Are the 'Illnesses' of Traditional Likert Scales Treatable?

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ABSTRACT

Purpose: The main aim of this paper is to introduce the development and the application of a fuzzy rating scale in measuring customer satisfaction which are to be demonstrated through a healthcare example in order to illustrate how the proposed methodology is able to enhance the reliability of traditional Likert scale-based evaluations.

Methodology/Approach: The proposed methodology is built on fuzzy sets the membership function of which is composed of two sigmoid functions by applying Dombi's conjunction operator. The possible 'values' of the linguistic variable expressing customer satisfaction are to be expressed by these functions which can also be linked to the level of organizational performance allowing the illustration of the mainly nonlinear relationship between the provided and perceived service performance.

Findings: The application of the proposed fuzzy rating scale confirms its ability to reflect the unambiguity of human ratings as well as the context-dependency of ratings resulting in a more precise representation of human judgements.

Research Limitation/implication: The presented methodology may be viewed as a viable approach in any kind of service quality evaluations where Likert-type scales are traditionally applied to handle its weaknesses.

Originality/Value of paper: The proposed methodology is not only able to reflect the satisfaction of customers and the organizational performance simultaneously, but the expectations of customers related to the desired level of performance can also be incorporated into the establishment of the scale yielding to more reliably supported managerial decisions.

Category: Research paper

Keywords: fuzzy number; Likert scale; healthcare; service quality; patient satisfaction

1 INTRODUCTION

Measurement is a key management activity in the service industry where subjectivity is an unassignable part of the evaluation process. In order to measure the level of service quality and to ascertain reliably whether the needs and requirements of the customers are met, it is fundamental that their expectations and perceptions are properly measured and correctly understood (Lupo, 2013). In order to serve that purpose, there is a need to design suitable and reliable evaluation methodologies and to identify appropriate measure units to highlight the achieved service performance level (Lupo, 2013; Battisti, Nicolini and Salini, 2010). However, the intangibility, inseparability and heterogeneity embedded in services make it difficult to measure and evaluate service quality (SQ) in a way upon which sole managerial decision could be made.

The vast majority of surveys developed to gain information related to customer perceptions and satisfaction associated with SQ utilizes primarily Likert scales, however, these scales are often criticized on the grounds that they cannot depict human judgement reliably so that the purpose of this paper is to provide more reliable methodological solutions. Likert scales generally use crisp values to present the feelings and subjective perceptions related to specific SQ dimensions. As the evaluation process obviously encompasses intangible and subjective information, crisp values are inadequate to reflect the real ratings of customers, which means that non-negligible difficulties arise when the differences and uncertainties in human semantic expressions are to be understood (Hu, Lee and Yen, 2010). The relevant literature calls attention to the application of the fuzzy rating scale as a viable alternative approach to Likert scale-based measurement (see e.g. Hesketh, Pryor, Gleitzman and Hesketh, 1988; de la Rosa de Sáa, Gil, González-Rodríguez, López, and Lubiano, 2015) since if the evaluation is the outcome of the evaluator's subjective interpretation of linguistic variables, it must be conducted in an uncertain, fuzzy environment. Therefore, this study aims to introduce a conceptual model to assess perceived SQ utilizing the fuzzy concept and also presents the advantages arising from the more effective evaluation of patient feedbacks associated with healthcare SQ. Additionally, we are also to compare the results brought by traditional Likert scales and the proposed approach in order to highlight the methodological benefits that can contribute to more reliable managerial decisions.

The paper is structured as follows. Section 2 discusses the features of traditional Likert scales. Section 3 includes the methodological background. Section 4 presents a case study demonstrating the application of the proposed methodology as well as its main benefits. Section 5 discusses conclusions and gives an overview of future research directions.

2 LITERATURE REVIEW

Measuring service quality, the satisfaction of stakeholders and the relative importance of the various service features are mainly realized through the application of Likert scales by utilizing either the original SERVQUAL methodology (Parasuraman, Zeithaml and Berry, 1988) or its numerous modifications specifically developed for the various service industries (in healthcare context see e.g. Vandamme and Leunis, 1993; Ramsaran-Fowdar, 2008; Al-Borie and Damanhouri, 2013; Garrard and Narayan, 2013). The widespread application and high popularity of Likert scales are primarily owing to their ease of use and the simple interpration of results. However, the subject of service quality is frequently burdened by fuzzy terms such as attitude, perception, satisfaction etc. as respondents may subjectively fill out the questionnaire based on their unique experience and perceptions of the given service performance. This subjective assessment is intrinsically imprecise and ambiguous, possibly inhibiting service quality (Liou and Chen, 2006).

