

ERP as the Foundation of Enterprise Autonomy: A Managerial Framework for Assessing Organizational Readiness for Agentic AI

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Abstract. *This paper introduces a framework linking AI capability layers (automation, predictive AI, generative AI, AI agents, and agentic AI) to levels of ERP maturity. These levels include: data integration, process standardization, governance clarity, and real-time operational visibility. We argue that AI performance depends critically on the underlying ERP systems that are in place and introduce the idea of “organizational readiness for AI”. This idea is defined through a measure of the alignment between ERP maturity levels and the degree of autonomy that the organization would wish to delegate to AI systems. This, then, views ERP systems as the key enablers for autonomous execution. The framework offers managers a structured diagnostic tool to assess whether their organizations are ready to move from simple automation to greater levels of enterprise autonomy.*

Keywords: Enterprise Resource Planning (ERP), Agentic AI, Enterprise Autonomy, Organizational Readiness, Business Excellence.

Introduction

In this paper we explore the issue of organizational success, as it relates to the institution’s ERP infrastructure, in the context of AI agents. Specifically, we are interested in the extent to which ERP maturity is a critical determinant of whether AI agents can operate successfully within an organization. We note that, at present, there is considerable evidence to suggest that organizations are investing heavily in AI, particularly in AI agents that can be used autonomously to plan and execute operations, but these businesses are not seeing reliable and extensive success as a result. Our diagnosis in this regard is that the issues relate less to the degree of AI sophistication and more to the maturity of the ERP infrastructure already in place that is able to support it. The key question is less *how advanced is the AI*, and more *is the organization already prepared, structurally, for autonomous systems*.

The paper provides a conceptual managerial model for assessing readiness for the introduction of AI agents, which aims to capture the alignment between the operational coherence of existing ERP systems and the level of autonomy of agentic intelligent systems. In particular, our framework provides a means for assessing ERP maturity through measures such as data integration, process standardization, governance clarity, and real-time operational visibility, and aligning this with AI capability levels of autonomy. The purpose, here, is to ensure institutions do not attempt

to introduce AI in otherwise immature ERP environments, thus avoiding the possibility that such an introduction will just scale chaos.

To guide our investigation, the paper addresses the following research questions:

RQ1. What is the relationship between levels of ERP maturity and an organization's readiness to deploy AI for greater autonomous execution?

RQ2. What aspects of ERP systems are the critical enablers of enterprise autonomy?

RQ3. How should organizations develop their ERP systems in order to achieve the effective integration of AI systems?

The structure of the paper is as follows. In the next section we provide a review of existing literature, focusing in particular on the evolution of AI in organizations and on ERP as a socio-technical infrastructure. We then move on to provide the methodology on which this work is based, followed by an analysis that results in our conceptual model and a discussion of its possible deployment. We end with our conclusions, areas for possible future investigation, and references to the literature.

Literature review

The evolution of AI as a field that has evolved from simple rule-based reasoning to predicative, generative and agentic AI has been dramatic (Russell S. and Norvig P., 2021,).

Within businesses *automation* represents the first level of AI integration at the organizational level. RPA software systems allow the execution of repetitive and standardized tasks, aim to eliminate operational errors, and to replicate routine manual decisions (Siderska *et al.*, 2023). RPA rapidly evolved into Intelligent Process Automation (IPA) by incorporating more advanced technologies (Richardson, 2020).

AI has rapidly developed to allow prediction. Such systems can consider large volumes of historical data to recognize patterns and forecast future outcomes, particularly with applications in, for example, demand forecasting and risk management. Anticipating customer behavior, preferences, and purchasing patterns, supporting personalized marketing strategies and increasing satisfaction are enabled at the level of various companies through such *predictive* AI systems. When we discuss supply chain management, *predicative AI* systems optimize inventory, reduce operational inefficiencies, and improve the accuracy of demand forecasting (Ramya, J. *et al.*, 2024).

The implementation has been taken beyond prediction with the advent of *generative* AI, granting systems to learn from massive datasets and developing new, fluent, and context-appropriate content across a variety of domains (Bommasani *et al.*, 2021). Such an approach can acquire an understanding of patterns and structures within training data and generating novel data with new characteristics (Sengar S., *et al.*, 2024).

