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COMPLEXITY OF ENTITIES AND ITS METROLOGICAL IMPLICATIONS

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Abstract: *Presented in the paper is generalised knowledge on the need of and possibilities to investigate, teach and introduce in practice measurements of any and all entities influencing quality, prosperity and social responsibilities of organisations. The premise stems in the finding that salience and complexity of entities should be identified and respected or honoured individually within each phase of the process of reproduction. Then, the basis of the paper is seen in clarification of the measurement as of a process of attaining factual reference (or ready-reference) pieces of information, based on comparing of entities against their blueprints, as well as in describing sub-processes of measurements in the following segmentation: purpose reasoning, proposing or designing, realising and presenting results of the measurement.*
Key words: *entity, salience, complexity, measurement process*

1. INTRODUCTION

In general, understood by the phrase "metrological implications of the entity salience and complexity" are generalised information pertaining to measurements, attained by modelling, by measuring and simulating the process, and the results of a wide variety of both productive and reproductive processes being performed in organisations (Slimák & Zgodavová, 2007). The present paper focuses upon four groups of generalised information: salience and complexity of entities; modelling and measuring of entities; process of measurement and measurement results; practice, research and education. The paper is intended primarily for the attention of creative professionals though it will well serve also those interested individuals that are practically involved in the process of performing measurements and quality improvement in whatsoever organisations. As to the idea of the entity complexity and of their metrological consequences we have been drawn to it due to the very need to consistently measure functional properties of automobile gear cases and components thereof, as well as to analyse the most recent results of measurement and cognition outcomes.

2. SALIENCE AND COMPLEXITY OF ENTITIES

The very term '**salience**'– a characteristic feature or a sum of characteristic features of entities – follows from their philosophical concept as of anything real or virtual that can be meaningfully considered or speculated upon. The wheel, being one of major inventions of humans, may well present a proper example. To explain salient and complex characteristics of the wheel a new term e.g. "wheel-ness" would need to be invented, and this could be used for a symptomatic common labelling of concentrity, circularity and frequency of turning or turns. After the measuring, followed by decision making about interventions needed for improving of wheel should up come firstly from this common characteristic. Then, once we introduce entity ME that we wish to measure into a specific environment and time (Fig. 1), investigated can be its relations with and to the co-operating/co-acting entities SE_1, SE_2,... SE_n.

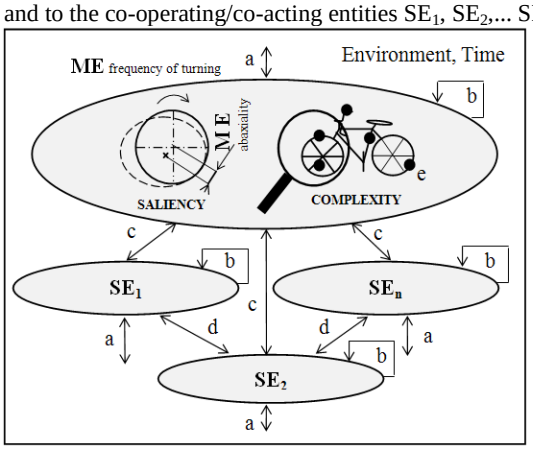

Fig. 1.Illustration of the situation of measured entity ME and of co-acting entities SE_1, SE_2 ,.. SE_n in the given environment and time

Explanation: Environment – collection of all significant determinants: the people, infrastructure, climate, etc.; Time – historical/chronological, procedural; a – external control/management and influences of the environment; b – internal control/management; c – bonds with related entities; d – structure of the entity; e – internal structure of the entity measures and relations existing among related entities; ME: measured entity; SE – related entities.

Fig. 1 presents the model introducing one into the issue of metrological implications of the entity salience and complexity, whilst the simplest understanding of **complexity** is the intricacy of describing properties and functions of entities and of their mutual relations within in time changing environment. Complexity or complexness is a highly frequently occurring term that is in the centre of attention of several research centres and journals, such as e.g. Journal of Complexity.Visual and material diversities of the wheel present examples of its complexity: geometric, colourful, mechanical, electrical, chemical and other, in varying combinations and appearances depending on the environment and time, transpiring properties. Based on the most recent research results as an example of complexity we can serve a complex measurement of nanospores on the level of 2 nm (nanometers). "National Institute of Standards and Technology scientists have moved a step closer to developing the means for a rapid diagnostic blood test that can scan for **thousands of disease markers** and other chemical indicators of health. The team's device is able to distinguish among different-sized polyethylene glycol (PEG) chains, and the model they have developed is encouraging them to think that with further effort, the minuscule sensors can be customized to measure many different molecules quickly" (Reiner et al, 2010). For our purposes it will suffice to state that characteristic features (salience) and the depth of their investigating (complexity) in entities are not constant but that

they change depending on the environment and the course of time, which holds not only for productive and reproductive processes but also for the entity identifying processes. As to the entities in Fig. 1, studied are: External control/management and other influences of the environment and time; internal control/ management and learning; bonds of the entity measured with the co-acting entities; relations among co-acting entities; internal structure of the entity measures.