The application of the traditional Likert scale raises diversified issues. Rating service quality features in a questionnaire is a complex task as customers make multiple decisions under uncertainty. First, the number of 'values' to choose from is usually small (Gil and González-Rodríguez, 2012) which means that the variability, diversity and subjectivity associated with an accurate rating are usually lost. Second, when Likert-type data are analysed for statistical purposes, the number of techniques that can be applied are quite limited since statistical conclusions addressed to ordinal data could only be reliable and relevant information could be lost (Lubiano et al., 2016). Third, the weighting of aspects is a key issue as the different SQ features are naturally not equally important for the respondents. As a consequence, an additional concern arises as the respondents' attitudes towards the rated features are not homogeneous as time goes on (see e.g. Tóth, Surman and Árva, 2017). Moreover, if raters' preferences are heterogeneous, it does matter how and to what extent it influences the overall evaluation of a given SQ feature. 'Average' scores are supposed to hide the real situation, namely, the performance of the given feature (e.g. Kuzmanovic, Savic, Popovic and Martic, 2013). As a conclusion, crisp values are inadequate to present the evaluations of customers properly due to intangible and subjective information embedded in the evaluation process.

The reliability could be enhanced by increasing the number of responses (Lozano, García-Cueto and Muñiz, 2008; de la Rosa de Sáa, Gil, González-Rodríguez, López, and Lubiano, 2015), however, it cannot be achieved by using a natural language (Sowa, 2013). In order to embed human perceptions more precisely, fuzzy set theory is increasingly applied in these situations. Fuzzy set theory is believed to be able to improve successfully the reliability of service process measurements and evaluations (Li, 2013; Lupo, 2016) by handling uncertainty in the case of weakly defined measurements (Benoit, 2013) and can be applied to overcome the limitations of standard scales by modelling the imprecision of human rating evaluations (Calcagní and Lombardi, 2014) as well.

This fuzzy assessment of service quality attributes is much closer to human thinking than the methods based on crisp numbers (Lin and Wu, 2008) yielding to more reliably supported managerial decisions as well.

3   METHODOLOGY

The purpose of the introduced methodology is to overcome the weaknesses of traditional Likert scale-based evaluations as well as to assess the service performance and customer satisfaction simultaneously. Tóth, Jónás and Dénes (2018) have already proved that in a fuzzy environment, one may be able to deal with the vagueness arising either from the uncertainty or subjectivity of the respondent or from the variation of the performance over time. The proposed fuzzy number-based evaluation may be further enhanced by linking the satisfaction levels of patients to the experienced performance level.

With the purpose of evaluating SQ and customer satisfaction simultaneously, the possible values 'completely dissatisfied', 'dissatisfied', 'rather dissatisfied', 'rather satisfied', 'satisfied', 'completely satisfied' of the linguistic variable expressing patient satisfaction are considered to be fuzzy sets and they are assigned to the experienced performance level. The membership function, which expresses the degree to which a given level of performance belongs to a certain fuzzy set, is composed as a Dombi-intersection of two sigmoid-shaped functions.

Definition (1), the sigmoid function $\sigma_a^{(\lambda)}(x)$ with parameter a and λ, is given by:

$$\sigma_a^{(\lambda)}(x) = \frac{1}{1+e^{-\lambda(x-a)}}, \tag{1}$$

where $x, a, \lambda \in \mathbb{R}$ and λ is nonzero (Dombi, 2009).

