The Negotiated Procedure in Procurement Based on the Belief Theory and the Value Model

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***Abstract*:** The procurement procedure includes analytical modelling that enables better decision-making. Negotiations generally take place in the conditions of incertitude. Incertitude is frequently the result of lack of information, lack of understanding of such information, and of encountering equally attractive alternatives in the process of decision-making. The Dempster–Shafer belief theory is used so that information from multiple sources is combined into a consolidated presentation; the plausibility of the sources is taken into account in the calculation, which should enable better insight into the situation of decision-making on the other side, that is, of both parties participating in the negotiated procedure. The hypothesis that, from the aspect of resolving conflict situations, the use of DST enables better insight into the situation of decision-making on the other side, that is, of both parties participating in the negotiated procedure, was confirmed.

Key-Words: negotiations, procurement incertitude, Dempster-Shafer, decision-making, value.

I. INTRODUCTION

The methodology of harmonisation in the procurement procedure is based on analytical modelling with a view to more successful decision-making in the procedures of negotiations on organisation, clients, and tenderers. [9] In view of the complexity of the problem of decision-making connected with procurement, the appropriate procedures of the negotiated procedure are used. They shorten the procedure for submitting proposals of solutions and the time leading up to the beginning of negotiations considerably, and the said procedures are sufficiently flexible and leave enough space for creating the so-called satisfactory situation for both sides to the negotiation. Negotiations generally take place in the conditions of incertitude. Defining incertitude depends on the conditions in which it appears, but one could say that incertitude is a phenomenon that is not fully quantifiable. [6] The theory of incertitude that uses probabilities and sets of numbers to describe incertitude was constructed in order to determine the extent to which the phenomenon is quantifiable. Probability is quite frequently defined as a synonym of incertitude but the two concepts are very different and should not be used interchangeably.

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Incertitude is frequently the result of lack of information, lack of understanding of such information, and of encountering equally attractive alternatives in the process of decision-making. Lack of understanding of information and equally attractive alternatives represent the sources of incertitude that are dependent on the environment in which they appear and on the person making the decision. The Dempster–Shafer belief theory (DST) is used so that information from multiple sources is combined into a consolidated presentation, where the plausibility of such sources is taken into account, that is, we can interpret it as the assignment of a degree to the plausibility of the sources. [16] The use of DST should enable better insight into the situation of decision-making on the other side, that is, of both parties taking part in the negotiated procedure. The terms incertitude and negotiations are discussed in detail at the beginning of the paper, and so is the concept and the possibility of using DST. Preparations for the negotiated procedure are described in detail in further text as an introduction to the use of DST in preparations for the negotiated procedure. A description of the negotiated procedure based on the value model and the evidence theory is presented at the end of this paper immediately before the conclusion.

II. INCERTITUDE AND NEGOTIATIONS

The negotiated procedure generally takes place in an environment that we could describe as uncertain. Incertitude includes the impossibility of making a prediction and the impossibility, in principle, of making a prognosis. Incertitude is objectively different from ignorance, a condition that can be altered by further research and study.[7] It is different from risk, since risk can always be calculated. [10] In the case of complex decision-making in the conditions of incertitude, the person making the decision chooses from several possibilities and has no information about their probability. [3] Uncertain decision-making is defined as part of the theory of decision-making in which possible results are known but the likelihood of their appearance in terms of possible states cannot be calculated. We can make a brief distinction between the terms risk and incertitude [30] by stating that risk is the probability of appearance of an unfavourable or harmful event, which can be determined and measured, that is, in general, statistically modelled, while incertitude is a circumstance where there is no sufficiently accurate knowledge of the probability of a

harmful event but only awareness of the possibility of its appearance.

The outcome of decision-making, in the case of uncertain decision-making, can be presented by using the results matrix where the person making the decision chooses from a number of possibilities (m_i), which depending on the possible states (s_j), result in a different outcome (r_{ij}). However, the person making the decision does not know all states and the probability of appearance of the results of his decision.

From the very beginnings of the probability theory, scholars are aware that truth is not the only criterion of potential interest for interpreting probabilities. There is a whole series of situations where belief has primary significance for the person making decisions, or at least the same relevance as truth. [1] Belief is important in situations where the goal is to remove doubt and in analyses in which emphasis is on justifying recommendations given to clients, that is, in all business decisions made in circumstances that are uncertain and in which truth cannot be established with certitude.

