The holons model of quality improvement in SMEs

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Abstract
The article refers to the ability of continuous improvement of processes and their assessment in Polish SMEs. The research problem emerges from the lack of a clear and understandable for this group of enterprises model of self-assessment and ability to precisely define areas for improvement as well. The way to competitiveness in these organizations usually starts with implementation of pro-quality management standards respondent to ISO 9001 standard requirements. The next steps are usually quite chaotic and do not employ systematic approach and holistic view of an enterprise. PNJ and EFQM excellence models are too general at this stage of organizations maturity. Thus, the main goal of the author’s project is to develop and verify the idea of modularized measuring of an organization’s excellence, and its final output is to be the model developed and modes of assessment identified in preliminary research.

Keywords: improvement, quality, self-assessment, model

1. Introduction
According to data published by the International Organization for Standardization by the end of 2009, the number of certified quality management systems has reached 1 million within 175 countries (in Poland, there are 10 thousands of ISO certificates). The main assumption of quality management systems is continuous improvement. However, this assumption and goal is not fully met by small and medium enterprises in Poland.

The results of preliminary research and experience of the authors in implementation and exploitation of a pro-quality system has led to the following conclusion: it is necessary to develop a self-assessment model and assessment matrix adequate for small and medium enterprises. The model should enable assessment of the entire enterprises, as well as assessment of its separate areas and aspects (predefined modes are holons of an operational excellence system). It is especially important to develop self-assessment modes as according to best practices applied in large enterprises, improvement activities should be launched first.
in one of the areas and then spread to the others to cover the enterprise. Concepts of improvement and excellence models (WCM, EFQM, MBNQA) applied successfully in practice of large enterprises do not meet requirements of small and medium ones, and their use is limited. The range of application of the models before mentioned is limited mostly, also in Poland, to large enterprises supported with foreign capital. This is the consequence of the general character of assessment criteria identified, and their limited understanding by managers of small and medium enterprises. The consequence of the above listed postulates it is necessary to build a modularized idea of assessment and improvement of activities performed by small and medium enterprises, which will enable assessment of the present state and then continuous improvement of actions performed by an enterprise in the areas identified as crucial for its success. The model and modes developed and verified are to be an important input to development of quality engineering tools. The range of modes is directly connected with operational improvement of an enterprise, thus the tool of achievement measurement should be also an important element of self-assessment of an enterprise and identification of goals based on facts on its way to operational excellence.

2. Research framework
Striving for excellence requires taking a predefined strategy, as well as measuring progress in changes made. This is why enterprises benefit from models. Excellence models are short representations of a set of related real issues and problems concerning organizations, challenges they face and choices they make, and regular self-assessment verifies efficiency of actions taken and results achieved. Self-assessments generate process-oriented feedback that enables managers to obtain a snapshot of how well organizational processes are functioning and of where process improvements can be made. Such feedback should be valuable in the conduct of the organizational performance review, since the intent of the organizational review is to provide a reliable guide for both improvement and change. The way to competitiveness in small and medium enterprises usually starts with introducing ISO pro-quality management standards. The way requirements of the standard are introduced (e.g. in ISO 9001), because of its individual character (they can be implemented in any organization), leads to free interpretation, and often simplification, which in consequence results in excluding some important aspects influencing competitiveness of small and medium enterprises in Poland from analysis (e.g. maintenance, ergonomics, health of employees, learning, and knowledge management). The above mentioned aspects are taken into consideration by customers, when they are assessing its capability. Thus improving remarks or conclusion from such assessment (so called customer audits) introduce a necessity to change the approach to exploitation of pro-quality systems. Management striving towards sustainable functioning of organization requires identification of methodology of exploitation of pro-quality holons which are autonomous
aspects (domains) and their efficiency based on current trends and concepts in management area. Such an approach to innovations for quality allows to cope with requirements of environment, especially globalization of markets, shortening moral use of products and their growing reliability, and what is most important, repetitiveness on required level. Small and medium enterprises which want to develop their processes dynamically to be successful expect adequate pro-quality instruments to increase their competitiveness.

A holon is an autonomous and cooperating mode responsible for satisfaction of customers, both internal and external as well as stakeholders during exploitation of pro-quality systems. Identification and separation of holons, their use and operating creates opportunity for better understanding not only by managers, but also by employees, and natural commitment to process of continuous change and efficient realization of processes.

The holoninomic approach to exploitation of pro-quality systems leads to achieving efficiency of parts, which create entity influencing its success. The idea of the holon concept of pro-quality systems exploitation is:

- focusing activities of the enterprise on needs and expectations of customers – internal providers, partnership and creating internal value chain,
- unblocking capacity of employees of each holon to creative and innovative changes (creating knowledge, sharing knowledge, evaluation of knowledge),
- development of enterprise’s capability to meet requirements of stakeholders (ergonomics, safety and health of employees, environmental management),
- creating teamwork atmosphere (participation and commitment).