The main properties of the sigmoid function are thoroughly discussed in Jónás, Tóth and Árva (2018). Let $\sigma_{a_l}^{(\lambda_l)}(x)$ be an increasing sigmoid function given by the parameters a_l, λ_l and $\sigma_{a_r}^{(\lambda_r)}(x)$ having the parameters a_r and λ_r be a decreasing sigmoid function. Conjoining these two sigmoid functions by Dombi's intersection operator denoted by $*_{(D)}$ (Dombi, 2009), one may get the following membership function:

$$\sigma_{a_l}^{(\lambda_l)}(x) *_{(D)} \sigma_{a_r}^{(\lambda_r)}(x) = \frac{1}{1+e^{-\lambda_l(x-a_l)+e^{-\lambda_r(x-a_r)}}}. \tag{2}$$

In order to determine the parameters a and λ of the sigmoid function given in Definition (1), one should choose two pints of the function curve. If one seeks to be consistent with human thinking and traditional evaluations, the parameters a and λ should be determined based on the parameter triplet l, m, r. That is, the rater is asked to express his or her opinion on the experienced level of performance by the parameter triplet l, m, r, where m is the value which seems most likely to express the assessor's judgement in the examined dimension, and

in addition to that l and r denote the worst and the best possible value which the assessor would give when evaluating the given statement, respectively.

It should be highlighted here that in the case of a traditional Likert scale-based evaluations only the value m can be given, that is, the respondent is forced to reduce his or her opinion to a single value which is most likely to express his or her judgement. On a fuzzy Likert scale, the additional two parameters l and r should be chosen so that they are proportional to the perceived variability of the performance or to the uncertainty or subjectivity the respondent. In other words, the higher the uncertainty in the evaluation or the more variation of performance is experienced, the larger should be the difference between l and r. Since the sigmoid function neither takes the values of 0 or 1 (these are only the limits of this function), one should choose a small positive number denoted by ε, for example, $\varepsilon = 0.001$. After that, based on the values l and m, the parameters a_l and λ_l can be determined as:

$$a_l = \frac{l+m}{2}, \tag{3}$$

$$\lambda_l = \frac{2}{m-l} \ln\left(\frac{1-\varepsilon}{\varepsilon}\right). \tag{4}$$

The parameters a_r and λ_r are determined based on the values m and r as follows:

$$a_r = \frac{r+m}{2}, \tag{5}$$

$$\lambda_r = \frac{2}{m-r} \ln\left(\frac{1-\varepsilon}{\varepsilon}\right). \tag{6}$$

Having identified the parameters of the increasing sigmoid function $\sigma_{a_l}^{(\lambda_l)}(x)$ according to Eq. (3) – (4) and the parameters of the decreasing sigmoid function $\sigma_{a_r}^{(\lambda_r)}(x)$ based on Eq. (5) – (6), the two sigmoid functions are conjunct by applying Dombi's intersection operator in (2). Setting the parameters as given in (3) – (6) results in a function value of ε at the points l and r and $1-\varepsilon$ at the point m. Henceforth, the variable x represents the performance level, whereas the function values of $\sigma_{a_l}^{(\lambda_l)}(x)$ or $\sigma_{a_r}^{(\lambda_r)}(x)$ express the truth of the statement that a certain level of performance belongs to a given fuzzy set which depicts the patients' verbal judgement on the performance, that is, their satisfaction with the experienced performance level.

From this point, the Dombi's intersection of two sigmid-shaped membership functions is utilized as a membership function of a fuzzy set expressing the verbal judgement of patients with a given level of performance experienced at a healthcare institution.

With the purpose of establishing a fuzzy Likert scale, the following considerations are taken into account:

- to each linguistic variable, a sigmoid-shaped membership function is assigned;

- to the linguistic variable 'completely dissatisfied', a sigmoid function with $l = -\infty$, and similarly, to the linguistic variable 'completely satisfied' a membership function with $r = \infty$ is assigned;

- in each point of the scale, two linguistic variables are defined with a membership value being greater than ε;

- in our approach, the value m of a certain membership function is assumed to be equal to the value of r of the previous membership function and to the value of l of the following membership function.

In their work, Hu, Lee and Yen (2010) utilized a similar rating scale for evaluating hospital out-patient services by a fuzzy linguistic SERVQUAL model. In contrast to their work, the current research does not specify the parameters of the linguistic terms in advance. Instead, a group of patients is asked to give the parameter m for each linguistic term in each SQ dimension to be evaluated. That is, in each dimension, patients should choose a value which expresses the performance of the healthcare institution if their satisfaction is characterized by a particular linguistic label. Establishing the rating scale based on surveying the patients is beneficial since it allows not only the mapping of the relationship between the healthcare institutions' performance and the patients' satisfaction level but also the involvement of customers' expectations related to the performance level into the formulation of the rating scale. During the 'calibration' phase of the rating scale, patients are asked to answer the following questions in each of the SQ dimensions to be evaluated:

- *What is the performance level under which you would be 'completely dissatisfied' with the performance of the healthcare institution?*
- *What is the performance level which seems most likely to express the performance if you are 'dissatisfied', 'rather dissatisfied', 'rather satisfied' and 'satisfied' with the performance of the healthcare institution, respectively?*
- *What is the performance level above which you would be 'completely satisfied' with the performance of the healthcare institution?*

By answering the above listed questions, the values of m can be determined for each membership function. In our approach, the value of m of a certain membership function is assumed to be equal to the value of r of the foregoing membership function and to the value of l of the forthcoming membership function, as a result of which, for each linguistic term, the corresponding membership function can be calculated unambiguously by utilizing the equations (3) – (6) and then, the two sigmoid functions can be conjoined by Dombi's

intersection operator in (2). As such, for each of the possible values of the linguistic variable expressing patient satisfaction, the membership function of the corresponding fuzzy set can be determined.

4 HEALTHCARE EXAMPLE DEMONSTRATING THE APPLICATION OF THE METHODOLOGY

In recent years, healthcare has become one of the extremely complex and consistently growing industries in the world (Bertolini, Bevilacqua, Ciarapica and Giacchetta, 2011). Due to the complexity of healthcare services and to the great number of stakeholders, service quality (SQ) in the healthcare sector is fairly variable. Patient perceptions have attracted considerable attention and have been increasingly emphasized as an important element of healthcare SQ evaluation for several reasons (Iversen, Holmboe and Bjertnæs, 2012; Carlucci, Renna and Schiuma, 2013). First, a high level of SQ has a relationship with patient satisfaction, willingness to re-use the services (e.g. Arab, Tabatabaei, Rashidian, Rahimi and Zarei, 2012). Second, patient feedbacks are an integral part of any accreditation and evaluation programs. Therefore, patient feedbacks are considered as an essential element in planning and policy making that enhance the more effective management of the services provided by healthcare institutions (Carlucci, Renna and Schiuma, 2013) by providing the opportunity to organizational learning and development and identifying the shortcomings in the service provision.

Based on the literature, a great variety of approaches is used for data collection to increase the quality awareness of the healthcare system. As a mean the most important stakeholders', namely, patients' experience is measured and evaluated to improve healthcare quality on different levels of the system. The most popular method is to collect patient satisfaction and perception data to assess the quality of healthcare services (e.g. Alhashem, Alquraini and Chowdhury, 2011; Naidu, 2009) which are primarily based on the application of Likert scales. At the same time, the results of fuzzy set theory have been increasingly utilized in healthcare service quality evaluations as well (e.g. Woldegebriel, Kitaw and Rafele, 2015; Akdag, Kalaycı, Karagöz, Zülfikar and Giz, 2014; Singh and Prasher, 2017; Tsai, Chang and Lin, 2010; Büyüközkan, Çifçi and Güleryüz, 2011; Hu, Lee and Yen, 2010; Lupo, 2016; Behdioğlu, Acar and Burhan, 2017).

In the light of the state of the art (e.g. Naidu, 2009; Kessler and Mylod, 2011; Haque, Sarwar, Yasmin and Anwar, 2012; Yesilada and Director, 2010; Roberge, Tremblay, Turgeon and Berbiche, 2013; Grondahl, Wilde-Larsson, Karlsson and Hall-Lord, 2013), our study considers 7 major aspects of patient satisfaction, namely, processes (main processes and supporting processes of caring); outcomes (reputation, image, efficiency, effectiveness); care characteristics (personalized attention, availability of healthcare workers, timing and organizing of caring, catering); accessibility (availability, accessibility for disabled people with reduced mobility); communication (communication and interaction with

healthcare workers, clarity and timing of communication and information); responsiveness (attitude and empathy of healthcare workers, respect and courtesy); tangibles and environment (physical facilities, equipment, appearance of contact personnel, modernity, hygiene, safety).

