A Hybrid Multi-criteria and Creative, Problem-solving Approach, for Measuring Local Values of Information Technology Products

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Abstract: The frame of the procedure for multi-criteria decision making, that support complex problem solving, has been well-verified in business practice, but lacks a fully defined approach, for the determination of local alternative values. The purpose of this paper is to develop a hybrid multi-attribute value model and creative problem-solving approach for measuring local alternatives' values. It also aims to verify the applicability of this approach in an Information Technology company. Within measuring local alternatives' values, the paper describes how to create increasing and decreasing piecewise, linear functions by using a bisection method. It introduces a systematic approach for the determination of the local alternatives' values, by using the "six questions" technique. In addition to the theoretical statement of the hybrid multi-criteria and creative problem-solving approach in determining the local alternatives' values, the approach is applied to the "real-life" problem of choosing the most appropriate switch, for small and medium-sized companies. The resultant increasing and decreasing piecewise linear functions, can serve as a good approximation of exponential value functions, that would otherwise, require a large series of data and a demanding statistical knowledge. The presented approach can be applied to a wide range of organizational and management problems for the selection, assessment, and evaluation of alternatives.

Keywords: creative problem solving; information technology; multi-criteria decision making; piecewise linear value function; prescriptive approach

1 Introduction

Consideration of a prescriptive approach to decision making [22], which advises against the exclusive treatment of people, as perfectly rational individuals, resulted in systematic decision-making procedures to support smart decisions. They follow the decision-making phases and consist of well-described steps [26]. Among them, the frame procedure for multi-criteria decision making (MCDM) by using the group of methods based on assigning weights [7] that follows the phases of the Belton and Stewart's decision-making process [2] has been well-verified in practice, mainly to support the preparation of business decisions for complex problem solving in small and medium-sized enterprises. The particularities of the above-mentioned frame procedure for MCDM, which includes the following steps: problem definition, elimination of unacceptable alternatives, problem structuring, measuring local alternatives' values, criteria weighting, synthesis, ranking and sensitivity analysis [7], have been introduced in the selection of Information Technology (IT) services and products [7]. The growing role of IT in meeting the needs in enterprises' growing businesses and supporting their integration into global economic processes [13], which also stood out during the Corona crisis period [29], underlines the need for the methodological development of individual steps.

In MCDM based on assigning criteria weights, measuring alternatives' values encompasses measuring local alternatives' values with respect to each criterion on the lowest hierarchy level, and synthesis, i.e., measuring alternatives' values with respect to all criteria structured in a problem hierarchy. The purpose of this paper is to develop a hybrid multi-criteria and creative problem-solving approach to measuring alternatives' values with respect to criteria on the lowest hierarchy level, the so-called local alternatives' values.

The local values of alternatives can be measured indirectly, e.g., by value functions or pairwise comparisons, or directly. According to Kadziński *et al.* [18], a direct specification of a set of parameter values can be difficult for decision makers since it requires considerable cognitive effort. For this reason, indirect specification of preference information is considered more user-friendly. The recognized advantage of the indirect over the direct approach is that it allows decision makers to investigate their evaluation of parts of the problem, i.e., alternatives according to criteria, and to elicit their preferences to alternatives with respect to each criterion on the lowest level. Rezaei [23] noted that the existing MCDM methods often use simple monotonic linear value functions for measuring alternatives' values and pointed out that the assumption of an increasing or decreasing linear function between a criterion level (over its entire range) and its value might lead to improper results. Ghaderi and Kadziński [14] pointed out that the shape of value function is of great importance in different areas of research in decision analysis, including multi-criteria decision making as it decides upon the contribution of various performances into the comprehensive value of an alternative. They found that accounting for the structural patterns at the population level considerably improves the predictive performance of the constructed value functions at the individual level [14]. Greco *et al.* [16] introduced the concept of a representative value function in robust ordinal regression applied to multiple criteria sorting problems and proposed a way of selecting a representative value function among the set of compatible ones. In [16] the authors introduced several examples of level-increase value function on multiple sections in real world decision problems. Rezaei [23] proposed a set of the following piecewise linear functions: increasing, decreasing, V-shape, inverted V-shape, increase-level,

