in Figure 4.

Table 3. Mean values of variables measuring service quality: in clusters and overall

Var. no.	Cluster 1	Cluster 2	Cluster 3	Overall
1	6,04*	4,78*	8,08*	6,36
2	6,12*	4,70*	8,37*	6,47
3	7,11*	5,63*	9,20*	7,39
4	5,38	3,46*	7,40*	5,52
5	6,69	3,90*	9,05*	6,72
6	6,46	3,70*	9,09*	6,58
7	7,42	4,65*	9,58*	7,40
8	7,61	4,63*	9,39*	7,41
9	7,98	5,11*	9,55*	7,74
10	7,33	4,53*	9,44*	7,28
11	7,30	4,41*	9,32*	7,20
12	7,13	4,27*	9,18*	7,05
13	7,03	4,39*	9,42*	7,11
14	6,51	3,81*	9,06*	6,62
15	6,16	3,51*	8,72*	6,29
16	6,30	3,75*	8,94*	6,48

* – statistically significant, significance level $\alpha = 0,05$, test for the difference between mean values (clusters versus overall).

Source: author's own study.

**Figure 4.** Mean values of variables measuring service quality: in clusters and overall

Source: author's own study.

From Table 3 and Figure 4 it can be concluded that for every cluster the dispersion of quality assessment is very similar with „summits” for variables no. 3 and nine (contact center is available in convenient hours and contact center gives comprehensive answers accordingly) and a clearly visible „pit” for variable no. 4 (time for waiting for connection with contact center is short). Nevertheless, the similar shape of the curve is drawn on different levels of the scale for each of the clusters, that is:

1. Cluster 1 joins 431 customers who are „neutrals” or „fence sitters”. The shape of the curve measuring quality assessment nearly exactly covers the mean value for most variables. Apart from variable no. 3 quality assessment covers the range between 6 and 8 points.
2. Cluster 2 joins 254 customers who are „detractors”. Apart from two variables (no. 3 and no. 9) quality assessment covers the range between 3 and 5 points.
3. Cluster 3 joins 315 customers who are „promoters”. In most cases (11 out of 16 variables) the quality assessment covers the range between 9 and 10 points.

It was checked, that the dispersion of overall quality assessment has a characteristic of a normal dispersion. It is shown at a histogram in Figure 5.

