



Maturity models as a tool for diagnosing and improving management systems in Ukrainian enterprises

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Abstract. The purpose of the study was to justify the theoretical and methodological foundations of the use of maturity models to assess the level of development of enterprise management systems and to determine the directions for their improvement in the conditions of transformational changes. The research methodology implied the use of methods of theoretical generalisation and systematisation, historical-logical, structural, systemic and comparative analysis, economic and statistical analysis, as well as case studies of Ukrainian and foreign enterprises. The main findings of the study showed that Ukrainian enterprises operate under conditions of macroeconomic and military challenges: in 2022, gross domestic product fell by approximately 29%, and a significant proportion of enterprises curtailed their activities, whilst in 2023 most enterprises resumed operations, albeit with reduced turnover and continuing resource constraints. Under these conditions, the feasibility of using maturity models as a tool for the systematic assessment and development of enterprise management systems is justified. It has been established that their application ensures the formalisation of business processes, improved manageability and the integration of digital tools into the management system. The theoretical and methodological foundations for the use of maturity models have been substantiated, which envisage their combination with business diagnostics, a focus on data-driven approaches and adaptation to the conditions of an unstable environment. Case analysis has shown that the implementation of maturity models at Ukrainian enterprises (the National Joint-Stock Company "Naftogaz of Ukraine", the Joint-Stock Company "Ukrnafta", the Ukrainian Gas Transmission System Operator) ensured the formalisation of processes and the standardisation of management, whilst at Blue People, project delay rates fell from 80% to 1%, costs from 55% to 12%, and revenue increased by 440%. The approaches to adapting maturity models involved their phased implementation, integration with digital management tools, simplification of assessment procedures, and combining process standardisation with the flexibility of management systems. The practical significance of the study lies in the possibility of using appropriate approaches to assess the level of development of management systems and improve business processes in enterprises

Keywords: performance evaluation; business processes; digitalisation; transformation; strategies; risks

Introduction

In an unstable economic environment caused by military challenges, Ukrainian enterprises face the need to improve the effectiveness of their management systems. Many of them operate under conditions of limited resources, a high level of uncertainty and the need for rapid adaptation to change, which highlights the importance of systematic management improvement. In this

context, the importance of tools for assessing the level of development of management systems is growing, as they enable the identification of weaknesses and the determination of directions for their further improvement.

The low level of integration of approaches to assessing and improving management practices, as well as the fragmented use of innovative tools in business

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operations, complicate the development of effective management mechanisms. In the study by Y. Naumenko *et al.* (2025), models and methods of managerial decision-making were systematised, classified according to the specific nature of enterprises' activities, and key approaches were identified, notably customer-oriented, flexible and data-driven. The authors also justified the feasibility of using innovative tools, such as Big Data, artificial intelligence (AI), scenario planning and collective methods, demonstrating their impact on enhancing the adaptability, efficiency and competitiveness of enterprises in the context of digitalisation and an unstable environment. The Scale-Up Maturity Model, developed by Y. Potiuk & A. Zaverbnyi (2025), covers managerial, financial, process, innovation and foreign economic criteria, and provides a five-level scale of enterprise development. The authors have also developed an integrated Scale-Up Readiness Index (SURI), which allows for a quantitative assessment of an enterprise's level of development, the identification of bottlenecks, and the justification of management decisions regarding further growth.

The current lack of consistency in approaches to assessing the digital maturity of enterprises, as well as the fragmented consideration of information and communication resources as an integral part of digital transformation, complicate the development of a comprehensive approach to analysing the relevant methodologies. In his study, A.R.K.B. Almansoori (2025) assessed the digital maturity of enterprises across key dimensions (processes, technologies, data, personnel, management), and conducted a comparative analysis of enterprises in various sectors in Ukraine and the United Arab Emirates. The author identified disparities in levels of digital maturity, notably the achievement of an integrated level of information technology (IT) by fintech enterprises and the predominance of the process level in the manufacturing sector, and substantiated the importance of information and communication resources as the foundation for enhancing adaptability, the effectiveness of management decisions, and the resilience of enterprises. The essence of business diagnostics as a tool for identifying internal constraints and "bottlenecks", as defined by V. Zamlynskyi *et al.* (2023), lies in identifying problems in enterprise operations; the authors justified the appropriateness of its application in the early stages of transformational change and developed a classification of diagnostic types (express, partial and comprehensive). The authors proposed a toolkit for assessing enterprises' readiness for digital transformation, emphasised the role of Enterprise Resource Planning (ERP) systems, digital ecosystems and platforms, and demonstrated the need for continuous monitoring and improvement of management processes to ensure effective development.

The insufficient level of formalisation in approaches to assessing the strategic maturity of project management, as well as the complexity of accounting for risks, resource constraints and the dynamic operating

conditions of enterprises, necessitate the improvement of methodological tools. An economic-mathematical model for assessing project management maturity, based on linear programming methods for cost optimisation and the formation of an effective project portfolio, was developed by N. Prokopenko & K.-K. Krush (2025). The relationship between the level of maturity and the effectiveness of enterprises' operations is substantiated by demonstrating that a higher level ensures better adaptability, profitability and resilience to risks, and also involves the integration of digital technologies and management approaches. The essence of digital transformation as a comprehensive process of change encompassing technological, organisational and managerial aspects, as outlined by I. Rybak & O. Garafonova (2025), lies in enhancing the effectiveness of managerial decisions, flexibility and the competitiveness of enterprises. Key stages of digitalisation include strategy formulation, readiness assessment, integration of digital solutions into business processes and performance monitoring, whilst the use of Big Data, ERP, Customer Relationship Management (CRM) systems and AI enhances the productivity and adaptability of enterprises.