Since Lubiano et al. (2016) point out that in the case of fuzzy Likert scales, detailed instructions for the respondents are usually needed on how to answer the questionnaire, a pilot study has been launched among university students. In order to gain experience with the application of the proposed methodology, 219 engineering students were asked to assess specific quality-related attributes based upon their last experience in a healthcare institution. The experience gained during this pilot study could serve as a basis for the establishment of a final survey which is planned to be launched among out-patients of a specific Hungarian healthcare institution specialized in rehabilitation. These students were asked to assess the performance level under which he or she would be 'completely dissatisfied' with the healthcare institution's performance and similarly, to address the performance level above which he or she would be 'completely satisfied 'with the experienced level of performance for all the aspects listed above. Besides that, for the 'scale points' located in the middle of the scale, respondents were asked to give a performance level which is most likely to express the performance of the healthcare institution if he or she is 'dissatisfied', 'rather dissatisfied', 'rather satisfied' or 'satisfied' with the care received, respectively. Since these questions should be answered in each of the investigated service quality dimensions, the different expectations associated with the healthcare institution's performance related to the studied dimensions could be taken into account as well.

Figure 1 depicts the healthcare institutions' performance (on the x-axis) and the membership functions of the linguistic terms 'completely dissatisfied', 'dissatisfied', 'rather dissatisfied', 'rather satisfied', 'satisfied' and 'completely satisfied' assigned to the performance level in each investigated service quality dimensions.

Figure 1 suggests that the linguistic terms representing the patients' satisfaction do depend on which quality-related aspect is to be evaluated. While in the case of outcomes, the performance level should be higher than 55.1 to avoid 'completely dissatisfied' customers, in the case of accessibility, the performance level of 36.2 is already enough if healthcare institutions seek to avoid 'completely dissatisfied' patients. The same conclusions may be drawn if one examines the performance level above which patients are 'completely satisfied': in the case of outcomes, institutions should achieve as high performance level as 99, while in the case of communication, a performance level of 90.3 is already considered as one 'completely satisfying' the patients. One may be tempted to conclude that the higher the importance of a particular service dimension is, the higher the expectations related to the performance in this dimension are.
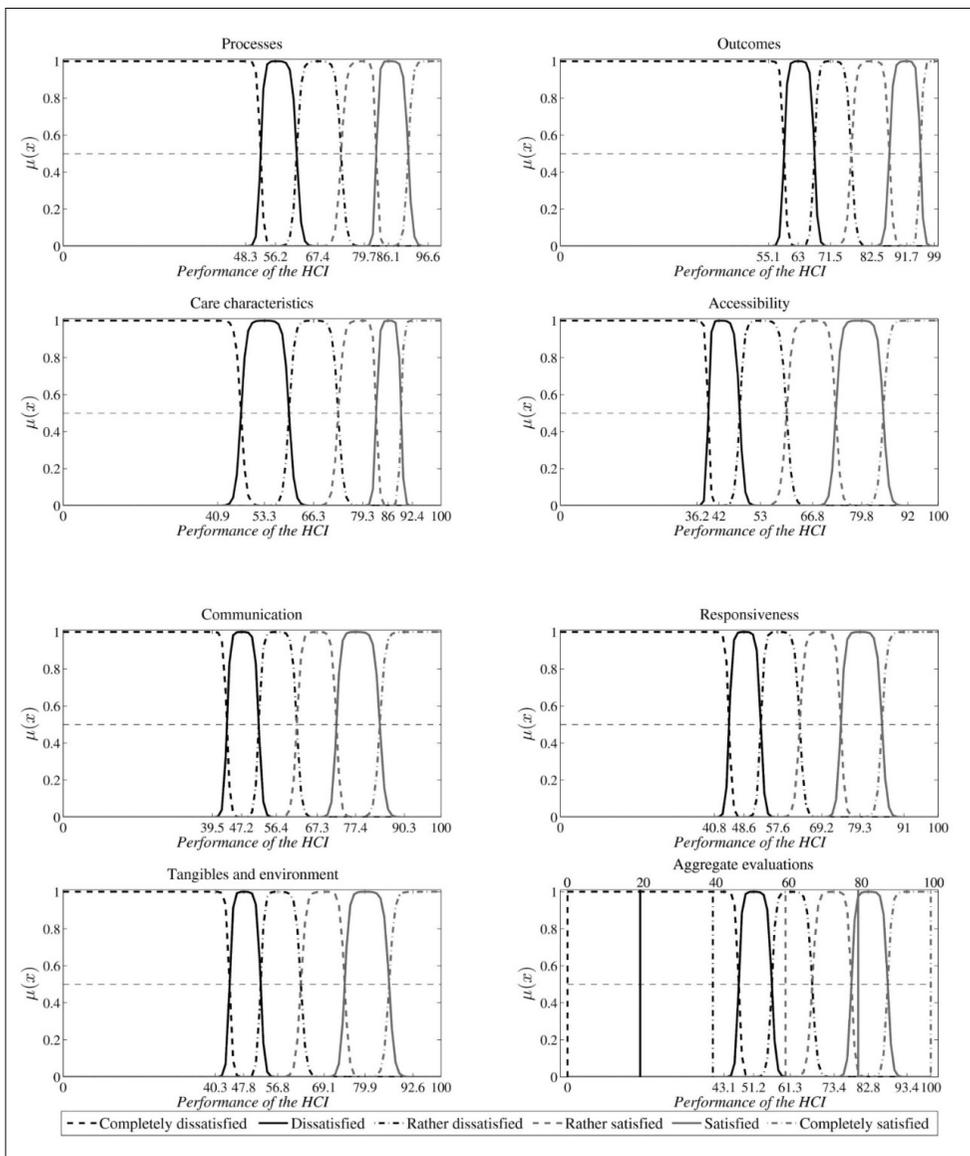
Figure 1 – Membership Functions of the Linguistic Terms Assigned to the Healthacre Institutions Performance Level in the Investigated Dimensions as Well as That of the Agregate Evaluation