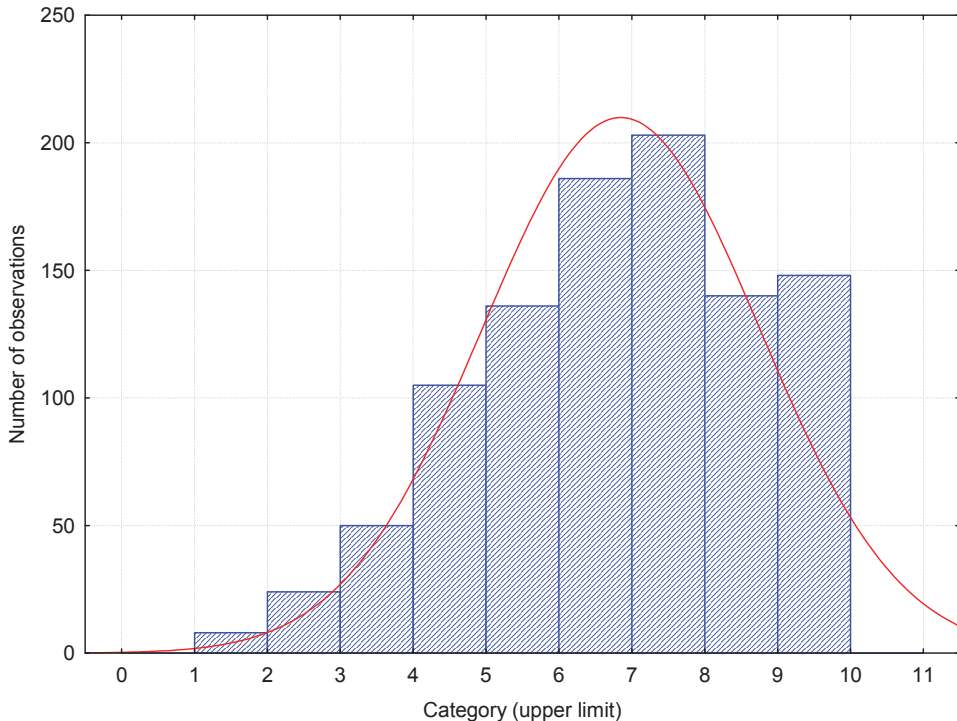


Figure 5. Overall quality assessment – a histogram and alignment of a dispersion

Source: author's own study.

From Figure 5 it can be concluded that the dispersion is close to normal. So it was possible to make the use of the variance analysis (ANOVA) to check if belonging to a cluster differentiates the assessment of service quality. For the model concerning all of the 16 observable variables, the observable value of significance level $p = 0,000$ was obtained, with statistic $F = 89,65$ and 32 degrees of freedom. For the overall quality again $p = 0,000$ was calculated, with statistic $F = 2227,04$ and 2 degrees of freedom. This means that clusters do differentiate quality of examined services (as well observable variables as the overall quality). The results can be seen in Figure 6 for all the observable variables and in Figure 7 for the overall quality.

Then, the research hypothesis H3 was examined, stating that customers into each of the clusters differ according to demographical variables, contact channels and types of services they use. Table 4 includes the percentage of knowledge workers' sex broken down into clusters and overall.

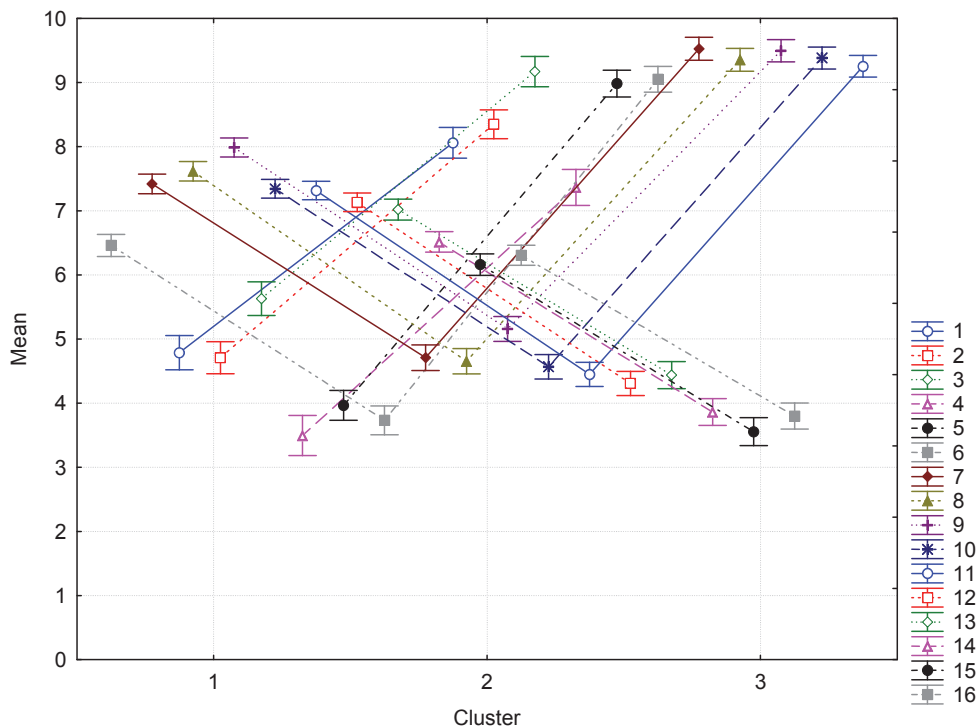


Figure 6. Results of variance analysis (ANOVA) for observable variables

Source: author's own study.