The adaptability of management systems to the conditions of the digital economy and the ability of enterprises to integrate digital technologies into strategic management require a rethinking of approaches to the organisation of management. The theoretical and methodological foundations of the digital transformation of management systems, as outlined by I.A. Verbovsky & K.S. Serdyukov (2025), involve identifying key challenges, in particular organisational, technological, human resource and information barriers that hinder effective digitalisation. The authors have also developed a model of adaptive management, which involves the use of flexible management approaches, data analytics, digital platforms and the integration of technologies (Big Data, AI, ERP, CRM) to improve decision-making efficiency and ensure the competitiveness of enterprises. L.M. Shymanovska-Dianych & O.V. Lozova (2024) summarised the main models for assessing the digital maturity of business processes in their study, identified their advantages and disadvantages, and highlighted the key factors influencing the level of digital maturity of enterprises. The components of business process management (design, modelling, implementation, monitoring and optimisation) were examined; the role of digital technologies in the transformation of enterprise activities was substantiated; and the results of assessing the level of digital maturity of leading Ukrainian companies were presented, demonstrating uneven development and varying degrees of adaptation to digital changes.

At the same time, issues regarding the adaptation of approaches to the specific characteristics of Ukrainian enterprises remain insufficiently addressed; there is a lack of a harmonised methodology for assessing the level of development of management systems;

and there is a need to resolve the tasks of universalising models, integrating them with business diagnostics and digital transformation, and developing unified approaches to assessing enterprise maturity in a dynamic environment. The aim of this study was to identify methodological approaches to diagnosing the development of enterprise management systems based on maturity models and to justify directions for their development in the context of transformational change. To achieve this objective, the following tasks were set: to analyse scientific approaches to assessing the level of development of management systems; to systematise and generalise existing models and diagnostic tools; and to investigate the specific features of applying maturity models and the practice of their implementation in the context of Ukrainian enterprises.

Materials and Methods

The study was of a theoretical and analytical nature. Within the scope of the study, a theoretical and methodological analysis of maturity models as a tool for assessing and developing management systems was applied. Approaches to interpreting them as structured conceptual frameworks were considered (Maturity model as a tool..., 2020). Using historical and logical analysis, the evolution of maturity models was investigated – from quality management concepts (Crosby, 1979) to the Capability Maturity Model (CMM) (Paulk *et al.*, 1993) and their subsequent integration into the Capability Maturity Model Integration (CMMI) (White, 2026). Using methods of systematisation and generalisation, a five-level structure of maturity models was identified and a generalised classification of levels was developed (Organizational maturity models..., 2020).

Based on the established theoretical principles and using the method of structural analysis, maturity models have been grouped according to the object of assessment; in particular, process-oriented models such as CMMI and the Business Process Maturity Model (BPMM) have been identified (Use our business..., 2025). Project-oriented models – the Organizational Project Management Maturity Model (OPM3) (Miller, 2004) and the Portfolio, Programme and Project Management Maturity Model (P3M3) (Buehring, 2024) – were considered separately, as this was necessary to investigate the specifics of their application in various areas of management activity. Furthermore, using a generalisation method, functional maturity models were examined, specifically the People Capability Maturity Model (PCMM) (What is PCMM..., 2025), the Cybersecurity Maturity Model Certification (CMMC) (Cisco Systems, Inc., n.d.) and the Big Data Maturity Model (BDMM) (n.d.). Furthermore, data management maturity assessment models were considered – the Data Management Capability Assessment Model (DCAM) and the Data Management Body of Knowledge (DMBOK) (Steenbeek, 2018). Using a comparative approach, a distinction was made between

general-purpose and specialised maturity models, in particular CMMI and ISO 15504 (International Certification Center, n.d.), which was necessary to determine the specific features of their application in various organisational and sectoral contexts; using a comparative method, a comparison was carried out of the characteristics of maturity models based on the object of assessment, specifically CMMI, BPMM, OPM3, P3M3, as well as functional models – PCMM, O-ISM3, CMMC, BDMM, DCAM and DMBOK. The comparison was carried out according to criteria such as the object of assessment, main focus, number of maturity levels and key features of the models. The application of this approach was aimed at systematising maturity models and determining the possibilities for their use in assessing various aspects of enterprise activities.

The next stage of the study involved examining the impact of the external environment on the functioning of enterprises. A method of analysis and generalisation was employed to identify the influence of macroeconomic, military and institutional factors (Moroz, 2025), which enabled the identification of key factors contributing to instability. The application of economic and statistical analysis made it possible to assess the role of micro, small and medium-sized enterprises (MSMEs) and the dynamics of their activities in 2022-2023 (United Nations Development Programme, 2024). Furthermore, systematic and structural analysis was used to examine the characteristics of digitalisation in management and data usage (Integral Solutions, n.d.), which helped to justify the feasibility of data-driven approaches. A comparative analysis was used to assess changes in the business environment in 2025 and early 2026 (Hoydenko, 2026).

Taking these conditions into account, a case study of Ukrainian enterprises was conducted, specifically the National Joint Stock Company (NJSC) 'Naftogaz of Ukraine' (Naftogaz received the international..., 2018) and the joint-stock company (JSC) "Ukrnafta" (Ukrnafta was the first..., 2025), which made it possible to identify the specific features of implementing maturity models. Using systematic analysis, the integration of the models into the activities of the Gas Transmission System (GTS) Operator of Ukraine was investigated (The GTS operator..., 2024). Generalisation and critical analysis made it possible to identify the limitations of their application in the Ukrainian context. To expand the comparative base, a case study of foreign companies was conducted, specifically Blue People (n.d.) and Bank of Montreal (n.d.), which allowed for an investigation into the use of the CMMI model. A comparative analysis of the case studies enabled a comparison of approaches across different sectors (CMMI Institute, 2018; Case study of CMMI..., 2022). The final stage involved summarising the results using a comparative method based on the following criteria: type of models, level of formalisation, availability of quantitative results, management orientation, integration into strategy, scale of implementation,

resource provision, level of process maturity, and publicity of the case studies. This made it possible to systematise the differences in approaches and identify the specific features of applying maturity models. On this basis, using a method of generalisation and systematic analysis, directions for their adaptation to the operating conditions of Ukrainian enterprises were developed.