Smith, Benson and Curley [1] tied this recognition to a philosophical analysis of knowledge as "justified true belief" [2] and to the use of probabilities as qualifications of beliefs that fall short of knowledge. The analysis highlights two separate criteria along which such beliefs may be qualified: truth and justification. This theoretical distinction forms the basis of a long-standing differentiation between Pascalian probability based on likelihood relative to a criterion of truth and Baconian probability based on support relative to a criterion of justification [13]. The distinction is also the basis of a common differentiation between the mass and the balance of evidence that can be traced to Keynes and which has played a major role in motivating the study of ambiguity in decision-making. When faced with incertitude, decision-makers apply numerous strategies and methods. Ignoring, accepting, and identifying incertitude are some of the strategies, and the methods that appear frequently are the sensitivity analysis, scenario analysis, simulation, and many others. Each of the methods is adequate for certain situations or incertitudes, and the selection of one of the methods, or several, is up to the decision-maker. For a method to be appropriately applied and for its results to be legitimate, it is important to collect quality and accurate facts that can be of help in diminishing incertitude.

The main elements of the negotiated procedure—namely, facts—are connected with the criterion of justification. The mass or, to put it simply, value depends on the quantity and plausibility of a particular fact. How many solid facts are there? How good are the facts at enabling differentiation of possibilities? As opposed to balance that is used to calculate probability, the mass does not mean complementarity, that is, increased support for one possibility, and it is not essentially reflected negatively on the support of other possibilities. Thus, with a view to encouraging faster resolution and boosting added value in negotiated procedures, it is proposed to use a simplified Dempster-Shafer evidence theory.

III. THE DEMPSTER – SHAFER BELIEF THEORY

The Dempster-Shafer theory (DST) is a mathematical theory of evidence. It is used to combine information from different sources into a consolidated presentation [4], where the plausibility of the sources is taken into account when making the calculation [2], that is, we can interpret the action as the assignment of degrees to the plausibility of sources.

In the 1960s, Arthur Dempster wrote a number of articles on the theory of evidence. Glenn Shafer continued in Dempster's footsteps in 1976. [2] Since then, the theory is known as the Dempster-Shafer theory of evidence. The fact or, within the meaning of this theory, evidence may be regarded as the expansion of likelihood where a two-dimensional measure is used instead of a one-dimensional, consisting of the degree of certitude or the degree of confidence in that a particular source is correct, and of the plausibility or probability of an event, that is, the area of probability with a lower and an upper frontier. [4]

An advantage of this practical approach consists of the modelling of the process of consolidating information from multiple sources into a single belief by aggregation of the grades of coefficients of certitude. [12] Experts use facts or evidence that direct their reasoning to an expanded subset of possible events instead of a single hypothesis. Shafer [2] noticed that there is no difference between insufficient or imperfect knowledge and the equal degree of certitude and, when applying Dempster's theoretical principle in practice, enabled the assignment of a degree of certitude to the subsets of hypotheses and all separate elements. The Bayesian probability firmly defines the relationship between the probability of an event "D" and the opposite event through the expression P(D) + P(not D) = 1. In DST, we express the relationship as m(D) + m(not D) + m(D,notD) = 1. For presentation of subjective incertitude, Dempster proposed [4] the terms lower and upper probability. Shafer [33] developed the theory further and practically elaborated on the function of certitude and the measure of probability with a view to attributing subjective belief.

IV. PREPARATIONS FOR THE NEGOTIATED PROCEDURE

Application of the said theory to the negotiated procedure will in most cases enable a win-win scenario because it makes possible to either create or design new values, shared by both parties interested in an agreement. Negotiations are often conducted under the circumstances of incertitude that can be most successfully managed by using co-operative negotiating techniques, thus reducing the possibility of creating an inappropriate environment that does not contribute to the resolution of conflict situations. Most authors agree that the outcome of negotiations depends greatly on the way in which the negotiations are conducted. [14]

In line with the foregoing, in further text of this paper the authors will focus on the confirmation of the hypothesis that, from the aspect of resolving conflict situations, the use of DST enables better insight into the situation of decision-making of the other side, that is, of both parties taking part in the negotiated procedure.