Recent developments emphasize the appearance of *AI agents* introducing autonomous software systems able of perceiving the environment, analyzing information, and executing actions to achieve defined objectives. The interaction of AI agents with distinctive applications and IT systems has the purpose of taking multiple operational decisions and automating complex workflows. AI agents have emerged from architectures with plain designs to advanced systems integrating learning, planning, and reasoning capabilities, highlighting their potential for adaptive, autonomous behavior in business environments (Bharti, 2025; Kota, 2025).

The results of Ying Mo & all (2026) study show that current models that integrate AI agents into ERP, CRM, and ITIL systems achieve only a 47.6% success rate in complex enterprise tasks, well below human performance. This difference highlights the existence of an “enterprise gap” in the current capabilities of AI agents and suggests the need to develop agents specialized in organizational domains and processes.

The most advanced stage in this evolution is *Agentic AI*, which is characterized by a higher degree of autonomy and strategic planning capacity. Making decisions to achieve organizational objectives and coordinating complex processes, in addition to executing individual tasks, falls within the scope of agentic AI systems. This paradigm highlights emphasizes autonomy, adaptability, and goal-oriented reasoning, facilitating greater involvement in complex operational processes and the strategic decisions of organizations (Bandi, et al., 2025; Pati, A. K., 2025).

This dramatic development in capabilities and technology clearly offers greater opportunities for organizations, but introduces difficulties and risks associated with its introduction into an immature ERP context – the topic of this paper.

ERP as a socio-technical infrastructure and support for AI agents

ERP systems as socio-technical infrastructures integrate technological components, organizational processes and governance structures, providing the efficient synchronization of activities and at enterprise level decision-making process (Stoykova and Shakev, 2023; Klaus, Rosemann and Gable, 2000). From this perspective, ERP serves as a central platform that connects people, processes and technology, providing the necessary framework for the implementation of AI technologies (Krishnan, 2025; Alva and Pandey, 2026).

Data integration backbone

The ERP systems centralize all the data of an organization into a single platform establishing data consistency and accuracy (Russell & Norvig, 2021; Murphy, 2012; Stoykova & Shakev, 2023). The effectiveness of AI technology relies upon the ability to access and interpret a structured and unified knowledge base. Information about the environment must be represented in a coherent and integrated form in such a way as to support the phases of planning, learning and continuous updating of environmental states and for autonomous reasoning and action to take place. These elements support the concept of a backbone in such a way that the centralization, standardization and accessibility of operational and transactional data are so that predictive models and autonomous agents can operate without inconsistencies or redundancies. (Russell and Norvig, 2021).

Process standardization mechanism

Consistency in the execution of organizational activities is ensured by standardizing processes within ERP systems and supports the development of clear and traceable operational workflows, essential for the efficient implementation of AI agents. Nevertheless, such standardization also streamlines the expansion of AI systems and the integration of AI agents without the need for repeated process adjustments. (Krishnan, 2025; Alva & Pandey, 2026).

Governance architecture

The ERP systems set up clear rules for roles, responsibilities and operational policies, composing a technological and organizational governance framework (Stoykova and Shakev, 2023). This framework grants the definition of objectives, limits and success criteria for AI agents, checking the responsible use and compliance with organizational standards. Considering that AI agent systems can make autonomous decisions and align multiple activities, it is essential the proof of a solid governance to avoid compromising the integrity or security of processes (Alva & Pandey, 2026; Sang *et al.*, 2025).

Operational visibility system

Real-time visibility into an organization's operations is provided by ERP systems facilitating performance monitoring and fast identification of deviations (Stoykova and Shakev, 2023). Such visibility facilitates informed decision-making by both humans and AI agents. For AI to become active in decision-making, agents require real-time visibility in order to react to

operational events, and to adjust processes and resources to optimize organizational outcomes (Krishnan, 2025; Alva & Pandey, 2026).

In conclusion, the literature demonstrates two issues of specific concern to this paper. First, the rapid and dramatic developments in AI technology are potentially valuable to organizations while demanding similarly rapid adjustments within their IT resources and practices. Second, that, in particular the maturity of their ERP systems is a critical factor in an organization's ability to implement these AI opportunities.