level-decrease, level-increase, decrease-level, increasing stepwise, and decreasing stepwise. This set of piecewise linear functions, however, does not explicitly expose piecewise linear increasing nor piecewise linear decreasing value functions with multiple (at least two) sections on which the absolute value of the slope coefficient is between 0 and 1. To fill this gap, this paper deals with the piecewise linear increasing and piecewise linear decreasing value functions, with multiple (at least two) sections on which the absolute value of the slope coefficient is between 0 and 1. The sections can be defined by using the bisection method [1] [27]. The first goal of this paper is therefore to delineate how to create increasing and decreasing piecewise linear functions by using a bisection method.

Since decision makers and/or the experts who measure the values of alternatives often do not have either specific mathematical knowledge or do not have enough time to study mathematical expressions and procedures, we propose that the elicitation of their preferences to determine value functions can be supported by using methods based on questions, e.g., W technique, six questions technique, Why and 5 Whys [3] [5]. The second goal of this paper is to introduce a systematic approach to determine the local alternatives' values by using a six questions technique.

The organization of the rest of this paper is as follows. The next section delineates how to create the increasing and the decreasing piecewise linear value functions with four sections, based on the bisection method, proposes a process on how to support the determination of the local alternatives' values by using the six questions technique, and defines the real-life problem, together with the data presentation. Then the approach proposed in this paper is illustrated in detail on a real-life case. The paper also discusses the obtained results, together with the approach's limitations and further research possibilities. The concluding part highlights the theoretical and practical implications of the proposed hybrid multi-criteria and creative problem-solving approach to measuring local alternatives' values.

2 Methods

2.1 A Systematic Approach to Determine Value Functions

It is well known that the choice of an appropriate technique for assessment of value function depends on the decision problem, its context, and the decision maker's characteristics [19]. According to Segura and Maroto [25], decision making not only considers opinions and judgments, but also integrates historical data and expert knowledge. Based on the research, knowledge and experience in measuring local alternatives' values of the author of this paper, it has to be pointed out that the set of influential factors to the assessment of value function depends on the type of a criterion, the data, and decision maker's preferences.

The systematic approach introduced in this paper includes the creation of piecewise linear functions by using the bisection method. In this method, two objects are presented to a decision maker; he is asked to define the attribute level that is halfway between the objects in respect of the relative strengths of the preferences. This paper delineates how to create the increasing and then also the decreasing piecewise linear functions with four sections by using a bisection method.

Let us delineate how to create the increasing piecewise linear function with four sections by using a bisection method. First, the two extreme points, the least preferred evaluation object x_{min} and the most preferred evaluation object x_{max} are identified and associated with values $v(x_{min}) = 0$, $v(x_{max}) = 1$. Then, a decision maker is asked to define a midpoint x_1, for which:

$$(x_{min}, x_1) \sim (x_1, x_{max}) \tag{1}$$

where ~ indicates the decision maker's indifference between the changes in value levels. While x_1 is in the middle of the value scale, we must have:

$$v(x_1) = 0.5\ v(x_{min}) + 0.5\ v(x_{max}) = 0.5 \tag{2}$$

Thus, we determined the increasing piecewise linear function with two sections. To create four sections, each of the existing two sections obtained by (1) and (2) must be halved according to the alternative's value. For the midpoint x_2 between x_{min} and x_1, for which:

$$(x_{min}, x_2) \sim (x_2, x_1) \tag{3}$$

we obtain:

$$v(x_2) = 0.5\ v(x_{min}) + 0.5\ v(x_1) = 0.25 \tag{4}$$

and for the midpoint x_3 between x_1 and x_{max}, for which:

$$(x_1, x_3) \sim (x_3, x_{max}) \tag{5}$$

we obtain:

$$v(x_3) = 0.5\ v(x_1) + 0.5\ v(x_{max}) = 0.75 \tag{6}$$

Let us also delineate how to create the decreasing piecewise linear function with four sections by using a bisection method. First, the two extreme points, the most preferred evaluation object x_{min} and the least preferred evaluation object x_{max} are identified and associated with values $v(x_{min}) = 1$, $v(x_{max}) = 0$. Then, a decision maker is asked to define a midpoint x_1 to which it applies (1). Again, while x_1 is in the middle of the value scale, we must have (2). Similarly, for the midpoint x_2 (between x_{min} and x_1) to which it applies (3), we obtain:

$$v(x_2) = 0.5\ v(x_{min}) + 0.5\ v(x_1) = 0.75 \tag{7}$$

and, for the midpoint x_3 (between x_1 and x_{max}), to which it applies (5), we obtain:

$$v(x_3) = 0.5\ v(x_1) + 0.5\ v(x_{max}) = 0.25 \quad (8)$$

2.2 Use of the Six Questions Technique in Measuring Local Alternatives' Values

When measuring local alternatives' values with respect to each criterion on the lowest hierarchy level, it is important to ask the decision maker good questions (the term 'decision maker' includes both an individual and a group). For this purpose, we can use the six questions technique – the creative problem-solving method for problem definition, based on questions. The six questions technique is namely a structured method that examines a problem from multiple viewpoints. According to Cook [5], it is best used with rational problems due to its complexity. Moreover, it can be used individually or in groups. A general summary of the six questions technique includes stating the problem using the question 'In what ways might…?', writing down who, what, when, where, why and how questions that are relevant to the problem, answering the above written questions, and examining responses and using them for problem redefinitions [5]. In MCDM, the technique can be used to define problems in the first step of the frame procedure of MCDM [8]. The technique has already proven useful in indirect criteria weighting [6] [9].

In addition, we propose the following process of determining the local alternatives' values:

1) In what ways might the local alternatives' values be determined?
2) The who, what, where, when, why and how questions regarding the local alternatives' values are put and written down.
3) The questions are answered, and the local alternatives' values are determined and re-determined.

2.3 Data

The systematic approach to determine value functions is illustrated in detail on a real-life case of choosing the most appropriate switch, from the viewpoint of an IT company that offers switches to small and medium-sized companies. Alternatives are the switches that can be offered: Alternative 1 is Dell EMC Switch N1524P [10], Alternative 2 is C1000-24P-4G-L [4] and Alternative 3 is 6300M 24x 1G PoE / 4x SFP56 (JL662A) [17]. In Table 1, the data of alternatives with respect to criteria on the lowest hierarchy level (see Figure 1) are compiled from [4] [10] [17].

Table 1
Alternatives' data

Criterion	Data Type	Alternatives		
		Alternative 1	Alternative 2	Alternative 3
Ports total	Quantitative: number of choices	28	24	28
Switching bandwidth	Quantitative: Gbps	176	128	880
Forwarding rate	Quantitative: Mpps	164	95.23	660
Power over Ethernet	Quantitative: W	600	195	600
Maximum power consumption	Quantitative: W	871	250	674
Acoustic noise	Quantitative: dB	45	0	34.2
Power supply	Quantitative: number of choices	1	1	2
Warranty	Mixed: years or verbal description	3	For the period of ownership or use	5
Training	Quantitative: €	400	500	600
Price	Quantitative: €	2500	2125	3500