A. The negotiated procedure in the procurement process

Negotiations during procurement should be handled strategically and systematically. In order to improve the

probability of reaching an agreement, the *creative negotiation design* is appropriate for negotiations as it can be used to restructure it. [11] The negotiation design is used to configure the process of negotiation with the aim of achieving the desired outcome. Lax and Sebenius [5] introduced the term *settings* to define the negotiators, their interests and options in cases where an agreement will not be reached, then the series of decisions, the choice of creative processes and the adoption of values, all with a view to realising the desired agreement. [5] In the analytical model of possible joint actions leading to an agreement, the negotiators decide the axes in view of their usefulness, the borders are determined by the alternatives of agreements, while the agreements include the negotiation potential. The described process consists of the creation and adoption of values, which increases the dynamic nature of the negotiation process, where it should be noted that the elements of interaction can be improved deliberately.

The analytical approach to the negotiation process can be divided into the individual adoption of decisions (selection of an alternative), interactive adoption of decisions (reviewing priorities), and the joint dynamic adoption of decisions, the purpose of which is to create or embrace value. Creating or embracing a shared value is a dilemma in most negotiations. Therefore, practical advice for negotiations on the procurement of equipment should include co-operation methods to parties in the negotiations.

Since negotiations present a complex process that cannot be resolved in just a few steps, complexity of the negotiating process can be reviewed by examining the process from various perspectives, bearing in mind its various goals. In selecting the negotiated procedure, it is necessary to review the degree of incertitude of tenders collected, to review all components of the tender required, reactions of the tenderers to the contest, and the adoption of joint decisions.

The negotiated procedure and the competitive dialogue are appropriate and, in the case of public procurement, legally founded procedures in the event of procurement of a complex assortment of products. The absence of more specific instructions on the rational way of determining subjective values of certain types of goal functions is the negative side of analytical modelling. A subjective evaluation of *incertitude* is an important element in the field of analysis of decisions, which is the role of the decision-maker. One of the basic presumptions of decision analysis is the possibility of expressing a subjective evaluation of incertitude in terms of probability. Sebenius claims how understanding the process of creating and embracing values, along with the understanding of psychological, cultural and organisational aspects, as well as the historical resemblance and knowledge of the systematic process of decision-making, eliminates the absence of determining evaluations of subjective values. [5]

The outcome of the model obtained in the first step of the methodology of harmonisation of the assortment of goods is to define the desired assortment, which is the most important step in the process of procurement. To the contrary, it is unnecessary products or services that are procured, which does not contribute to the realisation of the goals of the organisation. Further, during the negotiations, it is important to be aware of the assortment of products in order to deal with the real problem, and not channel the time and means to resolve irrelevant issues. Frequent mistakes are lack of understanding of the problems of the manufacturer taking part in the negotiations, placing emphasis in the negotiations primarily on the price of the product, voicing one's own position on certain disputable points instead of focusing on the interests of the organisation, search for joint interests instead of the recognition of different values, neglect of current sales actions, and failure to remedy the mentioned erroneous positions.

The most important aspect of the second step is a negotiation analysis in order to enable the organisation taking part in the procurement of products or services to prepare itself as best as it can for a negotiation with manufacturers. During preparations for the negotiation, and during the negotiation itself, one should bear in mind that the goal of any negotiation is to reach the greatest possible value in view of the financial means available. This determines the characteristics of the equipment desired and the possibility of concessions in the negotiation procedure.

B. Preparation for the negotiation

Preparation for the negotiation consists of active research of the subject-matter of the negotiation before it begins, and of the testing of the extent to which the interests and positions in making a decision on the procurement of equipment are realistic. Preparation for the negotiation accounts for 70-90% of its successfulness. [14] Two main elements of preparation for the negotiation are to define the number of participants and organise meetings with a view to finding a common ground for creating or embracing values and creating a formal structure for the co-ordination of the positions of the group, and to define the tasks and subsets of negotiations. [14]

Every member of the negotiating organisation whose reason to participate can be clearly defined must take part in the negotiations. One should be careful because too many members in the negotiating team can diminish efficiency. The number of members is not fixed but can change as needed.