Results

The essence and characteristics of applying maturity models in enterprise management

Maturity models are structured conceptual frameworks that reflect the gradual development of an organisation, its processes or functional subsystems through successive stages – from an informal state to a managed state focused on continuous improvement. Their essence lies in determining the current level of development of an enterprise and shaping a trajectory for further growth based on standardised criteria and practices. Thus, maturity models perform diagnostic and prognostic functions, ensuring the phased development of

the organisation (Maturity model as a tool..., 2020). The evolution of maturity models is linked to the development of management concepts and the formalisation of processes. Their foundations were laid in the 1970s within the field of quality management, particularly in the works of P.B. Crosby (1979). Further development took place with the creation of the CMM by the Software Engineering Institute (n.d.), which proposed a five-level model for assessing process maturity and became the basis for further developments (Paulk *et al.*, 1993). This approach was expanded in the CMMI model, which covers various areas of activity, including project, quality and service management (White, 2026). Most maturity models are based on a five-level development logic: from the initial level with informal processes to the innovative level, which involves data-driven management and continuous improvement. This allows maturity models to be used as a tool for the systematic assessment and development of enterprise management systems. Typical characteristics of maturity levels are presented in Table 1.

Table 1. Generalised characteristics of organisational maturity levels in process management

Maturity level	Management characteristics	Process characteristics	Management tools
Initial	Lack of structure	Processes are informal and chaotic	Absent or minimal
Managed	Partial standardisation	Basic procedures in place	Regulations, instructions
Standardised	Systematic and formalised	Processes described and agreed	BPM systems, modelling
Predictable	Data-driven management	Processes are measured and analysed	Key Performance Indicators (KPIs), analytics, process mining
Innovative	Continuous improvement	Flexible, integrated processes	Digital platforms, AI

Source: compiled by the author based on *Organizational maturity models in the field of process management* (2020)

The classification presented demonstrates that the development of maturity is accompanied by a transition from intuitive management to data-driven management and continuous improvement. Higher levels of process management integration with digital and strategic technologies boost an organization's agility and flexibility. The diversity of models necessitates their systematisation according to key criteria – the object of assessment, sectoral focus and conceptual structure. This allows the feasibility of their use to be justified and their scope of application to be determined. At the same time, maturity models perform not only a diagnostic but also a strategic function, forming benchmarks for the development of management systems.

Based on the object of assessment, maturity models are divided into process-based, functional and sector-specific models. Process-based models include CMMI, BPMM, OPM3 and P3M3, which are used to assess the management of processes, projects, programmes and portfolios. CMMI is an integrated model covering various areas of activity (software development, project management, services) and comprises five maturity levels – from initial to optimised. Its application ensures process standardisation, risk reduction and improved performance (White, 2026). BPMM focuses on the

development of business process management through incremental improvement and also employs a five-level model. It facilitates the identification of weaknesses, the alignment of processes with strategy, and the enhancement of operational efficiency (Use our business..., 2025). OPM3, developed by the Project Management Institute (n.d.), is designed to assess the maturity of project, programme and portfolio management based on best practices and performance indicators. It ensures alignment of project activities with strategy and provides for step-by-step improvement (Miller, 2004). P3M3 covers three areas (portfolio, programmes, projects) and enables a comprehensive assessment of an organisation's ability to implement change. The model is used for benchmarking and creating a development plan, and it consists of five maturity levels (Buehring, 2024).

Functional models form a separate group: the PCMM, the Operational Information Security Maturity Model (O-ISM3), CMMC, BDMM, DCAM and DMBOK. PCMM focuses on the development of human capital management systems across five maturity levels, covering workforce planning, competency development and performance management (What is PCMM..., 2025). O-ISM3 enables the assessment of information security maturity and its integration into the overall management system

(Beyond proprietary models..., n.d.). CMMC is aimed at standardising cyber defence and assessing the security level of information systems (Cisco Systems, Inc., n.d.).

The Big Data Maturity Model (n.d.) is used to assess analytical capabilities and the level of data utilisation in decision-making, facilitating the development of data-driven approaches. DCAM enables the assessment of data management maturity, specifically its quality, integration and architecture, whilst DMBOK systematises the principles and practices of data management, forming the basis for assessment (Steenbeek, 2018).

Such models provide a deeper analysis of specific functional areas. Depending on their scope of application, models are divided into universal and specialised. Universal models (CMM, CMMI, ISO 15504 (International Certification Center, n.d.)) have a wide range of applications, whilst specialised models take into account industry-specific characteristics, regulatory requirements and the particularities of business processes. This enhances the accuracy of the assessment and the practical significance of the results. A comparative overview of maturity models is provided in Table 2.

Table 2. Comparative characteristics of maturity models by assessment object

Model	Assessment object	Main focus	Number of levels	Key feature
CMMI	Organisational processes	Improving process management	5	Integration of best practices in process management
BPMM	Business processes	Development of process management	5	Focus on process systematisation and optimisation
OPM3	Projects, programmes, portfolios	Aligning project management with strategy	5	Based on PMI best practices
P3M3	Projects, programmes, portfolios	Comprehensive assessment of change management	5	Covers three levels of management (P, P, P)
PCMM	Human capital	Development of HR systems	5	Focus on staff competence development
O-ISM3	Information security	IS Management	3-5	Integration of security into business processes
CMMC	Cybersecurity	Information Systems Protection	3-5	Cyber security standardisation
Big Data MM	Data analytics	Data-driven management	4-5	Big Data Maturity Assessment
DCAM	Data management	Data governance	5	Focus on data quality and architecture
DMBOK	Data management	Data management methodology	–	Systematisation of knowledge and practices

Source: compiled by the author based on *Beyond proprietary models: Open Information systems management maturity model (O-ISM3) (n.d.)*, *Big Data Maturity Model (BDMM) – definition & overview (n.d.)*, B. Miller (2004), I. Steenbeek (2018), S. Buehring (2024), *Use our business process maturity model to measure progress (2025)*, *What is PCMM? – The people capability maturity model and its benefits (2025)*, S.K. White (2026)

A comparison of the maturity models listed shows that they differ not only in the object of assessment but also in the depth of analysis and the scope of practical application. In particular, process-based models (CMMI, BPMM) focus on improving internal processes and ensuring their standardisation, whereas OPM3 and P3M3 aim to integrate project management with the organisation's strategic objectives. Functional models (PCMM, CMMC, DCAM) allow for a more detailed assessment of individual aspects of operations, but do not provide a holistic view of the management system. At the same time, universal models are characterised by broader coverage but may require adaptation to the specific characteristics of the enterprise. This necessitates the combined use of different models depending on the objectives of the assessment and the organisation's level of development.