3 Results

The criteria hierarchy is presented in Figure 1. The criteria importance was together with the IT company's experts determined hierarchically. The criteria importance with respect to the global goal, which is choosing the most appropriate switch, was determined indirectly, by using the SWING method [28]: the change from the worst to the best level of technical criteria was considered the most important and was assigned 100 points; 70 points less, i.e., 30 points were assigned to the change from the worst to the best level of environmental criteria to reflect the importance of this change relative to the most important criterion change, and 30 points less than to the change from the worst to the best level of technical criteria, i.e., 70 points were assigned to the change from the worst to the best level of economic criteria; the first level criteria weights were obtained by normalization. The importance of economic sub-criteria was determined indirectly, too, by using the SMART method [11]: the change from the worst to the best training was considered the least important and was assigned 10 points; 20 points more, i.e., 30 points were assigned to the change from the worst to the best warranty to reflect the importance of this change relative to the least important criterion change, and 30 points more than to the change from the worst to the best training, i.e., 40 points were assigned to the change from the highest to the lowest price. The SMART method was also used to indirectly determine the technical sub-criteria weights. Again, the above-mentioned sub-criteria weights were calculated by using normalization. The environmental sub-criteria weights were determined directly.

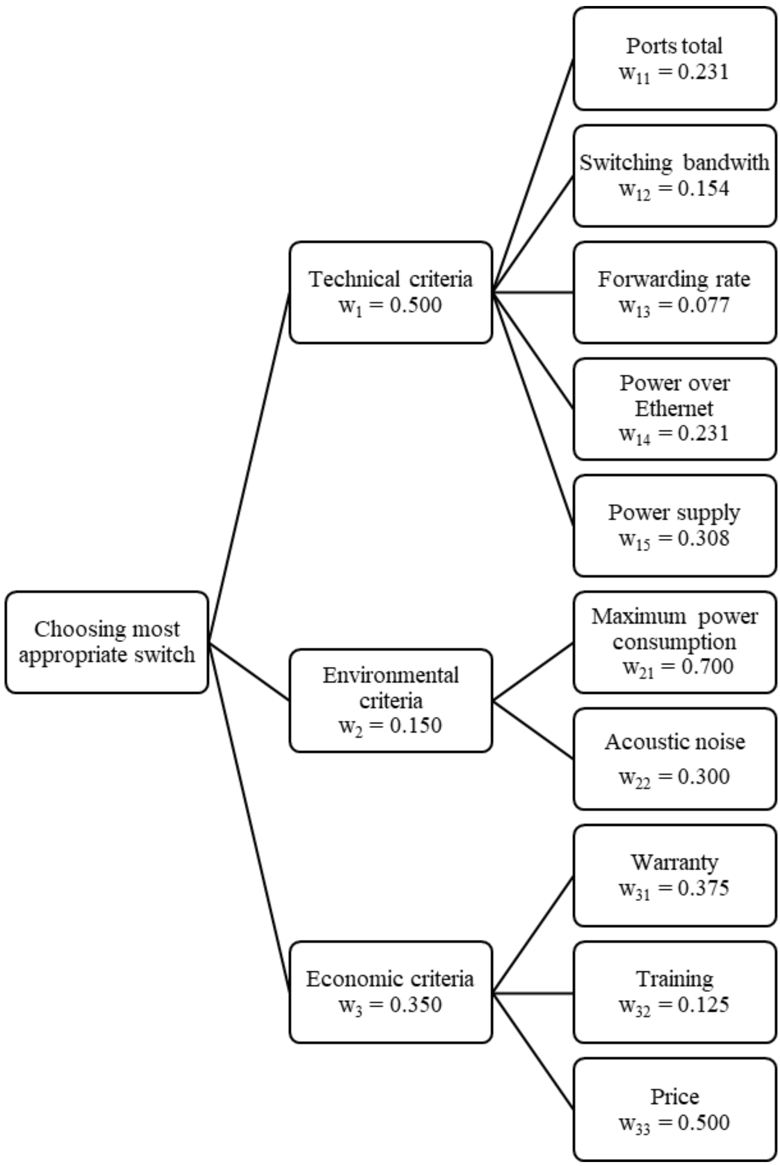

Figure 1
Criteria hierarchy and the weights

For measuring local values of alternatives, the coordinator, with appropriate knowledge for creative thinking techniques and for MCDM, asked and answered the typical question of the first step of the six questions technique process:

Q: In what ways might the local alternatives' values be determined?

