

ORGANIZATIONAL MATURITY MODELS - REVIEW AND CLASSIFICATION

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Abstract: The continuous development of the organization and business excellence currently belongs to the most important challenges of modern management. It requires many activities aimed at the improvement of the efficiency of processes and the improvement of the product quality. This is accompanied by a wide range of performance evaluation and organizational maturity analysis in many aspects. The objective of this paper is to provide a systematic review protocol followed and the associated reasoning. The systematic review of the literature is carried out according to strictly defined four phases. The literature of the subject placed in the universal Thompson/Reuters Web of Science database was adopted as the object of exploration. The analysis of the most important articles, proceedings, books and reviews has been performed. The review covers the last 25 years. The systematic review reported in this paper was guided by the objective to classify existing organizational maturity models (OMM), in order of their application area and to indicate the latest research trends. The result of the conducted research is the classification of organizational maturity models including key categories. The main contribution of the paper is the subsequent grouping of these models into nine areas of application to allow further study and development of these. In addition, new maturity models were selected for specific areas of the organization's operations or related to new management concepts. The value of the article is a clear and detailed review of the models proposed in the literature, which may be useful for both researchers and practitioners. The main limitation is the analysis in the scope of topic organizational maturity models including only the Thompson/Reuters Web of Science. This is the first stage of literature review that are continued.

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Introduction

Over the past twenty years, companies who have been focusing on the search for competitive advantage, have been participating in the evolution of market demands and observing customers' new approach to the perception of quality. Originally it referred to products and services, today it also applies to people, relationships and business processes. It is increasingly emphasized that quality can be perceived through the prism of business excellence, also known as organizational excellence.

The concept of business/organizational excellence has gained popularity both in practice and in management theory, becoming the foundation of many concepts and approaches to the organization. Business excellence has evolved by exposing various aspects of organizational management, such as: soft organization resources, change, learning, integrated development, quality building within 4P (people, partnerships, processes, products), maximization of values for stakeholders, business excellence models and management system maturity (Haffer, 2011). Modern organizations strive for perfection, which is determined by the maturity of the management system.

Maturity means systematic improvement of the organization's skills as well as processes which are carried out by it, in order to achieve higher productivity in a given time (Hammer, 2007). Maturity is the extent to which a specific process is defined, manager, measured, controlled, and effective (Lin et al., 2012). The organization's maturity is determined by its management system and its adjustment to the adopted business model. Enterprises, wanting to develop, use different kinds of methods, techniques or programs, implementing, e.g. a quality management system, Lean Management, or the Six Sigma methodology, while implementing information technology (IT) systems. Searching for excellence, they look for maturity in different areas, often doing it simultaneously, what is neither a simple and sometimes a legitimate challenge. Therefore, it is necessary to constantly evaluate the achieved results, which requires the use of appropriate methods. Assessing the competencies of a given organization in the management area are enabled by maturity models (MM).

There is a growing number of evaluation models being provided to organizations, either directly or indirectly, to assist with the assessment of how mature an organization is (Păunescu and Acatrinei, 2012). They relate to different areas of the organization's activities (e.g. project management, quality management), and there are also proposed models, which are dedicated to different types of activities (production enterprises, administration, education). Models, referring to modern management trends, such as Industry 4.0 (Schumacher et al., 2016) or agile project management, are also emerging. The multiplicity of available models may imply questions regarding the selection of an appropriate model to

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assess the maturity of an organization. In the light of the science development in this area, there is a need to develop a report on the state of knowledge in the subject of the organizational maturity model and their classification. Therefore, the objective of this paper is to provide a systematic review protocol followed and reasoning associated. The systematic review reported in this paper was guided by the objective of classification of existing maturity models and ordering them in the area of their application. The analysis was narrowed down to maturity models concerning business organizations. The main contribution of the paper is the subsequent grouping of these models into nine areas of application to allow further study and development of these. It will also allow to indicate the areas in which the models development is quite intense and those that have less dynamic development.

Data and methodology

The essence of a systematic literature review is to reflect the state of knowledge in a given subject on the basis of methodical behavior promoted by Tranfield et al. (2003). This approach has since been adopted by many authors in management research. The method is based on the deliberate literature selection and its distinguishing feature is the use of quantitative techniques, which are describing and analysing literature. The systematic review of the literature is carried out according to strictly defined stages (Czakov, 2016):

1. Phase 1
 - a. determining the purpose of the study
2. Phase 2
 - a. determining the basic literature
 - b. selection of publications
 - c. development of a publication database
3. Phase 3
 - a. bibliometric analysis
 - b. content analysis
4. Phase 4
 - a. preparation of the report

Phase 1

As previously indicated, the objective of this paper is to provide a systematic review protocol followed and the associated reasoning. Research is one of the stages of the literature review concerning maturity models and at this stage they focus on the concept of "organizational maturity model". The systematic review was guided by the objective of classification of existing maturity models and ordering them in the area of their application.