Maturity models serve as a universal tool for assessing the level of development of management systems, enabling the identification of their current state and the determination of areas for further improvement. Their diversity in terms of the object of assessment, structure and scope of application ensures the

possibility of adaptation to the specific nature of enterprises' activities and operating conditions. At the same time, the effectiveness of their use depends on the level of integration into the management system, resource provision and alignment with the organisation's strategic goals. Thus, maturity models form the methodological basis for the systematic development of enterprises in a dynamic environment.

Management challenges facing Ukrainian enterprises and an assessment of the effectiveness of implementing maturity models

Ukrainian enterprises work in the conditions of multidimensional instability, which is formed by the interrelated economic, military and institutional factors. Macroeconomic volatility, in particular gross domestic product (GDP), inflation and exchange rate fluctuations, limits the scope for long-term planning and increases the degree of risk associated with business activities. The investment activity of enterprises and their access to liquidity are hindered by financial instability, increased by the volatility of international financial markets and

limited access to credit. An additional factor is the decline in the purchasing power of the population and businesses, which leads to a contraction in demand and an increase in commercial risks. Military and geopolitical factors are affecting the operations of enterprises. The destruction of infrastructure, loss of production capacity and disruption of supply chains complicate operational activities and increase costs. Disruptions in the supply of raw materials, restrictions on transport routes and high security risks are forcing enterprises to review the organisation of their business processes. The high level of uncertainty necessitates the use of contingency scenarios, including relocation, diversification of activities or asset reduction, which diverts resources away from strategic objectives (Moroz, 2025).

MSMEs play a key role in Ukraine's economy, accounting for 99.98% of all enterprises, providing 74% of jobs and generating 64% of value added as of 2023. As a result of the full-scale invasion in 2022, the economy suffered a sharp downturn: GDP contracted by approximately 29%, and 64% of enterprises temporarily suspended or scaled back their operations. Throughout 2023, a gradual recovery of business activity was observed: around 91% of enterprises resumed operations, whilst as of October 2023 only 9.6% remain inactive or are on the verge of closure. At the same time, even among operating enterprises, a decline in economic performance was recorded in 2022-2023 – in particular, the average fall in turnover was 31.2% compared with 2021. Data from surveys conducted in late 2023 and early 2024 indicated that significant constraints on business development remain. The most common problems are the unpredictability of the economic environment (58.3% of enterprises), the risk of unpredictable government actions (50.7%), and low consumer purchasing power (49.4%). Additional constraints include insufficient manpower (42.1%) and inadequate financial resources (33%). Structural constraints are also long-term: in 2023 only 17.9% of MSMEs are involved in export activities, over 57.2% operate only in the domestic market and over 71% are not integrated in international supply chains. This means limited scope for risk diversification and greater reliance of firms on domestic economic conditions (United Nations Development Programme, 2024).

This, in turn, can be noticed that digitalisation of management allows to take decisions in real time. The integrated information systems usage becomes a premise of effective enterprises functioning. In this context data is becoming a key strategic resource, as its use allows increasing productivity, improving customer interaction and creating competitive advantages. The effective interconnection of the data coming from the different sources provides a holistic view of the enterprise's operations and creates the conditions for its flexibility and innovation. While, on the other hand, enterprises face a number of challenges in the field of data management, such as limited resources, lack of skilled

personnel, growing volume and diversity of data, and technical complexity of its integration. Other challenges are the increasing costs of data processing and the increasing requirements for information security, which make the development of effective analytical systems more difficult and slow down the development of data-driven management. Another challenge is human capital management, which needs flexible working conditions, staff support and effective communication due to the instability of the environment. At the same time, the financial management is transforming to a regime of continuous monitoring of liquidity, risks and sources of funding (Integral Solutions, n.d.).

Persistence of a high level of uncertainty in the business environment

The Small Business Sentiment Index has stabilised, but most entrepreneurs in Ukraine are still moving carefully, trying to maintain their position and using internal resources. Only 21% think their business is good, 31% say it is neutral, and 48% say it has gotten worse compared to 2025. The trend for the period September 2025 – January 2026 is again negative, with 56% of entrepreneurs reporting a deterioration in business conditions, 32% of entrepreneurs reporting no change and 12% of entrepreneurs reporting an improvement. Also low are the expectations for the second half of 2026: 48% of entrepreneurs expect a deterioration of the situation, 31% do not expect any changes, and only 21% expect an improvement. In general, 76% of respondents believe that the economic situation in Ukraine is unfavourable or critical, while only 4% believe it is favourable. In such uncertainty businesses are developing cautious strategies of development, on the basis of own resources mainly. It is increasing the share of entrepreneurs who consider their own funds the main source of financing – to 51%, the intentions to attract external financing are decreasing. In particular, the share of entrepreneurs planning to attract additional resources is decreasing, access to bank credit is still limited, a considerable part of entrepreneurs has problems with it. However, businesses are not abandoning development, but are moving in more cautious and controlled directions. The key priorities are to increase the customer base (63%) and to refresh or extend the product range (42%). A heightened emphasis on global markets indicates a pursuit of alternate economic prospects due to domestic uncertainty. The increasing importance of digital channels in business operations should also be emphasised. A significant share of companies actively use marketplaces and social media, and about one third of companies operate primarily in the digital environment. This allows businesses to adapt more quickly to changes and find new opportunities even in conditions of high uncertainty. Despite some signs of adaptation, entrepreneurs continue to face a range of systemic challenges, the key ones being military risks, energy instability, rising costs, economic

uncertainty and low purchasing power among the population. This further complicates the process of managerial decision-making and hampers the active growth of enterprises (Hoydenko, 2026).

The identified management challenges are directly linked to the need to use structured tools for assessing and developing management systems. In particular, macroeconomic instability and resource constraints complicate long-term planning, necessitating the implementation of maturity models as a tool for phased development and prioritisation. The high level of uncertainty and risk highlights the need to formalise processes and implement systematic risk management, which aligns with the logic of transitioning to higher levels of management maturity. Insufficient digitalisation and fragmented data usage limit the quality of management decisions, whereas maturity models enable the integration of data-driven approaches and ensure the development of the organisation's analytical capabilities. Furthermore, personnel and organisational barriers require the standardisation of management practices and the improvement of their consistency, which is also achieved by the implementation of appropriate models. Therefore, maturity models are a way to systematically address the key challenges of enterprises that operate in an uncertain environment.