A: Individually, in groups. Directly, indirectly, i.e., by using pairwise comparisons (verbal, numerical and graphical), and value functions (simple-monotonic, exponential, piecewise linear).

As the local alternatives' values were determined in groups, the group participants were defined in the second and the third step of the proposed six questions technique process.

Q: Who is responsible for this model building, including local alternatives' values determination?

A: Project manager, responsible for the defined problem solving, and IT experts.

Q: Who is competent to express preferences about the local alternatives' values?

A: Problem experts and/or experts in the field described by the considered criterion.

After the participants of the group for solving the problem were defined, they answered the questions regarding the model, successively put by the coordinator:

Q: Where will the model be used?

A: In small and medium-sized companies.

Q: When will the model be applied for problem solving?

A: In 2021 and beyond, for the next five years.

As this paper is focused on indirect specification of preference information about alternatives with respect to each criterion on the lowest hierarchy level with value functions, we present in more detail the questions (put by the coordinator) and the participants' answers expressing preferences to measure the local alternatives' values with value functions. Because the participants were not familiar with several ways of the local alternatives' ways determination, the coordinator briefly presented the ways of the determination of local alternatives' values. Then, the following question was asked for each criterion on the lowest hierarchy level:

Q: With respect to the criterion on the lowest hierarchy level, how will the local alternatives' values be determined?

When the response covered value functions, further questions referred to a more accurate determination of the value function. In this paper, we present questions for the bisection method to determine the piecewise linear function with multiple

– in this case four – sections, for measuring the local alternatives' values with respect to forwarding rate and with respect to price (Table 1).

To determine the increasing piecewise linear function for forwarding rate, the following questions were put and answered:

Q: Which is the least preferred evaluation object x_{min} so that $v(x_{min}) = 0$?

A: The least preferred evaluation object x_{min} is 50 Mpps.

Q: Which is the most preferred evaluation object x_{max} associated with $v(x_{max}) = 1$?

A: The most preferred evaluation object x_{max} is 850 Mpps.

Q: Why is x_{min} the least preferred evaluation object and x_{max} the most preferred evaluation object?

A: Because the greater the forwarding rate, the more favorable the alternative.

For the determination of sections, the following question based on (1) and (2) were put and answered:

Q: Which is a midpoint x_1, for which $(x_{min}, x_1) \sim (x_1, x_{max})$, where $\sim$ indicates the decision maker's indifference between the changes in value levels, so that $v(x_1) = 0.5\ v(x_{min}) + 0.5\ v(x_{max}) = 0.5$?

Because decision-makers were not familiar with mathematical expressions, a coordinator re-formulated the above written question:

Q: Which is a midpoint x_1, which is considered equally good if the forwarding rate increases from x_{min} to x_1, as if it increases from x_1 to x_{max}?

A: The increase of the forwarding rate from 50 Mpps to 250 Mpps is equally favorable as its increase from 250 Mpps to 850 Mpps. The local value of x_1 is 0.5.

Thus, we determined the increasing linear function with two sections. To obtain the increasing linear function with four sections, the following questions based on (3) – (6) were asked:

Q: Which is a midpoint x_2, which is considered equally good if the forwarding rate increases from x_{min} to x_2, as if it increases from x_2 to x_1?

A: The increase of the forwarding rate from 50 Mpps to 100 Mpps is equally preferred as its increase from 100 Mpps to 250 Mpps. The local value of x_2 is 0.25.

Q: Which is a midpoint x_3, which is considered equally good if the forwarding rate increases from x_1 to x_3, as if it increases from x_3 to x_{max}?