Phase 2

As the object of exploration, the literature of the subject was taken under consideration, which is placed in the universal Thompson/Reuters Web of Science database (WofS). The review was limited to the literature which has been published since 1994, which allows for the analysis of publications from only the last 25 years. This stage was based on the use of keywords related to the subject of the study. All searches were conducted using the databases advanced search function. The bibliographic databases was queried adopting the following keywords: "maturity model", and then the search was narrowed down to "organizational maturity model". The conducted analysis indicates at what stage of development the researched area is analyzed. From 2000 to 2018, the number of publications found in the topic "organizational maturity model" has a growing trend with a clear maximum in 2017. As for the sum of Times cited by year, the trend is clearly growing, the number of citations was the highest in 2018, these were 594 citations. The summary of information related to the bibliographic analysis indicates a total sum of the Times Cited equaling 4293, with the Average Quotations per Item equaling 12.59, and the h-index equaling 33.

The narrowing allowed enabled the preparation of a literature database with a number of articles which is sufficient to permit an individual analysis of particular publications, as well as excluded publications distantly related to the subject of the analysis.

The development of the publication database was to exclude publications such as: industry messages, conference presentations and reviews of books and editorial introductions, as well as medical, IT and legal studies. Recurring items had also been removed and publications were then selected. The subject

of the analysis were the publications abstracts. Based on their review, they have been classified into three groups:

- concerning the issue directly: 93,
- partly concerning the issue being investigated: 21,
- weakly related to the issue: 227.

The results of the analysis are presented in Table1 and Table 2.

Search criteria	WofS Categories	Number of articles
maturity model - topic	management, business, engineering industrial, operations research management science, economics, social sciences interdisciplinary, engineering manufacturing, engineering multidisciplinary, business finance, education educational research	3576
maturity model - topic	management, business, operational research management science	1488
organizational maturity model - topic	management, business, engineering industrial, operations research management science, economics, social sciences interdisciplinary, engineering manufacturing, engineering multidisciplinary, business finance, education educational research	341

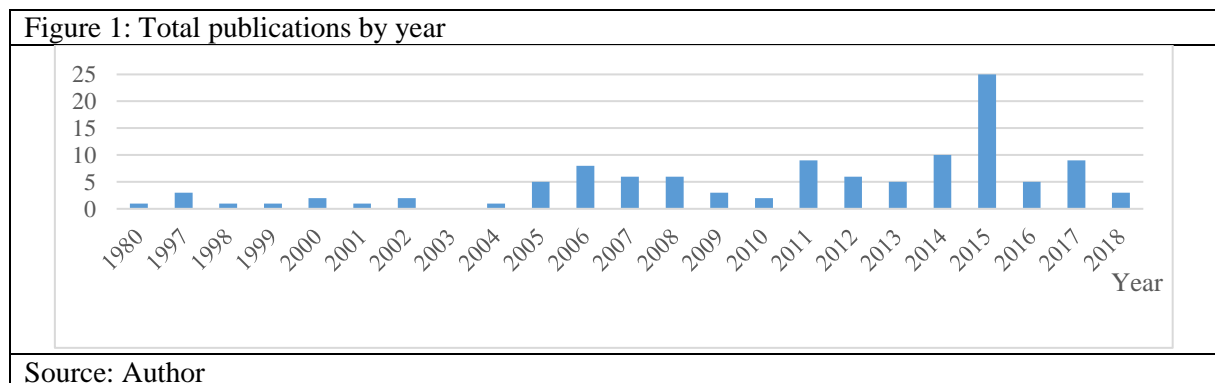
Source: Author

Search criteria	Number of publications
Organizational maturity model in topic	341
Article in journals	199
Proceedings paper	57
Other conference articles	85
After verifying the abstracts - directly and partly concerning the issue	114

Source: Author

Phase 3

As part of the bibliometric analysis, the analysis of the number of annual publications after verifying the abstracts were carried out. The results of the quantitative analysis are presented in Figure 1. The first publication in the WofS database were published in 1980. The largest number of publications were published in 2015.



