Managing Resistance to Change as Strategic Risk in Digital Transformation

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ABSTRACT

Digital transformation has become an important part of organizational strategy, bringing changes to business processes, organizational structures, and the way employees perform their activities. Although digital technologies offer opportunities for innovation and improved performance, their implementation also involves technological, organizational, and human-related risks. Resistance to change is particularly relevant in this context, as it can delay technology adoption, disrupt implementation processes, and affect the achievement of strategic objectives. This study examines the evolution and main research directions of the literature addressing resistance to change as a strategic risk in digital transformation. The research is based on a bibliometric analysis of 229 English-language articles and proceedings papers published between 1998 and 2026, retrieved from the Web of Science database provided by Clarivate. Biblioshiny was used to analyse publication and citation trends, the most relevant publication sources, keyword co-occurrence, thematic evolution, collaboration networks, and co-citation relationships. The results show a considerable increase in scientific publications after 2020, with particularly strong growth from 2023 onward. The analysis also identifies several closely related research themes, including organizational change, technology adoption, employee adaptation, and risk management. These findings highlight the importance of considering employee resistance alongside technological and organizational risks when examining digital transformation. The study provides an overview of the development of this research area and identifies opportunities for further investigation into the relationship between resistance to change, strategic risk management, and organizational transformation.

KEYWORDS: *digital transformation, employee resistance, strategic risk, change management, technology adoption.*

JEL CLASSIFICATION: *G32, M15, O33.*

1. INTRODUCTION

Digital transformation has become an important component of organizational strategy, requiring changes in established processes, working practices, and organizational capabilities. Its implementation extends beyond technological adoption and involves broader adjustments

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in how organizations operate and respond to competitive pressures (Hanelt et al., 2021). However, the expected benefits of digital initiatives also depend on employees' willingness and ability to adapt.

Resistance may emerge when new technologies disrupt familiar routines, alter professional responsibilities, or create uncertainty about future working conditions (Cieslak & Valor, 2025). Increasing technological demands can also generate stress and contribute to negative employee responses, particularly when appropriate support is lacking (Bausch et al., 2024). These reactions are shaped not only by individual attitudes but also by the organizational environment in which change occurs.

Managerial behaviour plays an important role in this process. Leadership that combines a clear orientation towards transformation with attention to employees can encourage more favourable responses to change (Weber et al., 2022). Employee perceptions may nevertheless evolve during implementation as individuals experience the practical consequences of new technologies (Van der Schaft et al., 2024). Moreover, the ability to manage competing demands between established practices and new organizational requirements may influence the acceptance of digital transformation strategies (Klein et al., 2024).

When resistance affects technology adoption, implementation schedules, or organizational adaptation, its consequences may extend beyond operational difficulties. Employee participation and learning opportunities can help address these challenges (Valtonen & Holopainen, 2025), while the relationship between resistance, digital transformation, and financial and operational risk management has also attracted research attention (Slassi-Sennou & Elmouhib, 2025). Resistance may therefore represent a strategic concern when it threatens the achievement of important transformation objectives.

The present study examines how research on resistance to change intersects with digital transformation and strategic risk. Through a bibliometric perspective, it seeks to clarify the development of this literature, its main thematic connections, and directions for future investigation.

2. LITERATURE REVIEW

2.1 Digital Transformation as Strategic and Organizational Change

Digital transformation has progressively moved beyond the adoption of individual information technologies and has become embedded in organizational strategy, business models, value creation, and competitive positioning (Bharadwaj et al., 2013; Vial, 2019). The increasing integration of digital technologies into products, services, processes, and relationships has reduced the traditional separation between information technology strategy and business strategy, resulting in what Bharadwaj et al. (2013) describe as digital business strategy. Digital transformation strategies consequently involve not only choices regarding technologies but also decisions concerning changes in value creation, organizational structures, and financial arrangements (Matt et al., 2015).

This broader perspective distinguishes digital transformation from narrower processes such as digitization and digitalization, which primarily concern the conversion of information or the application of digital technologies to existing activities (Verhoef et al., 2021). Digital transformation involves more extensive modifications to business models, organizational structures, resources, capabilities, and value-creation mechanisms (Verhoef et al., 2021). Vial (2019) similarly conceptualizes digital transformation as a process in which digital technologies create disruptions that trigger strategic organizational responses, structural changes, and modifications to organizational value-creation paths.

The strategic nature of this process is also reflected in the dynamic-capabilities perspective, according to which organizations must continuously adapt their resources and competencies to changing technological and competitive conditions (Warner & Wäger, 2019). Digital transformation involves capabilities for sensing digital developments, seizing emerging opportunities, and transforming existing organizational resources, while entrepreneurial roles, digital culture, and external partnerships support this process of strategic renewal (Warner & Wäger, 2019).

Such strategic renewal processes impose significant demands on organizational structures and employees because digital technologies frequently require new skills, work arrangements, responsibilities, and forms of coordination (Hoyer et al., 2020; Nadeem et al., 2024). Industry 4.0 implementation, for example, depends on technological infrastructure alongside organizational strategy, leadership, workforce competencies, and organizational culture (Hoyer et al., 2020). Digital transformation therefore takes place through interactions between technological innovation and organizational adaptation rather than through technological change in isolation (Vial, 2019; Hanelt et al., 2021).