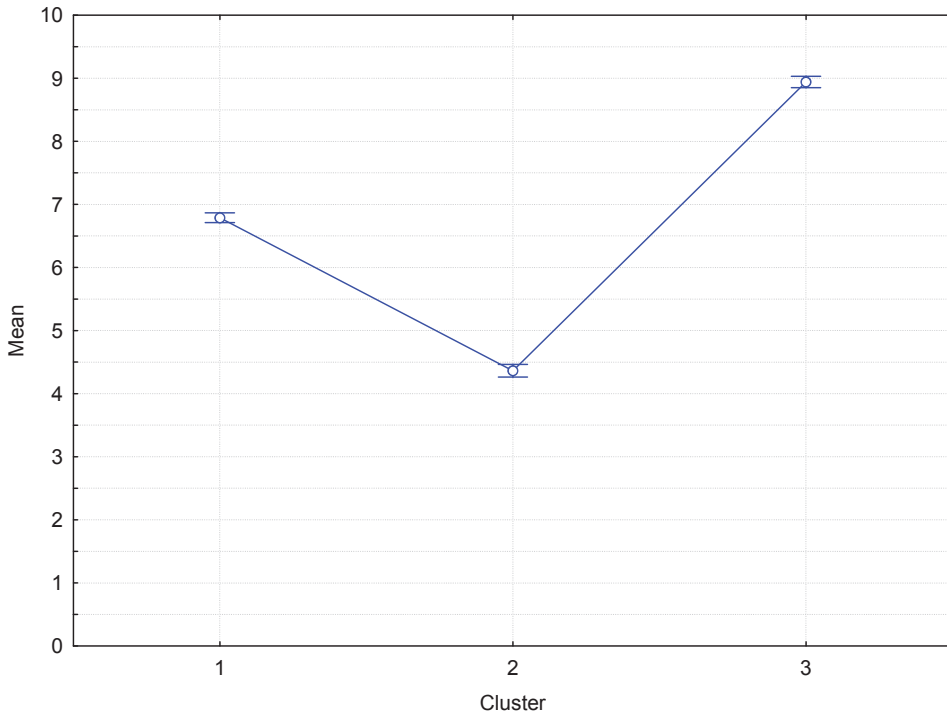


Figure 7. Results of variance analysis (ANOVA) for overall quality

Source: author's own study.

Table 4. Percentage of sex: in clusters and overall

Sex	Cluster 1	Cluster 2	Cluster 3	Overall
Man	38,52*	38,98	20,63*	33,00
Woman	61,48*	61,02	79,37*	67,00

* – statistically significant, significance level $\alpha = 0,05$, test for the difference between structure factors (clusters versus overall).

Source: author's own study.

Table 5 includes the percentage of age of the surveyed contact center customers grouped into ranges and broken down into clusters and overall.

Table 6 includes the percentage of customers using different contact channels broken down into clusters and overall.

Table 7 includes the percentage of customers using different contact center services broken down into clusters and overall.

Table 5. Percentage of customers using different types of services: in clusters and overall

Age	Cluster 1	Cluster 2	Cluster 3	Overall
<=25	13,46	8,66	7,94	10,50
26-35	15,55	15,75	16,83	16,00
36-45	19,03	19,29	22,22	20,10
46-55	26,45	30,31	26,67	27,50
56-65	20,42	16,93	20,95	19,70
>=66	5,10	9,06	5,40	6,20

* – statistically significant, significance level $\alpha = 0,05$, test for the difference between structure factors (clusters versus overall).

Source: author's own study.