In these circumstances, a practical assessment of the effectiveness of the implementation of maturity models in Ukrainian enterprises is necessary. The analysis of practical case studies of Ukrainian enterprises shows that the introduction of maturity models, especially based on ISO standards, mainly provides an improvement of management efficiency and the quality of business processes, although this effect is mainly indirect. In particular, in Naftogaz of Ukraine, the introduction of a quality management system in accordance with DSTU ISO 9001:2015 (2015) contributed not only to the formalisation of management procedures, but also to the stricter control of the execution of production processes, which made it possible to increase the transparency of the company's activities and reduce the risks of inefficient use of resources (Naftogaz received the international..., 2018). Here the maturity model functions as a tool for institutionalising management, ensuring a transition from ad hoc decisions to standard procedures and regulations.

The implementation of the industry standard DSTU EN ISO 29001:2021 (2021) based on the principles of DSTU ISO 9001:2015 (2015) at the JSC "Ukrnafta" made it possible to systematise quality management processes in the oil and gas sector under increased technological and operational risks (Ukrnafta became the first..., 2025). Not only has this stabilised the product quality and minimised operational risks, but also improved the alignment of operations with international requirements which has, in turn, expanded the company's opportunities to participate in international projects and cooperate

with foreign partners. Thus, the effectiveness of the maturity model in this case is shown by the increased reliability and predictability of the business processes.

The experience of the Gas Transmission System Operator of Ukraine demonstrates the full-scale implementation of maturity models the integration of DSTU ISO 9001:2015 (2015), DSTU ISO 14001:2015 (2015) and DSTU ISO 45001:2019 (2019) has ensured the formation of a unified management system for quality, environmental safety and occupational health and safety (The GTS operator of Ukraine..., 2024). This approach allows to ensure the consistency of internal processes and their compliance with international requirements in the operations of an energy sector enterprise. Here the maturity model works as an integrator, integrating the different management domains into one system.

At the same time, a generalisation of the cases presented allows for a more critical conclusion regarding the effectiveness of implementing maturity models in the Ukrainian context. Despite their positive impact on process standardisation, improved management quality and compliance with international requirements, these models rarely have a direct impact on the financial performance of enterprises. This is due to the fact that their implementation is often limited to the formalisation of procedures without deep integration into strategic management, and also depends on the enterprise's resource capabilities, the level of management culture and the stability of the external environment. Thus, in Ukrainian practice, maturity models demonstrate the greatest effectiveness as a tool for streamlining and systematising management; however, their transformational potential is realised only under conditions of comprehensive and consistent implementation.

An analysis of the practice of implementing maturity models in Ukraine reveals an asymmetry between the use of standardised approaches, such as ISO, and specialised maturity models focused on specific management or technological areas. Whilst there are publicly documented implementation case studies for ISO standards at the level of specific enterprises, no such case studies are available in open sources for other maturity models, such as CMMI, BPMM, OPM3, P3M3, PCMM, O-ISM3, CMMC, BDMM, DCAM and DMBOK. This situation can be explained by a number of factors. Firstly, most of the models mentioned require a high level of organisational maturity, as well as significant financial and human resources, which limits their application primarily to large companies. Secondly, the lack of institutional support and widespread certification practices complicates their integration into business operations. Thirdly, the instability of the external environment leads businesses to focus on short-term solutions, which reduces interest in implementing comprehensive development models. Thus, it can be concluded that in Ukraine, maturity models that differ from ISO standards are either applied to a limited extent or their use lacks a

sufficient level of public verification. This, in turn, complicates the assessment of their effectiveness and points to the need for further research and the promotion of practices for their implementation in the Ukrainian business environment.

Thus, the current conditions of the enterprises' operation of Ukraine are characterised by a high degree of instability, which necessitates the improvement of management systems based on systematic approaches. Maturity models enable a structured assessment of the level of management development, ensuring the formalisation of processes and the incorporation of digital and analytical tools into business activities. The experience of their implementation in Ukraine has a positive influence on standardisation and improvement of management quality. However, their effectiveness depends to a considerable extent on the level of integration into strategic management and resource provision. At the same time, the limited use of specialised maturity models and their low prevalence indicate the need for further development of methodological approaches and expansion of their implementation in the Ukrainian business environment.

The practice of implementing and adapting enterprise maturity models

A good example of the application of maturity models in international practice is the work of the IT company Blue People (n.d.) (Mexico), specialised in software development and consultancy services. In the phase of rapid growth, the company encountered limitations in the use of the agile Scrum methodology, which was not scalable enough to ensure process stability and effective knowledge transfer between employees. This required the development of a more formal management approach and led to the use of the CMMI. The CMMI was implemented to increase the maturity of the processes, to ensure standardisation of management procedures and to formalise the business processes, while still maintaining the flexibility of the organisation. The company has been able to achieve Maturity Level 3 (Defined) (ML3) and Maturity Level 5 (Optimising) (ML5) consistently. ML3 and ML5 have taken the company from defined and standardised processes to quantitative measurement and statistical control. A distinctive feature of the implementation was the synthesis of CMMI practices with agile approaches (Scrum, Kanban), which made it possible to adapt the model to the specifics of the company's operations and avoided excessive bureaucratisation (CMMI Institute, 2018).

The implementation of the maturity model resulted in a metrics system to measure process effectiveness, internal management tools creation (such as process monitoring platforms and knowledge documentation), and a move towards data-driven management. This allowed to predict the results of the projects, optimise the use of the resources and improve the quality of the decision-making in management. As a result of implementing the CMMI

model, the company achieved improvements in operational performance. In particular, the project schedule deviation rate was reduced from 80% to 1%, and cost deviation from 55% to 12%. Furthermore, the company demonstrated a 440% increase in revenue and achieved a return-on-investment ratio of 6:1, which attests to the high effectiveness of implementing the maturity model. At the same time, this resulted in greater predictability of operations, improved project delivery quality, and higher customer satisfaction levels. Thus, Blue People's experience confirms that the implementation of maturity models, in particular CMMI, enables the systematisation of management, improves the efficiency of business processes, and achieves significant improvements in business performance, provided they are adapted to the organisation's specific context and combined with flexible management approaches (CMMI Institute, 2018).