The most impacting publications in the developed literature database are:

- Hammer (2007), The process audit. Harvard business review. Sum of the times cited: 139, average citations per year: 10.69;
- Grant and Pennypacker (2006), Project management maturity: an assessment of project management capabilities among and between selected industries. IEEE Transactions on engineering management. Sum of the times cited: 78, average citations per year: 5.57;
- Kwak and Ibbs (2002), Project management process maturity (PM) 2 model. Sum of the times cited: 76, average citations per year: 4.22.

Phase 4

The article is the result of the fourth phase of the research, which included the preparation of the report.

Literature review: results and discussion

Maturity model are commonly used as an instrument to conceptualize and measure maturity of an organization or a process regarding some specific target state (Schumacher et al., 2016). Maturity models that depict the development of an entity are a natural application of the life-cycle process and they can be used to advance maturity by identifying and implementing the steps required to move to a higher level (Lin et al., 2012). As for practical application, typical purposes of use are descriptive, prescriptive, and comparative (Rosemann and Bruin, 2005).

Currently, in management, there are three distinguished approaches on how to use the maturity models (Martusewicz and Szumowski, 2018):

- commonly accepted reference models or sets of mature practices for assessing the organization's competencies,
- tools that simultaneously enable internal and external benchmarking of the organization and constitute a set of guidelines for the evolutionary process of organizational development,
- structured collections of elements describing the organization's abilities at particular levels.

The analysis of the literature content permits the identification of dominant research trends concerning OMM. It is possible to indicate several areas in which OMMs are a very clear research subject that has been deepened and developed for years, as well as areas in which the subject area has been developing a bit slower. Also, completely new scientific trends are indicated, which are related to the design of organizational maturity models evolving simultaneously with changes in the management of business organizations such as the growing importance of innovation, the growing role of supply chain management, or the development concerning the Fourth Industrial Revolution - Industry 4.0.

The group of models concerning business organizations, basing on the analysis of the literature content has been divided into domain groups according to the area covered by the model:

- information technology,
- process management,
- project management,
- risk management,
- quality management,
- knowledge management,
- supply chain management,
- innovation management,
- Industry 4.0 concept.

The mainstream research focus on the maturity assessment in the area of the information technology and the phenomena emerging in the area of the organization's activities, e.g. analysis of the relationship between organizational maturity and the IT systems maturity, assessment of the data warehousing process maturity, assessment of the software process maturity and the IT outsourcing relationships. One of the basic models of maturity comes from this trend, which is the capability of maturity model developed in the beginning of the 90's, intended to measure capability in software development project and capability model integration (CMMI) (Maier et al., 2012).

The second stream of research concerns the area of process management, in which particularly important models of organizational process maturity were created, including: developed by Hammer Process and Enterprise Maturity Model (PEMM), Business Process Maturity Model (BPMM) developed by the

international organization of the Object Management Group and the Business Process Maturity Model (BPMM) developed by the international consultancy Gartner (Kosieradzka and Smagowicz, 2016).

The third trend of research emerged from the field of project management. According to Mullaly (2006) the majority of these frameworks have been developed in the beginning of 2000. Since then more than 30 models have been created, for example OPM3 (Organizational Project Management Maturity Model), PM2 (Project Management Process Maturity Model), or also PM3 (Project Management Process Maturity Model) and Berkeley Project Management Process Maturity Model. In spite of the fact that publications are available, those which provide research are only a snapshot of the current level of project management maturity within enterprises operating in various industrial branches (Grant and Pennypacker, 2006; Guangshe et al., 2008), other authors emphasize, that the contribution of PM3s to organizational improvement and development is somewhat unclear (Backlund et al., 2014). Another research issue concerns the area of risk management, to which organizations paid particular attention to, at the beginning of the 21st century. The most popular model is the Business Continuity Maturity Model (BCMM) developed by Virtual Corporation alongside the Enterprise Risk Management Model (ERMMM) (Kosieradzka and Smagowicz, 2016). The conducted analysis of the publication draws attention to research related to the adaptation of the proposed models to specific cases. To meet the specific types of activity, which are Complex Product Systems (CoPS) projects: high cost, engineering-intensive products, systems, networks and constructs Risk Management Capability Maturity Model for CoPS Projects (Yeo and Ren, 2009) was elaborated. However, in order to support enterprise risk management and assess the Enterprise Risk Management (ERM) maturity in Chinese construction firms (CCFs), a knowledge-based decision support system for enterprise risk management (KBDSS-ERM) has been elaborated (Zhao et al., 2016).