Table 6. Percentage of customers using different contact channels: in clusters and overall

Contact channel	Cluster 1	Cluster 2	Cluster 3	Overall
Phone	95,38	95,28	94,25	95,00
E-mail	18,94	16,93	18,85	18,40
WWW knowledge base	17,55	11,42	14,06	14,90
Phone self service (IVR or SMS)	13,63	11,02	14,70	13,30
WWW form	11,78	6,69*	9,90	9,90
Fax	6,00	3,94	6,39	5,60
FAQ	4,16	3,94	4,15	4,10
Social media/chat	4,16	1,57*	4,79	3,70

* – statistically significant, significance level $\alpha = 0,05$, test for the difference between structure factors (clusters versus overall).

Source: author's own study.

Table 7. Percentage of customers using different types of services: in clusters and overall

Service	Cluster 1	Cluster 2	Cluster 3	Overall
Information	78,75	73,62	85,94	79,70
Technical support	46,88	42,52	48,56	46,30
Complaints	30,25	38,58*	23,96*	30,40
Shopping/reservations	19,17	13,39	13,42	15,90
Marketing research	11,78	7,48	10,22	10,20
Loyalty program	5,08	2,36*	5,43	4,50

* – statistically significant, significance level $\alpha = 0,05$, test for the difference between structure factors (clusters versus overall).

Source: author's own study.

In Tables 4-7 it is visible that each of the cluster is characterized by four features: two demographic (sex and age, shown in Tables 4 and Table 5 accordingly) and two describing the way and reason of using contact center services (contact channel and type of services, shown in Table 6 and Table 7 accordingly). It can be seen that only in few cases the difference is statistically important. Hence the results were narrowed to the sample and are given below:

- **Cluster 1.** There is a bit more men in this cluster than in the whole sample. As it comes to the age, there is a visible advantage of the youngest surveyed (aged 25 or less) over the average of the whole sample. This group uses WWW contact channels: a knowledge base or a form as well as FAQ lists more frequently than average. These customers often use customer contact to do shopping or reservations, as well as take part in marketing research. Summing up, this cluster can be named „young WWW shoppers”.
- **Cluster 2.** There is also a bit more men in this cluster than in the whole sample. As it comes to the age, there is less than average of the youngest surveyed persons, as well there is more than average persons aged 46-55 and the oldest – aged 66 or more. Of contact channels, these customers use internet channels (e-mail, WWW knowledge base, WW form, FAQ and social media/chat) less frequently than average. The only channel used with the above average frequency is phone. This group uses contact centers to make complaints in much more cases than average. Still, these customers visibly do not use contact center services as: gaining information, technical support and taking part in loyalty programmers. Summing up, this cluster can be named „older phone using complainers”.
- **Cluster 3.** There is substantial advantage of woman over man in this cluster when compared to the whole sample. There is more than average middle-aged customers (aged 26-55) in this group. These customers often use phone self service (IVR or SMS), fax and social media/chat. They use contact center services first of all covering gaining information much more often than averagely, as well as they do for technical support. They also take part in loyalty programs most often of all clusters. They rarely make complaints. Summing up, this cluster can be named „information seeking self-servicing middle-aged ladies”.

Putting together descriptive attributes of the identified clusters of customers (sex, age, contact channel and type of services) and the service quality assessment within each cluster (neutrals, detractors and promoters) allows to generate the statements shown in Table 8.

The results given in Table 8 seem sensible and easy to interpret. Each of the 3 statements in this table reflects the characteristic of each cluster. On this basis it can be claimed that in terms of (a) performed clustering concerning assessment of contact centers services quality together with descriptive attributes of each cluster and (b) NPS index customers classification: „young WWW shoppers” are neutrals or fence

sitters, „older phone using complainers” are detractors and „information seeking self-servicing middle-aged ladies” are promoters.

Table 8. Contact center customers clusters in terms of descriptive attributes vs. service quality assessment

Cluster No.	Cluster in terms of descriptive attributes	Verb	Cluster in terms of services quality assessment
1	young WWW shoppers	Are	neutrals
2	older phone using complainers		detractors
3	information seeking self-servicing middle-aged ladies		promoters

Source: author's own study.