Literature research and observation of so called good practices realized by corporations allows to make a thesis on future of pro-quality systems improvement: it is connected with holon approach to pro-quality systems exploitation. Holon approach is based on the idea of autonomous and cooperating modes which can function separately, and simultaneously synergistically cooperate as a greater entity.

Improvement of holons requires proper exploitation (use and service). Identification of holons in organization and definition of priorities for innovative changes implementation is connected with assessment of the present state based on modularized assessment system. Identification of domains requiring changes shapes capabilities of a company according to the principle „think globally, act locally“. It enhances active commitment of the managers and tactical and operational level staff (Jasiulewicz-Kaczmarek & Wiecek, 2007).

Such approach to pro-quality holons exploitation proves full consistence with the paradigm „satisfaction of internal and external customers is a result of long and efficient exploitation of pro-quality system“ in a way different from TQM approach, which is basing on quite unclear philosophy, which is not understandable for most managers running small and medium enterprises.

The current knowledge concerning the subject of examinations is made up of seven areas compiled in the table 1.
The results of literature research conducted and experience of the authors of the hereby application in implementation and exploitation of pro-quality system enabled making the following conclusion: it is necessary to develop a self-assessment model and assessment matrix suitable for small and medium enterprises. The model should enable both, assessment of the entire enterprise and its predefined domains (modes) separately. It was particularly important to build self-assessment modes as in large corporations improvement actions were always launched in one domain only and then spread on the entire organization, which can be an important and valuable benchmark.

Assessment matrix of achievement level should also be clearly described for all the modes.

To increase their prestige, organizations often take part in numerous contests realized by various organizations and associations. They use different, more or less general, scheme of assessment. Organizations learn various approaches to assessment, however they cannot refer it to excellence level.

### 3. Assumptions

The research to be conducted for the project purposes is multistage and preliminary research and literature research stages have already been finished. The scheme of the research is presented in

<table>
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<th>Tab. 1 Areas of examinations made.</th>
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<tr>
<td><strong>analysis and the</strong> inspection of models of the excellence and models WCM, e.g.:</td>
<td>Schonberger, 1986; McDonald &amp; Zairi, 2002; Rusjan, 2006; Williams at al., 2006; Conti, 2007; Digalwar &amp; Sangwan, 2007; Sharma &amp; Kodali, 2008; Bou-Llusar &amp; Escrig-Tena at al., 2009; Kim &amp; Kumar &amp; Murphy, 2010; Gorji &amp; Siami, 2011; Talwar, 2011; Ahmad at al., 2012</td>
</tr>
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<td><strong>evaluation of the effectiveness, use QMS e.g.:</strong></td>
<td>Lagodimos &amp; Dervitsiotis, 2005; Benavent &amp; Ros &amp; Moreno-Luzon, 2005; Yamaye &amp; Albright, 2008</td>
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<td><strong>maintenance excellence models, e.g.:</strong></td>
<td>Coudert &amp; Grabot, 2002; Labib, 2006; Crespo Marquez &amp; Gupta, 2006; Garg &amp; Deshmukh, 2006; Wang &amp; Chu &amp; Wu, 2007; Kodali &amp; Mishra, 2009; Lazreg &amp; Gien, 2009; Jasiulewicz-Kaczmarek &amp; Drożyner, 2010; Sharma &amp; Yadava, 2011</td>
</tr>
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<td><strong>organizational learning and knowledge management, e.g.:</strong></td>
<td>Ford &amp; Evans, 2002; Bozbura, 2007; Gunasekaran &amp; Ngai, 2007; Lancioni &amp; Chandran, 2009; Misztal &amp; Butlewski, 2012.</td>
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<td><strong>ergonomics, the health and safety of employees e.g.:</strong></td>
<td>Fleming, 2001; Kawakami &amp; Kogi, 2001; Jasiak &amp; Misztal, 2004; Terry at al., 2008; Smith &amp; Carayon, 2009; Jensen &amp; Friche, 2007; Vink &amp; Imada &amp; Zink, 2008, Haro &amp; Kleiner, 2008; Swuste, 2008; Tytyk &amp; Butlewski, 2011; Misztal &amp; Butlewski, 2012.</td>
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<td><strong>environmental e.g.:</strong></td>
<td>Pun &amp; Hui, 2001; Brando &amp; Caccarelli at al, 2004; Zhao &amp; Shao, 2010; Hariz &amp; Bahmed, 2013</td>
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the figure 1.

![Figure 1. The scheme of research.](image)

Basic assumptions for the predefined stages of the research are presented in the table below.

Goal of diagnosis status quo was:
- assessment of influence of implementation of quality management system on level of organization of activities and processes realized by enterprises and definition of methodological needs for performing improvement actions and measuring their efficiency,
- identification of literature examples and suggestion for quality management system development in various domains of activities performed, review and analysis of holistic models and excellence prizes (ETQM, MBNQA, PNJ) and maturity matrixes, review and analysis of modularized models and excellence prizes.