Defining a joint purpose of the negotiation consists of determining the position of members towards creating or embracing values during the negotiation. A joint purpose results in better motivation of individual members and improves co-ordination. It is best to include the definition of the joint purpose into a memorandum of negotiation, which is drawn up before the negotiation begins, and which includes shared goals. Further, before the negotiation, it is necessary to hold meetings regarding finances, maintenance, the legislative framework, logistics and other relevant aspects of the procurement of equipment. The most important aspects of the situation of decision-making arise from the fundamental goals of the organisation.

The formal negotiation structure must be simple and elegant, and in conformity with both national and EU standards. An appropriate structure will not limit the thinking of the group and it will prevent disagreement by ensuring flexibility and improving the process of learning.

C. Negotiation analyses

I. **Appointment of members of the organisation to take part in the negotiation.** Before the negotiation begins, it is necessary to determine the exact number of members of

the negotiating organisation who will take part in the negotiation with equipment manufacturers, where the number of such members during the negotiation can change. The exact number of members from the negotiating organisation is determined on the basis of clear grounds for participation in terms of the availability of information required for the negotiation and negotiation skills. It is not essential that negotiators belong exclusively to one of the parties vested with interest or that they are highly-positioned persons but, as stated, it is possible to appoint persons who will negotiate on behalf of the organisation. As the number of parties is limited, it is very important to document the negotiation process in detail, so that persons who cannot participate directly might follow the progress of the negotiation and take part indirectly.

II. **Interests in the negotiation** of the organisation can be strategic, fundamental, and support-related, arising from the values of the parties vested with interest set out in step one. The negotiating parties must be aware of the product or service, the network and hierarchy of goals, certain attributes, and the beliefs associated with certain attributes of the assortment of products or services.

III. **The best alternative to a negotiated agreement (BANA)** is an alternative that remains if an agreement with a particular tenderer is not reached. Unsuccessful negotiations most frequently mean repetition of the procurement procedure. BANA can be the maximum financial amount that the employer is willing to pay for a specific product or service, while in the case of the tenderer, BANA is the minimum amount that the employer is ready to pay for the assortment of products. Further, the example of BANA also includes a case where the organisation, in terms of the tender received, decides that the product is acceptable subject to a price reduction (e.g., a discount of 20% of the manufacturer's price). Determining BANA can be a complex task requiring assistance by a third party, and the result is a virtual best alternative to the negotiated agreement that sets out the situation which the organisation decides to accept if the agreement is not realised. One of the recommendations, especially when there are only two parties to the negotiation, is to include several parties to the negotiation [5], which increases the possibility of finding a common solution between the organisation and one of the tenderers.

IV. **Restructuring the negotiation** is the last in the series of elements in the negotiation analysis. It is the guiding of the negotiation in a way that is satisfactory to both parties and consists of the finding of additional information that enables precise defining of the zone of the potential agreement and of knowing the Pareto Efficient Frontier of the zone of the potential agreement. The first possibility is to add or remove parties to the negotiation. In the event of procurement of equipment, the procedures determine the set of manufacturers who can submit tenders. For the most favourable outcome, it is necessary to negotiate with several manufacturers. Thus, the zone of the potential agreement changes and there are several possibilities for creating new or shared values, and the likelihood of unsuccessful outcome is reduced. [15] Changing the zone of the potential agreement, as presented in Figure 1, changes the position of axes of the abscissa and the ordinate, thus creating preconditions for finding new solutions to the agreement. Presuming that the failure to reach an agreement is not acceptable in the event of procurement, conditional openness and the win-win approach provide viable options for a successful outcome of the negotiation. [5]. In Figure 1, the dot in the zone of the potential agreement shows what is possibly the starting position of each of the negotiating parties that yields a certain level of usefulness to the negotiating organisation and the manufacturer. By moving the position to the right, usefulness for the organisation increases without diminishing the benefit for the manufacturer, while moving the position upwards increases the usefulness for the manufacturer without reducing the benefit for the organisation. For the purpose of creating added value, the negotiation should be restructured in a way that benefits for all parties are increased, which is possible closer to the Pareto Frontier. It should be pointed out that, in accordance with the win-win approach and with the ethical principles, we do not want to "push the other side against the wall" to improve our position but use specific proposals and discussions about differences in the current positions to find favourable solutions.

Fig. 1 Added value in the zone of the possible negotiated agreement

The element of restructuring the negotiation does not take into account many other aspects, such as cultural characteristics, communication styles, interpersonal negotiation techniques, presentation styles, logistic aspects of the negotiation, the settings, etc. The said aspects have impact on the flow of the negotiation as they change the atmosphere of the negotiation.