Conclusion

Today's information and communication technology offers possibilities to communicate with customers in mass, yet customized manner with the use of multiple contact channels. This is done via contact centers, which are a tool for fulfilling the relationship marketing assumptions. Taking advantage on technology, organizations are seeking contact with their customers to inform them, offer additional services and learn about their behavior. Still, a problem of technology-intermediated service quality arises, contradicting a traditional face-to-face relationship during service delivery.

As a result of the empirical research it can be stated that the results obtained by applying cluster analysis to grouping contact center customers on a basis of their assessment of the service quality brings sensible and logical results. It was shown, that customers are grouped into the three clusters: „neutrals” („fence sitters”), detractors and promoters. These clusters cover the classification proposed by F. Reichheld in his NPS index, here considered in terms of service quality.

In more detail, it can be concluded that the results obtained using cluster analysis are as follows:

1. Cluster 1 joins 431 customers who are „neutrals” or „fence sitters”. According to a four-feature characteristic in this study these customers are „young WWW shoppers”.
2. Cluster 2 joins 254 customers who are „detractors”. According to a four-feature characteristic in this study these customers are „older phone using complainers”.
3. Cluster 3 joins 315 customers who are „promoters”. According to a four-feature characteristic in this study these customers are „information seeking self-servicing middle-aged ladies”.

The applied approach makes the behavior of contact centers customers and their perception of the quality services more comprehensible. The results of the research

are of both cognitive and utilitarian character. The first explain the structure of groups (clusters) joining contact centers customers on a basis of their perception of the quality of contact centers services and some descriptive attributes. The second, by specifying characteristics of different groups of customers, can be used to design contact centers services with a special attention paid to the matters of quality to fully meet these customers' expectations.

References

- Anton, J. (1994). *Call Center Design and Implementation*. Houston: Dame Publications.
- Anton, J. (1997). *Call Center Management: By the Numbers*. Purdue University: Ichor Business Books.
- Armistead, C. (1990). *Service Operation Strategy: Framework for Matching the Service Operations Task and the Service Delivery System*. International Journal of Service Industry Management, 2(1).
- Bartsch, S. (2012). *Superior Customer Experience in Voice-to-Voice Encounters*. Munchen: FGM-Verlag.
- Bearden, W., Malhotra, M. and Uscategui, K. (1998). *Contact and the evaluation of service experiences: Propositions and implications for the design of services*. Psychology and Marketing 15(8).
- Berkley, B. and Gupta, A. (1994). *Improving service quality with information technology*. International Journal of Information Management, 14.
- Bielawa, A. (2010). *Przegląd najważniejszych modeli zarządzania jakością usług*. Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania, 24.
- Bird, J. (1998). *Dial O for Opportunity*. Marketing, 29 (October).
- Bittner, M. (1990). *Evaluating service encounters: the effects of physical surroundings and employee responses*. Journal of Marketing, 54 (April).
- Bolton, R., Kannan, P. and Bramlett M. (2000). *Implications of Loyalty Program Membership and Service Experiences on Customer Retention and Value*. Academy of Marketing Science Journal, 28(1).
- Bowen, D. and Lawler, E. (1992). *The empowerment of service workers: what, why, how, and when*. Sloan Management Review, 33.
- Brady, M. and Cronin, J. (2001). *Some new thoughts on conceptualizing perceived service quality: A hierarchical approach*. Journal of Marketing, 65(3).
- Broderick, A. and Vachirapornpuk, S. (2002). *Service quality in internet banking: the importance of customer role*. Marketing Intelligence & Planning, 20(6).
- Brogan, Ch. and Smith, J. (2011). *Zaufanie 2.0. Jak wywierać wpływ, zdobyć lojalność klientów i kreować markę*. Warszawa: OnePress, Warszawa.