Another example of the implementation of a maturity model is the work of the Bank of Montreal (n.d.) (Canada), which adopted the CMMI approach to improve its software development processes. The reasons for the implementation included the presence of unstructured processes, low predictability of timelines and costs, a significant number of changes in projects, and the lack of systematic data collection and analysis within software development. Furthermore, documentation and knowledge management processes were insufficiently formalised, which complicated the coordination of activities. The implementation of CMMI was carried out in stages and included staff training, conducting to assess the current state of processes (gap analysis), developing improvement plans, and establishing an independent quality assurance team. Particular attention was paid to establishing a requirements management process, which involved engaging various roles and stakeholders in the development process. During implementation, configuration management practices, peer review, and the use of metrics to assess process effectiveness were also introduced. The results of the implementation demonstrated improvements in performance indicators. In particular, the number of defects related to requirements decreased by approximately 50%. As part of the further development of the management system, maintenance productivity increased by a factor of 3.8 and development productivity by more than a factor of 2, whilst the number of defects per release was reduced from 6-12 to 2. Furthermore, a comparative analysis of project performance indicators revealed an increase in the proportion of projects delivered on time and within budget (Case study of CMMI..., 2022).

At the same time, an analysis of international experience in implementing maturity models reveals an uneven representation of practical case studies depending on the type of model. While there are documented examples of implementation with quantitative results for the CMMI model (notably at Blue People and BMO Financial Group), for other maturity models – BPMM,

OPM3, P3M3, PCMM, O-ISM3, CMMC, BDMM, DCAM and DMBOK – there are no systematic empirical case studies with measurable performance indicators available in open sources. This complicates their comparative assessment and indicates limited public verification of the results of their practical application. This situation may be due to the complexity of implementing these models,

their high resource intensity, and their focus on companies' internal processes, the results of which are not always subject to public disclosure. To systematise the research findings and conduct a comparative analysis of the practice of implementing maturity models in foreign companies and Ukrainian enterprises, the summarised characteristics are presented in Table 3.

Table 3. Comparative analysis of the practice of implementing maturity models in foreign companies and in Ukraine

Criterion	CMMI cases	Ukrainian enterprises
Type of models	Predominantly CMMI (high maturity levels ML3-ML5)	Predominantly ISO-like approaches
Level of formalisation	High (structured processes, metrics, control)	Medium (formalisation of procedures without full integration)
Availability of quantitative results	Yes (productivity $\times 2-3.8$; defects -50% ; lead times $80 \rightarrow 1\%$)	Limited (mainly qualitative effects)
Management focus	Data-driven, statistical management	Reactive / partially systematic
Integration into strategy	High (link to business results)	Partial or none
Scale of implementation	Organisational level (enterprise-wide)	Local or functional
Resource allocation	Significant investment, specialised teams	Limited resources
Process maturity level	High (Quantitatively managed, optimising)	Lower (managed/partially standardised)
Publicity of case studies	High (case studies, reports)	Limited

Source: compiled by the author

A comparative analysis reveals differences in the implementation of maturity models between foreign companies and Ukrainian enterprises. International practice shows a more systematic use of maturity models, with a focus on quantitative indicators and integration into strategic management. In Ukraine, however, their application is predominantly piecemeal and limited to the formalisation of individual processes. This necessitates the expansion of the implementation of comprehensive maturity models and an increase in their integration into enterprise management systems.

Adapting maturity models to the operating conditions of Ukrainian enterprises requires taking into account the specific nature of the national business environment, which is characterised by a high level of uncertainty, limited resources, instability of the institutional environment, and the influence of external risks. In such conditions, directly adopting foreign maturity models without modification is insufficiently effective, as they are geared towards stable economies with developed management infrastructure and a high level of digitalisation. This necessitates the development of adapted approaches that take into account both structural constraints and the development potential of domestic enterprises. One approach to adaptation is the phased implementation of maturity models, taking into account the enterprise's current level of development. For most Ukrainian companies, it is advisable to focus on the basic levels of maturity, which involve the formalisation of processes, the definition of roles and responsibilities, and the introduction of control mechanisms. The transition to higher levels of maturity, involving the use of analytics and process optimisation, is carried out gradually in line with available resources and competencies.

A separate area of focus is the integration of maturity models with digital management tools. The use of information systems, data analytics and digital platforms enables greater process transparency and supports management decision-making. In this context, the development of data-driven approaches involves using data to monitor the company's operations, assess performance and forecast changes. Another area is the adaptation of maturity models to enterprises' resource constraints. This involves simplifying assessment procedures, using accessible analytical tools, and focusing on the processes that have the greatest impact on performance. In this context, the application of a modular approach allows for the implementation of individual elements of maturity models without a complete transformation of the entire management system.

The development of managerial competencies and the formation of a process management culture accompany the implementation of maturity models and involve a transition to more structured management approaches. The implementation of maturity models is accompanied by a transition to more structured management approaches, which involve the use of analytical tools and formalised procedures. This is linked to the need for staff training, the development of management skills and the establishment of internal expert functions. The application of maturity models also encompasses securing the flexibility of management systems towards environmental changes. The author employs a combination of standardised procedures and the adaptability to modify these procedures in response to internal and external changes. In this context, flexible management approaches provide the opportunity to maintain the balance between the formalisation of processes and the

flexibility of the enterprise's operations. Thus, adaptation of maturity models to the operating conditions of Ukrainian enterprises involves the integration of phased implementation, digitalisation of management, taking into account resource constraints, the development of management competencies and the provision of flexibility of management systems. It creates conditions for improvement of management organisation effectiveness and internal processes alignment with the requirements of the external environment.