Figure 1 also demonstrates that up to the one-third, in some cases almost up to the midpoint of the performance scale, patients are usually 'completely dissatisfied' with the provided performance level of the healthcare institution. A performance of 33 (at around the one-third of the performance scale) is considered to be 'completely dissatisfying' in all examined dimensions, while the performance of 50, at the half of the performance scale, results either in 'dissatisfied' or 'rather dissatisfied' patients, except for the attribute titled as

outcomes. In this special case the performance level is thought to be 'completely dissatisfying'. On the contrary, on a traditional Likert scale, a performance level around the one-third of the scale is already considered to be assessed by the second or the third linguistic term representing the patients' satisfaction. As a result of different expectations related to the performance level, the distance between the consecutive 'scale points' is not constant and also depends on which quality attribute is studied. Investigating the evaluations given in the quality attribute titled as care characteristics, based on Figure 1 one may also conclude that the 'distance' between the scale points which seems most likely to express the performance if the patients are 'rather dissatisfied' and 'rather satisfied' is 13 units, while the consecutive scale point is only 7.2 units away.

The different expectations in the examined quality attributes lead to the fact that the same performance is judged differently in various dimensions. While in the case of processes, a performance level of 56.2 is judged as 'dissatisfying', the same performance is more likely to be evaluated as 'rather dissatisfying' if the responsiveness of healthcare institutions is examined.

Jónás, Tóth and Árva (2018) suggest a methodology which is also based on Dombi's Pliant Inequality Model to aggregate sigmoid-shaped membership functions. The subplot in the bottom right-hand corner of Figure 1 shows the aggregate rating scale depicting the overall judgement related to the healthcare institutions' performance. The upper x-axis of this subplot belongs to a scale on which the consecutive linguistic terms 'completely dissatisfied (0)', 'dissatisfied (20)', 'rather dissatisfied (40)', 'rather satisfied (60)', 'satisfied (80)', 'completely satisfied (100)' are distributed equally apart from each other, exactly as often practiced when carrying out Likert scale-based evlautions, whereas the lower x-axis denotes their corresponding fuzzy counterparts.

Based on Figure 1, it can be concluded that the assumption of equally-distributed scale points in all dimensions usually does not match the patients' expectations. That is, traditional Likert scales not only lack the ability to deal with uncertainty, vagueness, imprecision or take the variation of performance into account, but the assumption of the same 'distance' between the consecutive scale points is not consistent with human judgement resulting in the fact that either the performance or the satisfaction is improperly interpreted and evaluated. The inadequate or biased judgement may lead to weakly supported managerial decisions and as a consequence, may set organizational competitiveness back as well. Fuzzy Likert scales, on the contrary, are able to depict patient evaluations in a manner which is consistent with human thinking due to the fact that this methodology is not only able to take into account the subjectivity, imprecision and variation of performance but could also model the often nonlinear relationship between organizational performance and customer satisfaction. Unlike prior studies in the literature (e.g. Hu, Lee and Yen, 2010), the proposed scale is established based on patient expectations related to the desired level of performance. This feature of the proposed rating scale further enhances its applicability owing to the fact that not only the perceived performance level and the satisfaction with the

experienced performance but also the expectations concerning the desired level of performance can be incorporated into the development of the proposed rating scale. The ability of measuring these three aspects of service quality simultaneously can be considered as the main benefit of the suggested methodology.