In this regard, data quality and process maturity are prerequisites. Core dimensions of ERP maturity identified through high-quality, well-governed data and standardized processes are essential components on which the success of AI tools is relying on. (Pohrib, S., Goga, A., & Pîslă, A., 2025; Chockalingam, D. 2025; Karim, M., *et al.*, 2024). In addition, reviews of ML-driven ERP optimization point out that fragmented, low-quality ERP data restricts AI benefits despite strong technical capability (Jawad, Z., & Balázs, V., 2024). Similarly, Enterprise-architecture research finds that the maturity of well-governed core systems is strongly correlated with successful digital transformation and the introduction of AI technologies (Bhagat, S., 2025).

Some initial work that considers an AI-ERP maturity model, is a white paper published in *Industry 4.0 Science* (Grum&Korjahn, 2023). So far as we have been able to ascertain, there has been no work to date that offers a semi-quantitative model for assessing readiness and capability, as we do in this paper.

Methodology

The study adopts a multi-phase exploratory approach, moving from theoretical synthesis to the design and refinement of a conceptual model framework investigating the relation between ERP maturity through specific indicators and five progressive AI capability layers with an assigned formal risk generated based on a proposed formula. This approach is selected as a result based on the integration of autonomous AI agents within ERP ecosystems, which as an emergent phenomenon requires deep contextual understanding and theory-building.

In the first phase, a systematic review of existing literature on ERP evolution (from Transactional to Intelligent ERP) and AI maturity models was undertaken. The review included both academic sources and recent industry reports.

In the second phase, core conceptual dimensions were identified and synthesized. ERP maturity was operationalized through for key dimensions that define the organizational operational coherence. Their five progressive AI layers reflecting increasing levels of delegated autonomy within organizations were described.

The third phase consisted of the design of the conceptual framework. The conceptual model illustrates the interdependent relationship between ERP Maturity and AI capability layers in achieving Business Excellence outcomes. The framework suggests that operational coherence, with layers consisting in visibility, governance, standardization and integration, acts as the structural prerequisite for advancing through stages of delegated autonomy, going from basic automation to agentic AI.

The proposed framework identifies and explains the "Risk Zone" where AI capabilities exceed the ERP maturity of an organization, suggesting that advanced autonomy without a stable operational base lead to instability rather than excellence. The goal of Business Excellence is going to be reached when AI capability and ERP maturity are in equilibrium. True resilience and stability are the products of this alignment, ensuring that delegated autonomy is supported by operational visibility.

In the final phase, a risk assessment model was developed and integrated into the process of assessing the organizational readiness across different levels of AI capabilities.

This methodological approach enables the development of a theoretically sound and managerial applicable framework that can be used to align ERP maturity with AI capability in pursuit of Business Excellence outcomes.

Results and discussions

The Conceptual Model

In this section we introduce our layered conceptual model linking ERP maturity with progressive AI capability levels that can evaluate organizational readiness for enterprise autonomy (Figure 1).