A: The increase of the forwarding rate from 250 Mpps to 500 Mpps is equally favorable as its increase from 500 Mpps to 850 Mpps. The local value of x_3 is therefore 0.75.

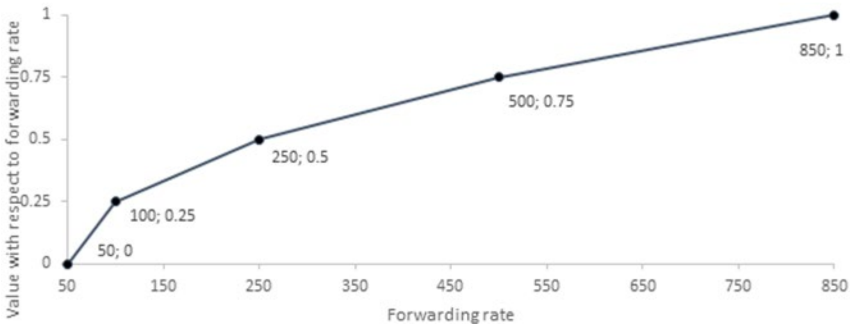

Figure 2
Piecewise linear value function for forwarding rate

The obtained increasing piecewise linear function with respect to forwarding rate is presented in Figure 2. The local alternatives' values with respect to forwarding rate are as follows: v_{13}(Alternative 3) = 0.865, v_{13}(Alternative 1) = 0.359, v_{13}(Alternative 2) = 0.236 and are higher than if they were obtained with monotonic linear increasing function.

To determine the decreasing linear piecewise linear function with four sections for price, the following questions were asked and answered:

Q: Which is the most preferred evaluation object x_{min} so that $v(x_{min}) = 1$?

A: The most preferred evaluation object x_{min} is 1500 €.

Q: Which is the least preferred evaluation object x_{max} associated with $v(x_{max}) = 0$?

A: The least preferred evaluation object x_{max} is 5000 €.

Q: Why is x_{min} the most preferred evaluation object and x_{max} the least preferred evaluation object?

A: Because the greater the price, the less favorable the alternative.

For the determination of sections, a question based on (1) and (2):

Q: Which is a midpoint x_1, for which $(x_{min}, x_1) \sim (x_1, x_{max})$, where ~ indicates the decision maker's indifference between the changes in value levels, so that $v(x_1) = 0.5\ v(x_{min}) + 0.5\ v(x_{max}) = 0.5$?

was worded in a question that is more comprehensible to the decision-maker:

Q: Which is a midpoint x_1, which is considered equally unfavorable if the price increases from x_{min} to x_1, as if it increases from x_1 to x_{max}?

A: The increase of the price from 1500 € to 2500 € is equally unfavorable as its increase from 2500 € to 5000 €.

The local value of x_1 is 0.5. So far, we determined the decreasing linear function with two sections. To obtain the decreasing linear function with four sections, the following questions based on (3), (5), (7) and (8) were put and answered:

Q: Which is a midpoint x_2, which is considered equally unfavorable if the price increases from x_{min} to x_2, as if it increases from x_2 to x_1, so that $v(x_2) = 0.75$?

A: The increase of the price from 1500 € to 1800 € is equally unfavorable as its increase from 1800 € to 2500 €.

Q: Which is a midpoint x_3, which is considered equally unfavorable if the price increases from x_1 to x_3, as if it increases from x_3 to x_{max}, so that $v(x_3) = 0.25$?

A: The increase of the quantity from 2500 € to 4000 € is equally unfavorable as its increase from 4000 € to 5000 €.