- Brogowicz, A., Delene, L., and Lyth, D. (1990). *A synthesized service quality model with managerial implications*. International Journal of Service Industry Management, 1(1).
- Burgers, A. et al. (2000). *Customer expectation dimensions of voice-to-voice service encounters: A scale development study*. International Journal of Service Industry Management, 2(1).
- Cattell, R. (1944). *A note on correlation clusters and cluster search methods*. Psychometrika, 9.
- Chang, E. and Fan, X. (2013). *More Promoters and Less Detractors: Using Generalized Ordinal Logistic Regression to Identify Drivers of Customer Loyalty*. International Journal of Marketing Studies, 5(5).
- Chen, I., Gupta, A. and Rom, W. (1944). *A Study of Price and Quality in Service Operations*. International Journal of Service Industry Management, 5(2).
- Cronin, J. and Taylor, S. (1992). *Measuring Service Quality – a Reexamination and Extension*. Journal of Marketing, 56(3).
- Dabholkar, P., Thorp, D. and Rentz, J. (1996). *A Measure of Service Quality for Retail Stores: Scale Development and Validation*. Journal of the Academy of Marketing Science, 24.
- Dabholkar, P. (1996). *Consumer evaluations of new technology-based self-service operations: an investigation of alternative models*. International Journal of Research in Marketing, 13(1).
- Dagger, T., Sweeney, J. and Johnson, L. (2007). *A Hierarchical Model of Health Service Quality. Scale Development and Investigation of an Integrated Model*. Journal of Service Research, 10(2).
- Dalrymple, J. and Phipps, K. (1999). *Call Centres – an Innovation in Service Quality: Access is a Quality Issue*. In: TQM & Innovation - Proceedings of the 4th International Conference on ISO 9000 & TQM. Hong Kong Baptist University, Hong Kong.
- Dejnaka, A. (2007). *Budowanie lojalności klientów*. Warszawa: OnePress.
- Deloitte (2013), *Global Call Center Survey Results 2013*.
- Delorey, E. (2003). *Correlating ICR Performance and Customer Satisfaction*. Call Centre Magazine, Feb.
- Dziewanowska, K. (2007) *Znaczenie zadowolenia i niezadowolenia klienta w budowaniu jego lojalności*. Zeszyty Naukowe Uniwersytetu Szczecińskiego, 12(473).
- Feinberg, R., de Ruyter, K. and Bennington, L. (2005). *Cases in Call Center Management*. Purdue University: Ichor Business Books.
- Ghobadian, A., Speller, S. and Jones, M. (1994). *Service Quality: Concepts and Models*. International Journal of Quality & Reliability Management, 11(9).
- Gilmore, A. (2001). *Call Centre Management: is service quality a priority*. Managing Service Quality, 11(3).
- Gore, P. (2000). *Cluster Analysis*. In: Tinsley, H. and Brown, S. (Ed.). *Handbook of Applied Multivariate Statistics and Mathematical Modeling*. San Diego: Academic Press.