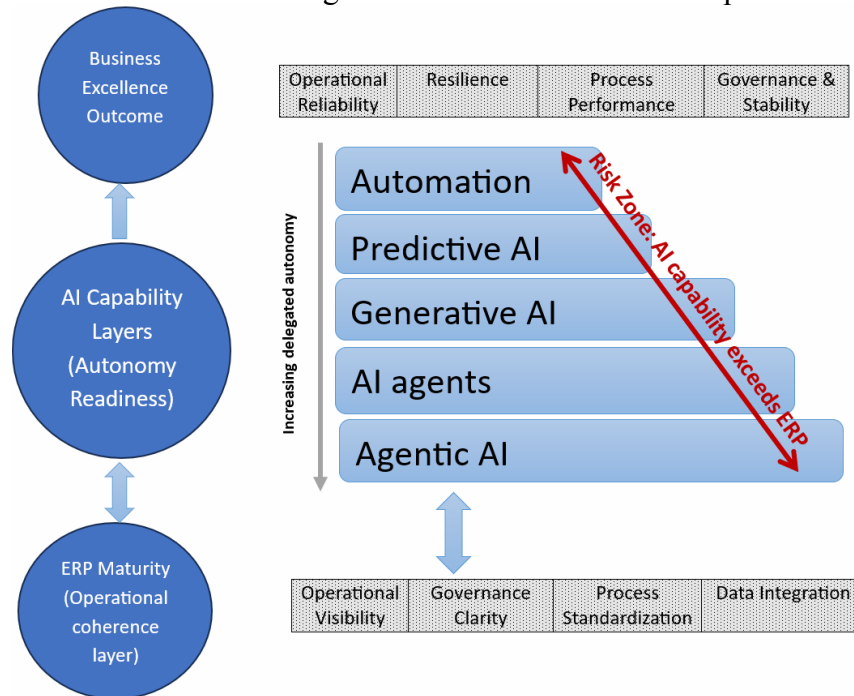


Figure 1. ERP-Enabled Organizational Readiness for AI Agents

Source: Authors' own research.

The model is built on a socio-technical perspective, which assumes that technological capabilities generate value only when aligned with process structures, governance mechanisms, and organizational decision rights. ERP systems are conceptualized as mechanisms that integrate data, standardize processes, and formalize accountability across the enterprise.

ERP Maturity Dimensions

Our model conceptualizes ERP maturity across four dimensions: *Data Integration*, *Process Standardization*, *Governance Clarity*, and *Operational Visibility*. It is these dimensions that determine the level of operational coherence within the organization. Within each of these dimensions, we identify key assessment questions and a set of indicators that relate to those. These are scored to determine an organisation's readiness and capability. The scoring scale lies in the range 0-5, representing the range from total absence of the capability (or fully incompetent on that measure) through to full compliance. The readiness score in each case is computed as a simple average.

Data Integration

Here we need to assess whether enterprise data exists and whether it does so in unified, consistent structures. Do all parts of the organisation operate from a unified master data structure? The relevant indicators here are: (1) there is a single master data model; (2) there is cross-system synchronization; (3) there are levels of data duplication; and (4) there is semantic consistency across all data sources.

Process Standardization

Here we need to assess how consistent business processes are across the organization. Are core operational processes executed through standardized ERP workflows? The relevant indicators here are: (1) there is ERP-driven workflow enforcement; (2) there are documented process models; (3) there is evidence of the rates of process compliance; and (4) there is minimal evidence of local process variation.

Governance Clarity

Here we need to assess whether the institution has clear decision rights and process ownership across systems. Are automated decisions clearly related to existing governance policies? The relevant indicators are: (1) there are defined process owners; (2) the rules for decision making are properly documented; (3) there exist clear escalation protocols to reconcile issues at lower levels; and (4) there are properly documented audit trails.

Operational Visibility

Here we need to assess the organisation's ability to monitor its operations in real time. What time granularity is available to the organisation that enables it to visualise operations across the ERP system? The relevant indicators here are: (1) the proportion of its operations are visible through its ERP dashboards; (2) there is real-time monitoring of all key operations and processes; (3) there are clear integrated performance metrics; and (4) there is low latency between operations and reports.

AI Capability Layers

The model distinguishes five levels of AI capability. At the lowest level we have *Automation*. This covers simple execution based on specific rules. The next level is *Predictive AI*. In other words, the use of AI in making forecasts and providing support for decision making. Moving up to the next higher level we have *Generative AI*. At this point the organisation is using AI directly in the creation of content and in enhancing its productivity. Next, we reach the level of *AI Agents*. At this level the organisation has delegated to the AI the ability to undertake multi-step task execution based specific goals. Finally, at the highest level of AI capability we have *Agentic AI*. The degree of delegation at this level has substantially increased and AI is permitted to self-optimize, adapting goals and execution of tasks based on these, independent of specific human direction.

As an organization moves across these layers, the degree of autonomy delegated to the AI is clearly increasing. Success in the deployment of systems at ever higher layers clearly requires the organisation to have stronger, more robust, and capabilities in its underlying ERP systems.

For each capability layer, the model assigns a formal risk. To do this we first assign a *capability score* to each of the five layers, from 1 for automation to 5 for Agentic AI. Then, under each of the five layers discussed below, we assign a risk as follows:

$$\text{Risk at layer} = (\text{Layer capability score} - \text{average of relevant ERP scores}) + 4$$

The relevant ERP readiness and capability areas are set out in each of the sections that now follow. These may be individual indicators within specific ERP maturity dimensions, or the dimensions themselves.