3. MODELLING AND MEASURING OF ENTITIES

Considered for a model of an entity is each such a description of the entity that meets criteria of the model usefulness, which in our case means needs of the measurement usefulness. Presently, at disposal are varying methods of modelling entities and of their inter-relationships: ERD – Entity Relationship diagram (Holley, 1999). Measuring of an entity performed on this basis and with the use of Fig. 1 can be deemed to present identification of its status and of the development tendencies in the given environment and time, thus: of internal properties and functions of elements and of relations among them; of external properties and functions. When quantifying the entity measurement result, factored in should be always their numerousness. Then, the following scenarios are imaginable: results of measuring the status and tendencies ... of a single entity – 1pc; results of measuring a selective set that characterises a basic set (batch) of entities; results of measuring multiple selective sets characterising the entity formation process. A number of research teams is involved in appropriateness of the entity measurement results and from the point of their utilisation in cutting-edge information technologies. Another issue of significance is the need and possibility to master, by measurement, also functional appropriateness or value of a magnitude of the entity properties, and this is referred to as the axiological measurement or axiometrics or qualimetry. Falling among significant axiological writings is e.g. the book (McDonald, 2004).

4. PROCESS OF MEASUREMENT AND MEASUREMENT RESULTS

Specialists in measurements have been for ages aware that understanding the measurement solely as determining a numeric value through using the value as a unit expresses only one face of measuring, and that at measuring with use of human senses neither a unit nor a number are required. Quite to the contrary, performing any measurement requires that determined be what, why, how and when to measure, and answers to these questions present the prevailing part of their efforts. These facts transpire especially when considered is e–management and control of processes of production when it is necessary to work without personal contacts with elements as with entities immeasurable based on SI units. These considerations have led us to talk about measurements in the broader and lesser sense, and we are describing it as: **"Measurement is the process of deriving purposeful/utilitarian ready-reference information, performed by comparing an entity against its purposefully reasoned sample, in the given environment and time"**.

Comparing an entity against a purposefully reasoned sample may pertain to a single or multiple properties of the entity functions, which implies that the measurement may be more or less complex and that the result does not have to be expressed by a numerical value but by an arbitrary, agreed upon sign or by a document containing also an evaluating statement such as e.g. match or negative match. Sub-processes of thus understood measurement then include: purposeful reasoning of the measurement; proposing the measurement process; realising the measurement results; rendering of measurement results. At times, the professional metrologists are requested to apply also measurement results not only to the quality management but also to influcence social responsibilities of organisations.

5. PRACTICE, RESEARCH, EDUCATION CORRESPONDING ADDRESSES

Relations among the measuring practice, measurement research and education in the field of measuring with respect to developing new more complex or more universal metrology. Metrology in future organisation can be described as: **"Performing measurements will come more detached from thee humans though people will be yet for a long time working in both conceptual and process-wise designing of measurements, in publicising ready-reference information, in creation of generalised information as well as in applying them – especially within strategic management of organisations"**.

6. ACKNOWLEDGEMENTS

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7. CONCLUSION

The basic information can be, as metrological implications of salience and complexity of entities, summed up as follows: Salience is the collection of those properties and function of the entity that make the entity the one and not another one in the given environment and time. Complexity is the term covering numerousness and intricacy of elements and mutual relationships of an entity with the environment in given time. Entity is whatever, real or virtual, that can be meaningfully pondered upon. To measure an entity means to identify its status and tendencies of its development within the given environment and time. Status and tendency of the development must encompass the magnitude (gradation) of inner and external properties and functions of the entity and plurality of its occurrence within the given environment and time. In this way understood measurement can be described as a process of attaining purposeful ready-reference information based on comparing the entity against its purposefully reasoned sample in the given environment and time, featuring the following processes: 1) Purposefully reasoned/justified measurements; 2) Proposing / designing the measurement; 3) Performing the measurement; 4) Rendering of the measurement results.

The objective of research, education and practice in the field of measurements is to develop its appropriateness for providing factual reference information on quality and quantity (magnitudes of properties and of plurality) of any entities so that they would meet requirements and need of e-engineering, e-medicine, e-education, etc. up to e-management of future organisations.

8. REFERENCES

Holley, S. (1999): Software for metrology, IEE Review, 15, July 1999, V: 45, I:4 On pages 161-163, ISSN 0953-5683

McDonald, H. P. (2004): Radical Axiology: A First Philosophy of Valves, Editions Rodopi B. V., Amsterdam - New York, NY 2004, ISBN 90-420-1040-1

Reiner, J. E.; Kasianowicz, J. J.; Nablo, B. J.; Robertson, J.W. F.(2010): Theory for polymer analysis using nanopore-based single-molecule mass spectrometry. Proceedings of the National Academy of Sciences, Published online on June 21, 2010, doi: 10.1073/pnas.1002194107

Slimák, I.; Zgodavová, K. (2007): Metrologické dôsledky príznačnosti a komplexnosti entít, in: Proceedings of V. International Conference „Strojárska technológia a automatizácia", Piatrová 17. - 18. 10. 2007