- Griffin, J. (1997). *Customer Loyalty: How to Learn It, How to Keep It*. San Francisco: Jossey-Bass Publishers.
- Grönroos, Ch. (1982). *Strategic Management and Marketing in the Service Sector*. London: Chartwell-Bratt.
- Grönroos, Ch (1988). *Service Quality: The six criteria of good perceived service*. Review of Business, 9(3).
- Guidici, P. and Figini, S. (2009). *Applied Data Mining – Statistical Methods for Business and Industry*, New York: Wiley and Sons.
- Hartigan, J. (1975). *Clustering Algorithms*. New York: Wiley and Sons.
- Hastie, T., Tibshirani, R. and Friedman, J. (2009). *The Elements of Statistical Learning – Data Mining, Inference and Prediction*. Springer.
- Hayes, B. (2008). *Measuring Customer Satisfaction and Loyalty*. Milwaukee: ASQ Quality Press.
- Haywood-Farmer, J. (1998). *A conceptual model of service quality*. International Journal of Operations & Production Management, 8(6).
- Hill, N. and Alexander, J. (2003). *Pomiar satysfakcji i lojalności klientów*. Kraków: Oficyna Ekonomiczna.
- Horowitz, J. (2006). *Strategia obsługi klienta*. Warszawa: PWE.
- Jeske, D., Callanan, T. and Guo L. (2011). *Identification of Key Drivers of Net Promoter Score Using a Statistical Classification Model*. In: Efficient Decision Support Systems – Practice and Challenges From Current to Future, InTech.
- Johnson, L., Dotson, M. and Dunlap, B. (1988). *Service Quality Determinants and Effectiveness in the Real Estate Brokerage Industry*. Journal of Real Estate Research, 3(2).
- Johnston, R. (1997). *Service Quality*. Warwick: Warwick Business School.
- Keaveney, S. (2009). *Customer Switching Behaviour in Service Industries: An Exploratory Study*. Journal of Marketing, 59.
- Keiningham, T. et al. (2007). *A longitudinal examination of net promoter and firm revenue growth*. Journal of Marketing, 71(3).
- Korneta, P. (2014). *What makes customers willing to recommend a retailer – the study on roots of positive Net Promoter Score index*. Central European Review of Economics and Finance, 5(2).
- Kostecki, M. (2002). *Call centers i ich pracownicy*. In: *Call/contact center jako dobre narzędzie konkurowania i budowy relacji z klientem*. White Paper. Computerworld Custom Publishing/IDG Forum.
- Kostecki, M. (2006). *Efektywność i skuteczność w call center*. Warszawa: Moimzdaniem.pl.
- Kotler, Ph. (1994). *Marketing: Analiza, planowanie, wdrażanie i kontrola*. Warszawa: Gebethner i S-ka.
- Lake, N. and Hickey, K. (2006). *Podręcznik obsługi klienta*. Gliwice: Helion.

- Lethinen, U. and Lethinen, J. (1992). *Service Quality: A Study of Quality Dimensions*. Helsinki: Service Management Institute.
- Lociacono, E., Watson, R. and Goodhue, D. (2000). *WebQual: A Web Site Quality Instrument*. Working Paper. Worcester: Worcester Polytechnic Institute.
- Lotko, A. (2003). *Zarządzanie relacjami z klientem. Strategie i systemy*. Radom: Wydawnictwo Politechniki Radomskiej.
- Lotko, A. (2004). *Call Center as a Perspective Form of Improving Customer Service Quality*. Regionalna Ekonomika, 2.
- Lotko, A. (2009). *Ocena jakości usług w centrach kontaktu z klientem*. Warszawa: PWN.
- Lotko A. (2012). *Lojalność klientów telefonii komórkowej*. Ekonomika i Organizacja Przedsiębiorstwa, 1(744).
- Marr, B. and Schiuma, G. (2001). *Measuring and Managing Intellectual Capital and Knowledge Assets in New Economy Organisations*. In: Bourne, M. (Ed.). *Handbook of Performance Measurement*. London: Gee.
- Mazur, A., Jaworska, K. and Mazur, D. (2001). CRM. *Zarządzanie kontaktami z klientami*. Zabrze: MADAR.
- Mazurek-Łopacińska, K. (2003). *Zachowania nabywców i ich konsekwencje*.
- Morgan, N. and Rego, L. (2006). *The Value of Different Customer Satisfaction and Loyalty Metrics in Predicting Business Performance*. Marketing Science, Sep/Oct.
- O'Neill, M., Wright, C. and Fitz, F. (2001). *Quality Evaluation in On-line Service Environments: An Application of the Importance-Performance Measurement Technique*. Managing Service Quality, 11(6).
- Oh, H. (1999). *Service quality, customer satisfaction and customer value: a holistic perspective*. International Journal of Hospitality Management, 18.
- Owen, R. and Brooks, L. (2008). *Answering the ultimate question: How net promoter can transform your business*. San Francisco: Wiley and Sons.
- Parasuraman, A., Berry, L. and Zeithaml V. (1998). *A Multiple-Item Scale for Measuring Customer Perceptions of Service Quality*. Journal of Retailing, 64(1).
- Parasuraman, A., Zeithaml, V. and Berry, L. (1985). *A conceptual model of service quality and its implications for future research*. Journal of Marketing, 49 (Fall).
- Pollack, B. (2009). *Linking the hierarchical service quality model to customer satisfaction and loyalty*. Journal of Services Marketing, 23(1).
- Rafaeli, A., Ziklik, L. and Doucet, L. (2007). *The Impact of Call Center Employees' Customer Orientation Behaviours on Service Quality*. Journal of Service Research, 1.
- Reichheld, F. and Sasser, W. (1990). *Zero Defections: Quality Comes to Services*. Harvard Business Review, September/October.
- Reichheld, F. (2003). *The One Number You Need to Grow*. Harvard Business Review, December.