The analysis of the literature shows that the source of the first maturity models were the concepts of quality management. The Quality Management Maturity Grid is considered the first maturity model developed by P. Crosby. The area of quality management was later enriched with the model included in the ISO 9004 and EFQM excellence model (Maier et al., 2012). However, it should be noted that in the area of quality management, research problems related to the maturity examination are also considered from the perspective of the excellence models (Martusewicz and Szumowski, 2018).

The next category of maturity models was distinguished in the area of knowledge management. According to Lin, the most important models in this field are: KPMG Knowledge Journey, Tiwana's 10-step Knowledge Management Roadmap, Kochikar Knowledge Management Maturity (KMM) model in Infosys, Siemens Knowledge Management Maturity Model (KMMM), APQC KMMM, G-KMMM, Hsieh Knowledge Navigator Model (KNM) (Lin et al., 2012) and, according to Maier et al.: KMM (2012). The analysis of the literature contents shows that they are currently used to identify obstacles in the knowledge flow at a different knowledge management maturity as well as to discuss the barriers and practices associated with knowledge management (Lotti Oliva, 2014).

The next models that are the subject of research in the field of OMM concern the area of the supply chain process management (SCPM). Lockamy III and McCormack (2004) developed an SCPM model that contains five stages. Accordingly, the model identifies the level of the maturity of SCPM as the processes are formalised, managed, measured and controlled. A few years a new model of SCPM called the SCPM Maturity Model 3 (SCPM3) was developed. The proposed model is to reduce the level of assessments subjectivity, which the SCPM model has been accused of. It has been used in order to investigate the relationship between the maturity level of supply chain process management and the company's organisational life cycle in Brazilian enterprises (Souza et al., 2015).

One of the "younger" research area concerns maturity models in the field of innovation management. In the analyzed literature, publications about innovation capability are listed, in which three maturity models stand out: Bessant, Corsi and Neau, and Essmann (Narcizo et al., 2017). Research in this area is associated with deepening and refining a framework of reference to represent the entire theoretical domain of innovation capability.

The last stream of research, which was to be indicated is the area related to the Industry 4.0 concept. Despite the fact that this concept was born less than a decade ago, several Industry 4.0 readiness and maturity models have been proposed: IMPULS-Industry 4.0 Readiness, Empowered and Implementation Strategy for Industry, Industry 4.0/Digital, The Connected Enterprise MM, I 4.0

Reifegradmodell (Schumacher et al., 2016). These models were developed in the years 2014-2016. Empirical research in this area still requires continuation and deepening.

The published literature database also indicates publications concerning completely new models of maturity. Among them: energy and utility MM (Ngai et al., 2013), a holistic sales and operations planning MM (S&OP MM) (Wagner, et al., 2014), purchasing MM (Úbeda et al., 2015), service capability sourcing model (SCSM) (Carroll and Helfert, 2015), collaboration maturity model (Col-MM) (Boughzala and De Vreede, 2015), lean MM (Maasouman and Demirli, 2016).

Conclusion

The systematic review of the literature is carried out according to strictly defined four phases. Quantitative research permitted to reflect the state of knowledge in a given subject. The growing trend the number of publications concerning OMM and the number of citations has been indicated. The analysis of the number of annual publications after verifying the abstracts revealed that only part of the publication were directly and partly concerning the issue. Content analysis was carried out on the basis of 114 publications selected based on the verification of abstracts. Information related to the bibliographic analysis has been summarized and, based on the number of citations, the most important publications in this research area have been indicated. They are related to classic models of maturity in the area of process and project management.

Models are associated with the development of organizations in various areas: information technology, process, project and risk management, as well as quality, knowledge and the supply chain. They also apply to innovation management as well as Industry 4.0, which has been particularly important in recent years. As indicated, new model categories appear and the number of models in each group increases. Along with these changes, support is needed for organizations: which model to choose for business evaluation, which will best meet the needs of managers. However, the first step is to organize theoretical knowledge in this area. That was the main purpose of this study.

The main contribution of the paper is the subsequent grouping of these models into nine areas of application to allow further study and development of these. In addition, new maturity models were selected for specific areas of the organization's operations or related to new management concepts. The value of the article is a clear and detailed review of the models proposed in the literature, which may be useful for both researchers and practitioners. The main limitation is the analysis in the scope of topic "organizational maturity models" including only the Thompson/Reuters Web of Science. This is the first stage of a literature review that will be continued including the results from the Scopus database. The presented classification is an introduction to carry out a comparison of individual groups of models and to compile a list of their common areas.

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