Therefore, maturity models serve as a tool for assessing and developing enterprise management systems under various operating conditions. Their application enables the structuring of processes, ensures the consistency of management decisions, and enhances the manageability of operations. At the same time, the practice of using such models varies depending on the level of enterprise development and the availability of resources. Adapting maturity models involves taking into account the specific nature of the environment in which enterprises operate and the characteristics of the management organisation.

Discussion

In an unstable economic environment, exacerbated by military challenges, digital transformation and growing uncertainty, enterprises face the need to improve the effectiveness of their management systems and their ability to adapt quickly. In particular, similar to the findings of L. Lai (2022), it was established that the implementation of maturity models facilitated a transition from informal processes to data-driven, systematic management and continuous improvement. At the same time, unlike L. Lai, where the main focus was on the technological component of Industry 4.0, this study showed that the effect of implementing maturity models was manifested primarily in an increase in the level of management formalisation and process standardisation, rather than in direct financial results.

The results also partially corroborated the findings of D.R. Domínguez *et al.* (2025) regarding the growing role of digital technologies and data in the development of maturity models. However, whilst D.R. Domínguez *et al.* emphasised the evolution of models towards Industry 5.0 and human-centredness, this study found that, in the context of Ukrainian enterprises, the key constraint remained the insufficient integration of maturity models into strategic management, which reduced their transformational potential. A comparison with the findings of G. Korsten *et al.* (2024) showed that, unlike studies where maturity models (in particular the Advanced Data Analytics Capability Maturity Model (ADA-CMM)) demonstrated a quantitatively measurable impact on the development of analytical capabilities, this study revealed the limited applicability of quantitative results in the practice of Ukrainian enterprises. This was confirmed by the absence of publicly verified performance

indicators for most models, with the exception of individual CMMI cases.

Similarly, the results were consistent with the findings of J. Gomes & M. Romão (2025) and A.F.S. Pino *et al.* (2024), who emphasised the importance of industry-specific adaptation of maturity models. This study found that universal models were applied in Ukrainian conditions predominantly in a simplified or partial format, which was due to resource constraints and an unstable environment. The most significant difference was observed when comparing with T.-C. Lin & K.J. Wang (2021), where the implementation of maturity models was accompanied by clear quantitative improvements in efficiency. This study demonstrated that, for Ukrainian enterprises, the effect of implementing maturity models was predominantly indirect in nature and manifested itself through improved manageability, process standardisation and a reduction in operational risks, rather than through a direct increase in financial indicators.

A comparison of the results of this study with the conclusions of E.T. Skupień (2025) showed that in both cases, maturity models were viewed as a tool for the phased development of systems with a multi-level structure. At the same time, whilst E.T. Skupień established the effectiveness of maturity models in the context of sectoral systems, this study demonstrated their universal nature for the assessment and development of enterprise management systems. The results also corresponded with the findings of T. Mettler & O. Ballester (2021), who identified methodological limitations in maturity models. In this study, these limitations manifested themselves through an insufficient level of integration of the models into strategic enterprise management and the absence of direct quantitative results of their application, which partially confirmed the authors' critical remarks.

A comparison with the results of K. Kimita *et al.* (2022) showed that, although both studies were based on the evolutionary logic of maturity development, K. Kimita *et al.* obtained more specific results through the definition of the competencies required for servitisation. In this study, however, it was found that in the Ukrainian context, the application of maturity models is limited primarily to the formalisation of processes without in-depth detailing of the competency component. A similar difference was observed when comparing with the results of U. Şener *et al.* (2026), where quantitative assessments of digital maturity were obtained based on an index approach. This study revealed the limitations of quantitative measurement of the results of implementing maturity models, indicating the dominance of a qualitative approach in assessing their effectiveness.

A comparison with the findings of D. Kato *et al.* (2025) showed that, when specialised maturity models are applied, it is possible to achieve clearly measurable improvements in efficiency. In contrast, this study found that for Ukrainian enterprises, the effect of

implementing maturity models was predominantly indirect in nature and manifested itself through process standardisation and improved manageability, rather than through direct quantitative results. The results were also consistent with the findings of D. Vavpotič *et al.* (2026), who argued for the need to adapt maturity models to the specific operating conditions of enterprises. This study confirmed that the effectiveness of maturity models in the Ukrainian context depended on their adaptation to resource constraints and an unstable environment.

A comparison with the studies by S. Ollis *et al.* (2024) and S. Njah *et al.* (2026) showed that, in international practice, maturity models ensured the attainment of quantifiable results, in particular an increase in the efficiency of system operations. This study found that such results are limited, and the application of maturity models primarily brings about qualitative changes in management. At the same time, the results were partly consistent with the findings of D.R. Domínguez *et al.* (2026) and T. Thorsen & M. Bick (2023), who pointed to the limitations of applying maturity models and the lack of empirical verification of their effectiveness. This study confirmed that the lack of publicly available quantitative results and the limited use of specialised maturity models complicate the assessment of their impact on business operations.

A comparison with the study by A. Ouazzani-Chahidi *et al.* (2023) allowed us to specify the practical dimension of the use of maturity models, as in both approaches, they were considered as a tool for phased assessment and improvement of management effectiveness based on a process-oriented approach. Another common feature was the focus on a multi-level maturity structure and its role in improving management decisions. At the same time, in the work by A. Ouazzani-Chahidi *et al.*, this approach was developed into a practical toolkit through the creation of a CMMI-based model with clear assessment criteria and empirical validation, whereas in the present study the emphasis remained on the theoretical generalisation and systematisation of maturity models. The need to enhance the objectivity of comparing maturity models became central to the study by B. Cognet *et al.* (2023), which logically continued the previous discussion on their practical application. Similar to this study, the authors acknowledged the multidimensionality of the models and their diversity, but went a step further by proposing a formalised approach to their comparison based on KPIs and quantitative coverage indicators. Against this backdrop, the approach used in this study remained analytically generalised, highlighting the distinction between quantitative formalisation and qualitative systematisation.

A further expansion of the context occurred in the study by S. Ferraro *et al.* (2023), where maturity models were considered within an industry-specific context – in the field of supply chains and logistics. As in this study, they were treated as a tool for assessment and continuous improvement, combining diagnostic and strategic

functions. However, S. Ferraro *et al.* focused on identifying global trends in the development of maturity models based on a systematic review of a significant number of studies, which allowed them to identify key gaps, in particular insufficient validation of models and limited integration of individual processes. In this study, however, the focus has shifted from identifying global trends to analysing the potential for the practical application of models in a specific management environment.