The proposed methodology has two notable limitations which should be highlighted here. One of them is the need to answer six questions during the 'calibration' phase of the scale in each of the quality aspects to be evaluated. The other major constraint of the suggested methodology arises from the fact that detailed explanations and instructions are needed on how to use the scale. One reason for asking university students to test the scale was the fact that due to their prior methodological studies they have been familiar with fuzzy logic-based issues. The majority of students does not experience any trouble when filling out the survey. Taking these considerations into account, after some minor modifications, the proposed methodology might be applied to gain information from out-patients of healthcare institutions but that has to be prepared carefully.

5   CONCLUSION AND FUTURE RESEARCH DIRECTIONS

In this paper, a fuzzy rating scale-based methodology is developed to overcome the weaknesses of Likert scale-based evaluations with the aim of assessing specific dimensions of healthcare service quality. The proposed methodology is considered to deal with the inherent uncertainty, subjectivity and vagueness characterizing stakeholders ratings by expressing their own judgements associated with quality attributes. Our results are in line with that of Yeh and Kuo (2003), Calcagní and Lombardi (2014) or Liou and Chen (2006) who pointed out that fuzzy evaluation of quality attributes is much closer to human judgement than traditional, 'crispy' evaluation. Tóth, Jónás and Dénes (2018) have already presented a flexible fuzzy number-based evaluation of institutional performance, their methodology, however, is not able to take into account the satisfaction of patients with the perceived level of performance. The evaluation framework proposed by Hu, Lee and Yen (2010) deals with the satisfaction of patients, yet, the linguistic terms representing customer satisfaction are determined by the researcher in advance.

In this study, the membership functions of the fuzzy sets expressing the judgement of patients on a given level of performance are determined based on patient expectations leading to a more precise and reliable depiction of patient judgements. Examining the established rating scales, one may conclude that the 'distance' between the consecutive scale point is not constant and there is no crisp boundary among the 'scale values' as the traditional Likert scale assumes. In addition to that, the proposed methodology is able to handle the fact that patient expectations do depend on which quality attribute is to be evaluated. As a result, the discussed methodology is able to map the often strongly nonlinear relationship between quality attributes and customer satisfaction. By offering the

way to evaluate the organizational performance and patient satisfaction simultaneously, the proposed fuzzy evaluation environment aims at supporting healthcare decision makers in order to facilitate effective and efficient strategies related to quality improvements by identifying which quality dimensions require more consideration.

Lubiano et al. (2016) argue that respondents need a special training before using fuzzy rating scales which was the reason for asking university students to test the proposed approach. Based on the encouraging results and the fact that the majority of the students has not experienced any difficulty, after some minor modifications a similar questionnaire is to be launched to collect feedbacks from out-patients of a given Hungarian healthcare institution.

In a further research, the fuzzy AHP process may be utilized to determine the importance of various service quality dimensions based on patients' viewpoints. Based on the importance 'scores', one may be able to weight the statements in a manner that expresses clearly how important a particular service dimension is (e.g. Büyüközkan, Çifçi and Güleryüz, 2011). Another possible future research direction is to investigate how the different levels of healthcare (GP, outpatient care, hospitals, rehabilitation institutions) or even the patients' personal characteristics influence the patient expectations related to healthcare quality issues. Since the proposed fuzzy rating scale is built on patient expectations with the provided performance level, one may assume, that different expectations at the distinct levels of provision may lead to different rating scales.

What is more, the applicability of the proposed scale is not limited merely to the assessment of patient satisfaction. Several other fields in which the evaluation is subjective in nature may be investigated by the proposed methodology. Besides examining stakeholder expectations in healthcare context (e.g. policy maker or employee expectations), it may also support managerial decisions in a couple of other areas where evaluation of service quality is at the forefront of organizational excellence. Based on the results demonstrated through the case study, the fuzzy rating scale introduced in this paper offers a viable alternative technique for these evaluation goals.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.