V. USE OF THE EVIDENCE THEORY IN THE NEGOTIATED PROCEDURE

Before defining the shared purpose of the negotiation, it is necessary to define our interest based on value-oriented theory and then, by using evidence theory and by expressing a subjective evaluation of incertitude within the meaning of likelihood, define the interests of the other side and finally, by

defining the shared purpose of the negotiation and using the win-win approach, enable concerted preparations for the negotiation.

Development of the model for the shaping of incertitude, developed and based on a simplified model of DST, which is needed to define the interests of the other side, includes a description of the problem, that is, the defining of the initial and final state of the premises and the defining of rules for an appropriate crossover from one state to another. The state of incertitude can be defined as a state that is unknown, undefined, dubious, often ambiguous, changeable, and unreliable. Facts that serve to realise advice on the best crossover from incertitude to the target state are the basis for a developed consolidated model integrated into the system of business intelligence.

It is key to represent interests, and not solely standpoints and positions, because that would not result in a favourable agreement for parties to the negotiation. Interests are more important because they are under the influence of the end result of the negotiation, while the outcome of the negotiation does not influence the positions or standpoints of the negotiators. For each tender of the manufacturer and the alternative that is the possible outcome of the negotiation, key insecurities and the associated incertitude must be reviewed. If they exist, the risk profile for each assortment of products or services is determined, which specifies a possible outcome of the purchase, their probability, and the consequences arising from the purchase of a specific type of products or services. If probability is not known, we refer to incertitude and we begin to develop the model on the basis of the theory of evidence that will consolidate collected information from various sources into a single belief, where the plausibility of such sources is taken into account in the calculation.

Assertion / tender	*T_o = Assertion / tender that needs to be processed on the basis of information and data collected from the tender!*						*Dempster-Shafer theory*
I	*U*	*V*	*X*	*Y*	*Z*	*K*	*o,n=1...N*
Information	*Impact %*	*Type of impact (-1,0,+1)*	*Belief %*	*Ignorance %*	*Disbelief %*	*Combination*	*Remarks*
I_1	U_1	*1*	$x_1=U_1$	$y_1=100-U_1$	$z_1=0$		*example V=+1*
I_2	U_2	*-1*	$x_2=x_1*(100+U_2*V)/100/(x_1*(160+U_2*V)/100+y_2+z_2)*100$	$y_2=z_1*(100+V*U_2)/100$	$z_2=z_1*V*U_2/100$		*example V=-1 scaled sum =100*
I_3	U_3	*0*	$x_3=x_2$	$y_3=y_2$	$z_3=z_2$		*example V=0 scaled sum =100*
I_4	U_4	*1*	$x4=x_3*U_4/100+(100-x3)*U_4/100+x3*(100-U_4)/100$	$y_4=y_3*(100-U_4)/100$	$z_4=z_3*(100-U_4)/100$	*double U_4 $k_4=Ua+Ub$*	*more evidence*
I n+1	*U n+1*	*+-V*	$xn+1=xn*(100+Un+1*V)/100/(xn*(100+Un+1*V)/100+yn+zn)*100$	$yn+1=yn*(100+V*Un)/100$	$zn+1=yn*-V*Un/100$		

Table 1: Basic model

In general, in this part of the negotiation analysis, starting positions for the negotiation are examined, and so are the minimal and maximal positions as well as target positions, that is, the standpoints of the negotiators. The said points can be key or problematic on the way to reaching an agreement. Modelling the as-is situation, described as incertitude, can be shown in the form of a table with the following structure: an assertion that needs to be proven, information or evidence corroborating the assertion, input obtained through various methods, and the calculation of the solidity of belief in the best tender based on the Dempster-Shafer theory of evidence. The assertion or a specific tender (in the table 1 and in further text, T_o) is the basis of the model. [8] After defining T_o, it is necessary to collect information from various sources and list all elements of the tender (in further text, I_n) and, as described in the previous chapters, process them and define their impact on the tender (in further text, U_n on T_o).