As a result, it was established that maturity models are an effective tool for assessing and developing enterprise management systems, ensuring the structuring of business processes and enhancing their level of formalisation and coherence. It has been demonstrated that, in an unstable environment, their application contributes to improved manageability of operations, the integration of digital and analytical tools, and the creation of conditions for the phased development of enterprises. At the same time, it has been established that in Ukrainian practice, the effect of implementing maturity models is predominantly indirect in nature and manifests itself through the standardisation of management and the reduction of operational risks, whilst the direct quantitative results of their use are limited.

Conclusions

A summary of the research findings indicates that maturity models are used as a tool for the structured assessment and development of corporate management systems in an unstable external environment. The functioning of Ukrainian business is accompanied by significant macroeconomic and military impacts, which were reflected in a reduction in GDP of approximately 29% in 2022 and the cessation or restriction of operations at 64% of enterprises. In 2023, a partial recovery took place: around 91% of enterprises resumed operations, whilst 9.6% remain inactive or are on the verge of ceasing operations. At the same time, the average decline in enterprise turnover stood at 31.2% compared to 2021. MSMEs account for 99.98% of the total number of business entities, provide 74% of employment and generate 64% of added value. However, their operations are constrained by a number of factors, including the unpredictability of the economic environment (58.3%), risks associated with government policy (50.7%), low consumer purchasing power (49.4%), labour shortages (42.1%) and limited access to financial resources (33%). Furthermore, only 17.9% of enterprises are engaged in export activities, over 57.2% are focused exclusively on the domestic market, and over 71% are not integrated into international supply chains.

Data on business expectations for 2025 – early 2026 indicate that instability persists: 48% of entrepreneurs report a deterioration in business conditions, 31% assess them as neutral, and 21% as positive. At the same time, 56% reported a deterioration in operating conditions, and 76% assess the overall economic situation

as unfavourable or critical. The proportion of enterprises relying on their own financial resources stands at 51%. The practice of implementing maturity models in Ukraine is illustrated by case studies of management standards. At NJSC Naftogaz of Ukraine, the implementation of DSTU ISO 9001:2015 ensured the formalisation of management procedures. At JSC "Ukrnafta", the use of DSTU EN ISO 29001:2021 was aimed at systematising quality management processes. In the activities of the Ukrainian GTS Operator, the integration of DSTU ISO 9001:2015, DSTU ISO 14001:2015 and DSTU ISO 45001:2019 ensured the consolidation of functional management areas within a single system.

International practice is illustrated by case studies of the implementation of maturity models based on CMMI. Blue People (Mexico) achieved a transition to maturity levels ML3 and ML5, which was accompanied by a reduction in project delivery time variances from 80% to 1% and cost variances from 55% to 12%, as well as a 440% increase in revenue and a return-on-investment ratio of 6:1. At BMO Financial Group (Canada), the application of CMMI was linked to process standardisation, the introduction of a metrics system, and the harmonisation of project management. Adapting maturity models to the operating conditions of Ukrainian enterprises involves phased implementation in line with the enterprise's

level of development, integration with digital management tools, the use of data-driven management approaches, simplifying assessment procedures to account for resource constraints, applying a modular approach to the implementation of individual model elements, developing managerial competencies, and ensuring the flexibility of management systems by combining process standardisation with the ability to adapt them to changes in the environment.

The limitation of the study lies in its focus on generalising theoretical and methodological approaches and analysing individual practical cases without conducting large-scale empirical verification. Prospects for further research relate to expanding the empirical base and developing applied tools for assessing the maturity of management systems, taking into account the specific characteristics of Ukrainian enterprises.

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Conflict of Interest

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Моделі зрілості як інструмент діагностики та вдосконалення управлінських систем українських підприємств

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Анотація. Метою даного дослідження було обґрунтування теоретико-методичних засад використання моделей зрілості для оцінювання рівня розвитку управлінських систем підприємств та визначення напрямів їх удосконалення в умовах трансформаційних змін. Методологія дослідження ґрунтувалася на застосуванні методів теоретичного узагальнення та систематизації, історико-логічного, структурного, системного та порівняльного аналізу, економіко-статистичного аналізу, а також кейс-аналізу українських та іноземних підприємств. Основні результати дослідження засвідчили, що функціонування українських підприємств відбувається в умовах макроекономічних і воєнних викликів: у 2022 році внутрішній валовий продукт скоротився приблизно на 29 %, а значна частина підприємств обмежила діяльність, тоді як у 2023 році більшість підприємств відновили роботу, однак із зниженням обороту та збереженням ресурсних обмежень. За таких умов обґрунтовано доцільність використання моделей зрілості як інструменту системного оцінювання та розвитку управлінських систем підприємств. Встановлено, що їх застосування забезпечує формалізацію бізнес-процесів, підвищення керованості та інтеграцію цифрових інструментів у систему управління. Обґрунтовано теоретико-методичні засади використання моделей зрілості, що передбачають їх поєднання з бізнес-діагностикою, орієнтацію на data-driven підходи та адаптацію до умов нестабільного середовища. Аналіз кейсів показав, що впровадження моделей зрілості на підприємствах України (Національної акціонерної компанії «Нафтогаз України», акціонерного товариства «Укрнафта», Оператора газотранспортної системи України) забезпечувало формалізацію процесів і стандартизацію управління, тоді як у компанії Blue People відхилення термінів виконання проєктів зменшилося з 80 % до 1 %, витрат – з 55 % до 12 %, а доходи зросли на 440 %. Напрями адаптації моделей зрілості передбачали їх поетапне впровадження, інтеграцію з цифровими інструментами управління, спрощення процедур оцінювання та поєднання стандартизації процесів із гнучкістю управлінських систем. Практичне значення дослідження полягає у можливості використання відповідних підходів для оцінювання рівня розвитку управлінських систем і вдосконалення бізнес-процесів підприємств

Ключові слова: оцінювання ефективності; бізнес-процеси; цифровізація; трансформація; стратегії; ризики