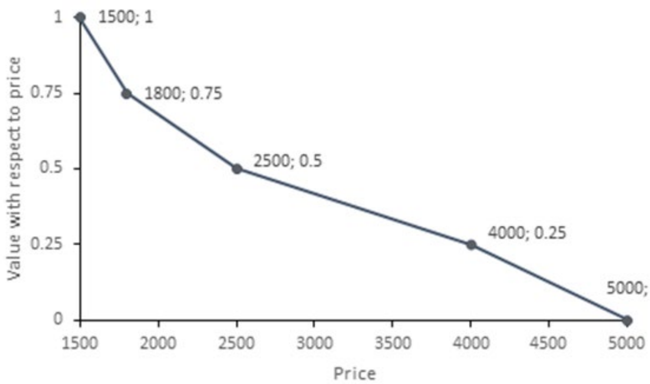

Figure 3

Piecewise linear value function for price

The obtained decreasing piecewise linear function, with respect to price, is presented in Figure 3. The local alternatives' values with respect to price are as follows: v_{33}(Alternative 2) = 0.631, v_{33}(Alternative 1) = 0.5, v_{33}(Alternative 3) = 0.333 and are lower than if obtained with a monotonic linear decreasing function.

The determination of value functions as a narrower professional task required the concentration and reflection of everyone in the group. The answers were written down by each participant. Then the coordinator reviewed all the answers and presented any differences to the participants. At the coordination meeting, the coordinator asked questions to provide justifications for the preferences expressed and to investigate the causes of differences, with an aim to bring the views of the participants closer. For example, in the case of increasing value function, the questions for the lower bound determinations were as follow: Why is x_{max} the most preferred evaluation object? How would the change of x_{max} affect the local alternatives' values? What do we want to achieve: greater or lesser differentiation of alternatives?

For measuring the local values of alternatives with respect to ports total, switching bandwidth, power over Ethernet, maximum power consumption and training, the monotonic-linear functions were used. In these cases, questions relating to the least and the most preferred evaluation object were put and answered. To measure the local values of alternatives with respect to power supply directly, the extreme values 0 and 1 were used. The expression of judgments on the local values of alternatives, with respect to acoustic noise and warranty was supported by pair-wise comparisons. The local values of alternatives are presented in Table 2.

Table 2
Local alternatives' values

Criterion	**Alternative**			**Measuring Local Alternatives' Values**
	Alternative 1	Alternative 2	Alternative 3	
Ports total	0.444	0.333	0.444	Value function: Lower bound: 12, Upper bound: 48
Switching bandwidth	0.064	0	1	Value function: Lower bound: 128, Upper bound: 880
Forwarding rate	0.359	0.236	0.865	Value function: Lower bound: 50, Upper bound: 850
Power over Ethernet	1	0.325	1	Value function: Lower bound: 0, Upper bound: 600
Power supply	0	0	1	Direct
Maximum power consumption	0	0.747	0.237	Value function: Lower bound: 40, Upper bound: 871
Acoustic noise	0.058	0.553	0.388	Pair-wise comparisons
Warranty	0.075	0.592	0.333	Pair-wise comparisons
Training	0.600	0.500	0.400	Value function: Lower bound: 0, Upper bound: 1000
Price	0.500	0.631	0.333	Value function: Lower bound: 1500, Upper bound: 5000

The aggregate alternatives' values obtained with an additive model [2] are presented in Table 3. The results in Table 3 show that Alternative 3 is best suited with respect to the technical criteria, and Alternative 2 is best suited with respect to the environmental and to the economic criteria. With respect to all criteria that are structured in the hierarchy (Figure 1), the aggregate values of alternatives are as follows: v(Alternative 3) = 0.592, v(Alternative 2) = 0.398 and v(Alternative 1) = 0.311. It can be concluded that with respect to all criteria taken into consideration in the model presented in Figure 1, Alternative 3 is most appropriate (Table 3). The gradient sensitivity results showed that the order of alternatives to weight changes up to 0.1 is stable.