- Reichheld, F. (2006). *The microeconomics of customer relationships*. MIT Sloan Management Review, 47(2).
- Rogoziński, K. (Ed.) (2000). *Marketing usług profesjonalnych*. Poznań: Akademia Ekonomiczna w Poznaniu.
- Sagan, A. (2003). *Analiza rzetelności skal satysfakcji i lojalności*. In: *Analiza satysfakcji i lojalności klientów*. Kraków: StatSoft.
- Santos, J. (2003). *E-service quality: a model of virtual service quality dimensions*. Managing Service Quality, 13(3).
- Seth, N., Deshmukh, S. and Vrat P. (2005). *Service quality models: a review*. International Journal of Quality & Reliability Management, 22(9).
- Sokołowski, A. (1992). *Empiryczne testy istotności w taksonomii*. Zeszyty Naukowe Akademii Ekonomicznej w Krakowie, Kraków.
- Spreng, R. and Mackoy, R. (1996). *An empirical examination of a model of perceived service quality and satisfaction*. Journal of Retailing, 722.
- Staples, W., Dalrymple, J. and Phipps K. (2001). *Excellence in Call Centres: Access is a corporate responsibility*. In: *Proceedings of the 6th International Conference on ISO 9000 and TQM*. School of Business – HKBU, Paisley Business School.
- Stefanowicz, B. (2004). *Informacja*. Warszawa: SGH.
- Stoma, M. (2012). *Modele i metody pomiaru jakości usług*. Lublin Q&R.
- Sweeney, J., Soutar, G. and Johnson, L. (1997). *Retail service quality and perceived value*. Journal of Consumer Services, 4(1).
- Taylor, S. and Baker, T. (1994). *An Assessment of the Relationship Between Service Quality and Customer Satisfaction in the Formation of Consumers' Purchase Intentions*. Journal of Retailing, 4(2).
- Tryon, R. (1939). *Cluster Analysis*. New York: McGraw-Hill.
- Upal, M. (2008). *Telecommunication Service Gap: Call Service Quality Perception and Satisfaction*. Communications of the IBIMA, 3.
- Wallace, C., Eagleson, G. and Waldersee, R. (2000). *The sacrificial HR strategy in call centres*. International Journal of Service Industry Management, 11(2).
- Yang, Z., Peterson, R. and Huang, L. (2001). *Taking the Pulse of Internet Pharmacies*. Marketing Health Services, Summer.
- Zeithaml, V., Parasuraman, A. and Malhotra A. (2000). *E-Service Quality: Definition, Dimensions and Conceptual Model*. Working Paper. Cambridge: Marketing Science Institute.
- Zeithaml, V. and Bittner, M. (2000). *Services Marketing: Integrating Customer Focus across the Firm*. New York: McGraw-Hill.
- Zhu, F., Wymer, W. and Chen, I. (2002). *IT-based services and service quality in consumer banking*. International Journal of Service Industry Management, 13(1).