ENTERPRISE READINESS MODEL FOR DIGITAL TWIN

ABSTRACT

The poor selection of tools for managing the introduction of Industry 4.0 technologies, such as the digital twin, described in literature and available in business practice, needs to be urgently addressed in the context of companies' dynamically growing digital transformation activity. The study of the existing patterns, standards and models of enterprise readiness for digital twins, presented in the dissertation in the context of the current, dynamically changing market conditions, resulted in the proposed multidimensional and universal model of enterprise readiness for digital twin.

By means of literature analysis and critique, Gordon's synectics, case studies and expert knowledge, the author of this dissertation collected and organized the results of previous research, designed a model of enterprise readiness for digital twin, and validated it against enterprises coming from services, trade and manufacturing sectors. Following a state of knowledge study in the fields of data readiness, technology, data management maturity the theoretical basis for the model was developed. By reaching beyond the field of management and quality, the analysis of digital twin types, methods used and application areas (in industry, medicine, geology, logistics) has extended the domain and semantic range of scientific problems identified in the conceptual phase of this study. The synthesis of concepts and components of the existing readiness and maturity models enriched the creative part of the design phase of this study and enabled the author to achieve intermediate goals in the form of proposed readiness dimensions and parameters. The developed model consists of four parts, including the following tools:

  e) epistemological part - a quantified description form of the planned implementation,
  f) formal part - formulas for calculating parameters,
  g) graphic part - visualization of readiness state change vectors in Euclidean space,
  h) decision-making part - diagram of the implementation decision-making process.

In order to increase the usability of this research results for decision support, the author proposed formulas for calculating the adequacy, effectiveness and risk of the planned implementation. By validating the designed model in the business reality, the epistemological part of the model was enriched and the duplicate and inadequate objects were reduced.

The model, developed in the course of this study, contributes to the discipline of management and quality sciences by proposing structured dimensions, parameters for assessing

a company's readiness for digital twins. It also supports the company in the decision-making concerning the selection of digital twin implementation scenarios. Consequently, the proposed results fulfill the research gap and goals identified in the conceptual phase of this study.