Research was conducted in the years 2007-2011 years. It were examined small and medium enterprises which:
- implemented quality management system according to ISO 9001 or branch standard ISO 22000:2005, ISO/TS 16949,
- have been using quality management system for more than a year.

The literature study conducted in two areas:
- referred to modularized models of excellence and WCM models,
- referred to Universal excellence models.

Research results confirmed the need to develop operational improvement model of SMEs. Goal of the focused research I was an assessment of opportunities to use modularized system improvement model for small and medium manufacturing enterprises.

The research sample was:
- 10 small and medium enterprises selected with the criteria introduced below,
- 2 experts teams (first including scientists specializing in the areas given, second including representatives of large companies applying for excellence prize/ awarded with excellence prize/ following WCM approach with their own model/ applying BSC for all organization or for its parts).

The enterprises have to meet the following criteria:
- manufacturing enterprises,
- enterprises which implemented quality management system according to ISO 9001 standard requirements or to requirements of a branch standard e.g. ISO 22000:2005, ISO/TS 16949,
- quality management system has been exploited for at least a year,
- definition of ergonomics, safety and health of employees or maintenance or organizational learning and knowledge by organization’s managers as the priority area requiring improvement.

In enterprises used AHP analysis with fuzzy triangular numbers washed away (referred to ranges given to assessment criteria), for others, research questionnaire. For experts teams used
Delphi method.

As a result of several months of focused research it were obtained was a verified model of excellence for small and medium enterprises and two modes. The model consists of five modules of self-evaluation: quality, environment, maintenance, ergonomics and safety of employees, and logistics. For all of the modules together there have been identified six criteria of evaluation, such as, policy and strategy, prevention, teamwork, employee qualifications, resources, and internal and external communication. For each of the modules specific conditions are established for access to one of the five levels of excellence:

1. Started point,
2. Below average performance,
3. Average performance,
4. Effective operations,
5. Best practices.

The condition for the transition to a higher level is to meet all of the criteria for the lower levels. Self-evaluation leads to obtaining a partial evaluation of the 6 criteria in the assessed module. Further calculations result in a cumulative evaluation of the module. When carrying out assessments in more than one module, further calculations lead to attaining an assessment of the total enterprise in the specified areas. A schematic model of self-evaluation along with details on the example of the maintenance module is presented in Figure 2.

![Figure 2. The scheme of the model of assessment (own preparation)](image-url)
Goal of the focused research II was an assessment of usability of the model developed and predefined modes in enterprises maintaining and not maintaining a certified quality management system.

Analyzed sample – two groups:

a) 50 enterprises that met the same criteria as in the focused research I,
b) 30 enterprises that met the following criteria:
   - manufacturing enterprises,
   - not maintaining certified system of quality management,
   - definition of ergonomics, safety and health of employees or maintenance or organizational learning and knowledge by organization’s managers as the priority area requiring improvement.

During research were applied the following methodologies:

- focused research - modes of the model validation,
- predefined methods and models of mathematical statistics.

As a result of a two-year study two modes of improvement model were validated.

4. Results

The following final results were obtained for the detailed goals and stages of the research:

- examples of improving action performer in enterprises,
- classification of improvement methods and techniques,
- verification of usability of improvement methods and techniques,
- evolution of organization in reference to maturing to excellence (excellence matrixes).

The main results are assumptions of a modularized model of self-assessment for small and medium enterprises and then a model of a modularized idea of organization’s improvement. There were also specified assumptions for predefined modes of the model and matrix of assessment, criteria and characteristics, classification of assessment criteria defined for modes (weights for criteria) and characteristics describing each criterion as important from improvement’s point of view. The holons model of quality improvement is very likely to be used in small and medium enterprises because of the clear assessment of the level of meeting requirements/characteristics.

Currently authors are working on areas of the model which can be improved in the future.

References

Ahmad M.K. & Rhbeini Y.A. at al. (2012), Quality Assessment of a Dental Centre Using EFQM Excellence Model: A Case Study on King Fahd Armed Forces Hospital, Business and Management Research, 1 (4), 121-140.


Bou-Llusar J.C. & Escrig-Tena A.B. &


Jasiak & Misztal (2004), Makroergonomia i projektowanie makroergonomiczne, Publishing House of Poznan University of Technology.


Lazreg M. & Gien D. (2009), Integrating Six Sigma and maintenance excellence with QFD, Int. J. Productivity and Quality Management, 4 (5-6), 676-690.


McCain, C. (2006), Using on FMEA In a service setting, Quality Progress, 39(9), 24-29.


Misztal A. & Butlewska M. (2012), Life
improvement at work, Publishing House of Poznan University of Technology.


Smith M.J. & Carayon P. (2009), Using the 'Balance Model’ for Occupational Safety and Health Promotion, *LNCS* 5624, 105-114.

Swuste P. (2008), "You will only see it, if you understand it" or occupational risk prevention from a management perspective, *Human Factors and Ergonomics In Manufacturing*, 18 (4), 438-453.