Depending on U_n and the type of impact (in further text, V), the values of belief (X_n), ignorance (Y_n) and, in the case of conflicting information, disbelief (Z_n) are presented. The model states examples in which V is positive, neutral and negative. The case with more facts is also indicated, in which an assessment of the joint impact U_n results in the calculation of the value X_n. In view of the main effort to have the value X_n strive towards 100%, the number of collected information n will depend on their impact U_n and the type of impact V_n on the assertion T_o.

TENDER (example)	Tender X.1.2.3. for the purchase of equipment for the navigation of ships in river transport!						Calculation of value based on the theory of evidence
No.	Evidence	Percentage of impact %	0=no impact 1=solidifies- 1=reduces	Belief %	Neutral %	Disbelief %	Total-control	Remarks for easier following of the calculation:
1	Quality of equipment based on expert!	80	1	80	20	0	100	solidifies 80%
2	Offered price of equipment	60	-1	32	8	12	52	temporary result before scaling
2a	*scaling*	-	-	75	10	15	100	reduced to 75%
3	Certificates of equipment	10	1	78	9	13	100	solidifies to 78%
4	Securities offered	20	1	82	7	11	100	solidifies to 82%
5	Other types of co-operation	15	1	85	6	9	100	solidifies to 85%
6	Additional information obtained	30	0	85	6	9	100	belief does not have impact, we still believe 85%
7	Impact by the manufacturer's state	0	1	85	6	9	100	no impact, I still believe 85%
8	Number of employees	20	1	88	5	7	100	solidifies to 87%
9	Profit generated in the previous period	40	-1	53	3	8	64	temporary calculation before scaling
9a	*scaling*	-	-	83	5	12	100	reduces to 83%
10	Percentage of expert to other countries	35	1	89	3	8	100	conclusively belief at 89%

Table 2: Example of a complex form with included impact and conflicting information

In the example that follows (Table 2.) there is a calculation that is based on the tender T and on a series of information I_n that consolidate belief in the tender. After the first piece of information that by assessment of an expert with 80% belief confirms our certitude that we are dealing with quality products, all impact or evidence in favour of the belief to follow are expressed in an amount by which they come close to absolute belief (which is a situation with 100% belief).

We then incorporate negative value of impact V on assertion T in the model, that is, in the case of the second information I_2 there is the combination of conflicting evidence. The variant in which both pieces of information are correct I_1 and I_2, that is, they solidify our belief in an assertion, now become impossible. If it is claimed otherwise, both information cannot be plausible. According to the Dempster-Shafer theory, all possible cases are scaled again so that the sum of all values once again yields 100, which means that all values for potential cases are divided by the sum of all values for possible cases.

Any entry I_n, that is, individual piece of information, is presented with the value obtained through assessment that reflects our belief in the assertion that needs to be proven. If we hold that a piece of information I_n does not affect the assertion, we can exclude it (V=0). For the sake of objectivity, any entry that can be on the scale from -100 to 100 (multiplied with the value of impact -1 to 1) can be determined by using some of the methods that are usually used in the preparation and processing of business information Methods used can also be methods for the shaping of incertitude, such as the fuzzy method or the simplest methods of calculating the frequency or the method of averages. Selection of a method depends on evidence and the source of data processed.

VI. NEGOTIATIONS

After the preliminary part in which various scenarios and acceptable alternatives are examined and forecast, and in which tenders collected are processed by using the theory of evidence as presented, the parties negotiate. At the beginning of the negotiation, the parties present the current situation, described in real needs of the negotiators and their starting positions entered in the table of information collected. The introductory part is followed by specific proposals and a discussion about differences between the parties in the current and future states, especially in the part concerning the determination of impact on the assessment of the tender. The goal of the negotiation is to direct the parties towards a solution that leads to added value, as shown in *Figure 1*.

Based on added and perceived greater value, it is expected that all parties involved in the negotiation will experience greater satisfaction and a satisfactory return on investment, that is, a positive outcome.

The use of the theory of evidence in the negotiation procedure enables better decisions before and during the negotiating process. The outcome of the negotiation analysis is the preparation for creating new values, with the lowest possible price of the product. The use of the theory of evidence enables the restructuring and change of the flow of the negotiation, creation of new values, and a better negotiation outcome. The described manner of negotiation should be recognised as the procedure of preparation and application of certain tried models that do not require considerable organisational changes. Any negotiation for the purpose of creating added value requires the introduction of tools and procedures that enable higher management levels and other influential persons in the organisation to provide better management and better provision of support to the negotiators. After the negotiation is finished, it is necessary to perform a review of the results, and institutionalise the negotiation. By institutionalisation, negotiating becomes an organisational ability, just like risk management.