Table 3

Aggregate alternatives' values

Value with respect to:	**Alternative**		
	Alternative 1	Alternative 2	Alternative 3
Technical criteria	0.371	0.170	0.861
Environmental criteria	0.018	0.689	0.282
Economic criteria	0.352	0.600	0.341
All criteria	0.311	0.398	0.592

4 Discussion

The introduced systematic approach applied to a real-life problem of choosing the most appropriate IT product can be used in the IT companies that offer support to their customers.

The results in Tables 2 and 3 show that the most appropriate switch, Alternative 3, has the highest value with respect to technical criteria, too. Among the considered alternatives that are suitable for small and medium sized companies, Alternative 3 has therefore the best potential to enable communication among different networked devices in small and medium sized companies.

The presented approach to measuring local values of several IT products by value functions proved useful in the elicitation of expertly justified preferences. The determination of value functions included the coordinator with appropriate knowledge for creative thinking techniques and for MCDM, and problem experts and/or experts in the field described by the considered criterion. The engagement of the coordinator and the commitment of each expert provided the reviewed and the justified value functions. The hybrid multi-criteria and creative problem-solving approach has an application potential for other sectors, primarily for small and medium-sized enterprises, or local government decision-making.

Limitation of the measurement of local alternatives' values with value functions is the availability of numerical data, based on interval or ratio scale, of alternatives with respect to the considered criteria on the lowest hierarchy level. Further research possibility is therefore to complete the introduced systematic approach to determine the local values of alternatives with other methods that enable dealing with data on nominal and ordinal scale, too [12] [15] [24]. In these cases, before measuring the local values of alternatives, it is necessary to define the problem requisitely holistically [8], to include comparable alternatives and to structure an appropriate set of criteria that allows for a comprehensive evaluation of alternatives.

In this paper we presented how to determine the increasing and the decreasing piecewise linear functions with four sections. The increasing or the decreasing piecewise linear functions with more than four sections can be determined according to the same principle by splitting existing sections.

In addition, several possibilities of group preference elicitation [20] [21] [26] in the step of measuring alternatives' values can be further explored in detail in the framework procedure for MCDM. Within this, the original procedure can be completed with other quantitative and qualitative methods, with an emphasis to several creative problem-solving methods for problem definition.

Conclusions

Piecewise linear functions are distinguished by simplicity and representativeness. To meet the first goal of our work herein, we defined how to determine piecewise linear increasing and decreasing linear functions, with four sections, by using, the bisection method. The resultant increasing or decreasing piecewise linear functions, determined by using a hybrid approach that is proposed in this paper, can serve as a good approximation of exponential value functions, that would otherwise, require a large series of data and a demanding statistical knowledge base. Moreover, considering the expressed expert preferences, the approach also allows the creation of value functions, whose form deviates from simple monotonic-linear or exponential value functions. The simple monotonic-linear functions are easier to work with, but they might not be representative in non-linear cases. On the other hand, Rezaei [23] showed that exponential value functions might have a better representativeness, than simple linear functions, however, it is difficult for a practitioner to estimate a value for the shape parameter of the exponential value functions and cannot be easily interpreted.

Within the frame of the procedure for MCDM, we explored the possibilities of measuring alternatives' values and within this, recommended the original systematic approach, that includes both the quantitative and qualitative methods. The described approach is based on the "six questions" technique – a creative problem-solving qualitative method, which is usually used to define problems. The novelty of this paper is in the extension of the use of the six questions technique, to the measurement of the local alternatives' values, which has usually been seen as a quantitative step in the frame procedure for MCDM. By introducing the systematic approach to determine the local values of alternatives, by using the six questions technique, we met the second goal of this paper. A practical case has proven that the six questions technique can adopted in group preference elicitation and thus, adequately supports the step of measuring local alternatives' values.

The practical case presented in this work is limited to choosing the most appropriate switch for small and medium sized companies, in the current era of digitalization, it is an important IT product. Further application possibilities of the presented approach can be extended to a wide range of organizational and management problems, for the selection, assessment and evaluation of various alternatives.

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