Risks, in this model range from 0 (lowest risk – *e.g.* layer capability 1 with an ERP competency of 5), through to 9 (highest risk – *e.g.* layer capability 5 with an ERP competency of 0).

Automation

At this basic level, AI is used to performs rule-based operational tasks. Examples of these (which need to be adapted to institutional context in this and all other areas that follow) are invoice processing, scheduling, and reporting. These imply a set of ERP requirements that ensure standardized workflows, structured data, and stable operational rules.

The risk if ERP is immature is that automation simply replicates inefficiencies and does so more broadly and more rapidly.

Predictive AI

This covers the use of AI to forecast outcomes. Examples where this might be deployed include demand forecasting, maintenance prediction and financial forecasting. The implied ERP requirements are historical data consistency, integrated operational datasets and stable measurement definitions.

The risk here is that inconsistent data will produce unreliable predictions. The use of AI will make these even harder to spot.

Generative AI

This is the layer at which AI is used to produce new content or deeper analysis. Examples where AI might be used to generatively are in creating operational recommendations, report generation, and even in customer interaction. The implied ERP requirements would include unified knowledge sources, structured operational documentation and an integrated system context.

At present, AI is capable of generating hallucinations and this will be more likely if knowledge is fragmented. The risk is, clearly, that decision makers have no mechanism for distinguishing sound from absurd recommendations, and that customers may be dealt with inappropriately.

AI Agents

AI executes multi-step tasks across systems. Examples that would require such differentiated tasks are in automated procurement, supply chain coordination, and finance reconciliation. The implied ERP requirements are clear process boundaries, machine-readable workflows and governance controls.

Because the use of agents implies a number of process cascades (possibly iterative and therefore unbounded), there is a risk for cumulative error propagation and amplification if this is not mediated by controlled and reliable ERP at each step.

Agentic AI

AI makes strategic or adaptive operational decisions. Examples where agents might be delegated responsibility for action would include areas such as dynamic supply chain reconfiguration, autonomous planning, and multi-system coordination. The implied ERP requirements here strongly include highly integrated operational systems, real-time data flows and strong governance frameworks

The degree of delegation at this level is so extreme that the organization risks its entire business model to instabilities that will arise if autonomy exceeds control.

Conclusion

This paper discusses the relationship between ERP system maturity and the increasing complexity of AI within organizations and proposes a conceptual framework that will allow managers to assess readiness for AI integration within their organizations. The framework functions as a diagnostic tool that analyzes the dimensions of ERP system maturity (integration, process standardization, governance clarity, and real-time operational visibility) through specific indicators and provides a risk-based assessment of the organization's preparedness for introducing AI across a range of complexity.

The proposed model assigns a formal AI implementation risk, calculated for each of the five layers of AI capabilities, based on an AI layer capability score and the average of the scores of the most relevant indicators for assessing ERP maturity.

Alignment between AI capability and ERP maturity is central to a responsible approach to the introduction of AI of any kind. Successful AI implementation depends crucially on the structural maturity of enterprise infrastructures, especially on the maturity of ERP systems. Organizations must, therefore, co-evolve ERP maturity and AI capability level to avoid either the premature implementation of AI, leading to organizational and operational chaos, or the possible underutilization of existing robust digital infrastructure, leading to lost value and missed opportunities for automation. Our risk-based assessment provides a tool to avoid either eventuality.

In the future, we aim to undertake an empirical examination of specific organisations that are at different stages of ERP maturity, and to then assess how those levels of maturity relate to their current or future introduction of AI. As organisations continue to develop along these lines, the distinction between underlying ERP systems and AI systems will likely blur. Tracking and understanding this will also be an important line of future enquiry.

A less technical, but nevertheless important avenue for further examination relates to organisations' governance mechanisms, and the ways in which these respond and adjust to increasingly levels of decision-making delegation to AI systems. Indeed, understanding the conditions under which autonomy leads to responsible decision-making is essential. The ways in which such ERP systems might develop in response to the introduction of AI is also an important avenue for future research.

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