VII. CONCLUSION

Negotiating is a business organisational activity that must be improved continuously because it leads to a better final outcome. New knowledge incorporated in the described negotiation analysis, the goal of which is to create new added values, is a characteristic of dynamic negotiations and relates to risk management before and during the negotiation, and before the issuing of a final decision on procurement.

The next step in the harmonisation methodology, risk management, is applied immediately after the completion of the negotiation, and before signing. After the risk management process is concluded, the negotiation with manufacturers may be regarded as finished.

The negotiation analysis, along with determining the number of participants and the model of the most appropriate assortment for a particular organisation, also includes the defining of the limitations of the organisation. Some of the most frequent limitations are limited financial resources, the time and the deadline of procurement, insufficient number of experts for financial and legal problems concerning procurement, and the lack of experience of the parties in the organisation in negotiations.

One of the most important limitations of the organisation that becomes particularly pronounced during negotiations is the inability to check all performances of the manufacturer's tender. The same limitation relates to the process of risk management if the risk is quantified. Use of the theory of evidence can reduce the limitation considerably and contribute that through the collection of information connected with the process of procurement everything is simply and successfully processed.

REFERENCES

[1] Curley S. P.: *The application of Dempster-Shafer theory demonstrated with justification provided by legal evidence*; University of Minnesota; 2007.

[2] Fioretti G.: *A Mathematical Theory of Evidence for G.L.S. Shackle*, Universita di Firence and ICER, Torino, Vol. 2. Nr. 1, pp 77-98, Springer Berlin, Heidelberg 2001.

[3] Halpern J. Y., *Reasoning About Uncertainty*, COM S 6766, www.cs.cornell.edu/ home/halpern 2007.

[4] Halpern J. Y., Fagin R.: *Two views of belief: Belief as generalized probability and belief as evidence*; Automated Reasoning, AAAI, www.aaai.org , pp. 112-119, 1990.

[5] Lax, D.A. and Sebenius, J.K.: *The Manager as Negotiator*; The Free Press, New York, 1986.

[6] Liu, B.:*Why is there a need for uncertainty theory?*; Journal of Uncertain System; Vol.6, No.1, pp.3-10; 2012.

[7] Merkaš Z.: *The Application of Fuzzy Logic to customer scoring, 16th International Conference on Information and Intelligent Systems – IIS* 2005, University of Zagreb, Faculty of Organisation and Informatics, Varaždin, Croatia, September, 21-23, 2005., 295-302, 2005.

[8] Merkaš Z.: *Modeliranje neizvjesnosti u sustavima poslovne inteligencije*, doktorski rad, Sveučilište u Zagrebu, 2009.

[9] Peharda I.: *Usklađivanje karakteristika opreme i strateških ciljeva organizacije u početnoj fazi procesa nabave*, doktorski rad, Sveučilište u Zagrebu, 2009.
[10] Paetzmann K.: *Risiko, Risikomanagement und Unternehmens-uberwachung*, Springer Berlin - Heidelberg, 2008.
[11] Sebenius, James K. "*Negotiation Design for Large, Multistakeholder Projects*" *Negoti-ation* 9, no. 4 (April 2006): 4–6
[12] Sevastianov P., Dymova L.: *Synthesis of fuzzy logic and Dempster-Shafer Theory for the simulation of the decision-making process in stock trading systems*, Mathematics and Computers in Simulation; Volume 80, Issue 3, pp.503-521; 2009.
[13] Shafer G. : *A Mathematical Theory of Evidence*, Princeton University Press, Bultetin of American Mathematical Society, Vol. 83, No. 4, pp. 667- 672, 1976.
[14] Tomašević Lišanin M.: (2004) "*Pregovaranje – poslovni process koji dodaje vrijednost*"; Zbornik Ekonomskog fakulteta u Zagrebu, godina 2, broj 1, 2004.
[15] Winterfeldt D., Edwards W. (1986). *Decision Analysis and Behavioral Research*. Cambridge: Cambridge University Press. 1986.
[16] Yager, R. R.: *On the Dempster-Shafer framework and new combination rules, Information Sciences*, Vol. *41*, pp. 93–137, 1987.