The introduction of digital technologies can also create competing organizational requirements that are difficult to reconcile simultaneously (Dieste et al., 2022). Industry 4.0 implementation generates tensions associated with organizational learning, work organization, employee belonging, identity, and performance, requiring organizations to balance technological objectives with human and organizational considerations (Dieste et al., 2022). Such tensions become particularly relevant when employees must adapt established routines and competencies while organizations simultaneously pursue efficiency, innovation, flexibility, and performance objectives (Dieste et al., 2022; Nadeem et al., 2024).

Changes in employees' jobs represent an important component of technology-driven organizational transformation because major information systems can alter both job demands and employees' perceptions of control over their work (Bala & Venkatesh, 2013). Digital transformation has similarly been associated with changes in autonomy, engagement, self-efficacy, resilience, job satisfaction, psychological capacities, and affective commitment (Nadeem et al., 2024). Employee reactions to digital transformation therefore emerge within a broader transformation of work rather than solely from attitudes toward individual technological tools (Bala & Venkatesh, 2013; Nadeem et al., 2024). The strategic and organizational scope of digital transformation also increases the importance of successful implementation because transformation investments are expected to produce economic, operational, and competitive benefits rather than merely technological improvements (Matt et al., 2015; Warner & Wäger, 2019). Industry 4.0 implementation is nevertheless exposed to uncertainty concerning investment requirements, economic benefits, organizational readiness, workforce capabilities, and implementation delays (Ghadimi et al., 2022). Digital transformation consequently combines strategic opportunities with substantial technological, organizational, financial, and human challenges (Ghadimi et al., 2022; Vial, 2019).

2.2 Resistance to Change in Digital Transformation

Resistance to technology-driven change has long been recognized as a complex organizational response rather than as simple unwillingness to use a new system (Lapointe & Rivard, 2005; Beaudry & Pinsonneault, 2005). Resistance develops through employees' interpretations of technological change, particularly when new technologies are perceived as threatening existing resources, routines, working conditions, roles, or organizational relationships (Lapointe & Rivard, 2005). Employee responses are therefore shaped by the meaning attributed to technological change and by assessments of its expected consequences (Beaudry

& Pinsonneault, 2005). The multilevel model developed by Lapointe and Rivard (2005) demonstrates that perceived threats represent a central mechanism through which resistance develops during information-technology implementation. Individual reactions can evolve into collective resistance when perceptions of technological threats become shared among organizational members, meaning that initially localized resistance can develop into a broader organizational phenomenon (Lapointe & Rivard, 2005). The object and intensity of resistance can also change during implementation as employees gain experience with the technology and reinterpret its consequences (Lapointe & Rivard, 2005).

A complementary explanation is provided by coping theory, which emphasizes employees' evaluations of technological events and their capacity to respond to them (Beaudry & Pinsonneault, 2005). Users assess whether a technological change represents an opportunity or a threat and whether they possess sufficient control over its consequences, with these evaluations producing different adaptation and coping responses (Beaudry & Pinsonneault, 2005). Resistance can consequently be associated with perceived loss of control or unfavorable expectations concerning the consequences of transformation rather than with opposition to technology itself (Beaudry & Pinsonneault, 2005). Status quo bias provides another explanation for resistance by emphasizing the costs associated with abandoning established working practices (Kim & Kankanhalli, 2009). Perceived switching costs increase resistance to new information systems, whereas perceived value and organizational support for change reduce resistance (Kim & Kankanhalli, 2009). Employees may therefore resist when perceived switching costs are high or when the perceived value of the new system is insufficient to compensate for the transition from existing practices (Kim & Kankanhalli, 2009).

These mechanisms remain evident in more recent digital-transformation and Industry 4.0 environments, although the scale and intensity of technological change introduce additional sources of resistance (Ito et al., 2021; Cieslak & Valor, 2025). Resistance to Industry 4.0 technologies has been associated with feelings of excessive supervision, unclear technological value, perceived inadequacy, increased workload, and concerns about losing jobs or organizational power (Ito et al., 2021). These factors demonstrate that employee resistance can originate simultaneously from the technological characteristics of new systems and from their expected consequences for work and employment (Ito et al., 2021). Job vulnerability has emerged as a particularly important explanation for resistance in contemporary digital transformation (Cieslak & Valor, 2025). Employees may resist digital transformation when technological change is perceived as threatening valued job resources and increasing their perceived job vulnerability (Cieslak & Valor, 2025). Such perceptions make resistance closely connected to employees' expectations concerning how the benefits and costs of transformation will be distributed within the organization (Cieslak & Valor, 2025).

The continuous character of digital transformation also means that employee adaptation cannot be treated as a one-time response occurring only during initial technology introduction (Hanelt et al., 2021). Resistance can change as employees acquire experience, observe consequences, reassess perceived threats, and respond to subsequent stages of technological and organizational transformation (Lapointe & Rivard, 2005). Continuous digital transformation may therefore expose employees to repeated adaptation requirements that interact with competence demands, perceived risk, and change fatigue (Hanelt et al., 2021; Zhao et al., 2026).

2.3 Risk and Strategic Risk in Digital Transformation

The increasing technological interconnectedness associated with digital transformation has expanded the range and complexity of risks faced by organizations (Tupa et al., 2017; Lee, 2021). Industry 4.0 connects people, machines, information systems, infrastructure, and organizational processes, creating dependencies through which disruptions in one component can generate consequences elsewhere in the organizational system (Tupa et al., 2017). Risk management in digitally transformed environments therefore extends beyond isolated technological failures toward interconnected organizational and technological exposures (Tupa et al., 2017). Cybersecurity constitutes one of the most visible forms of digital risk because greater dependence on cloud technologies, interconnected systems, mobile applications, and digital infrastructure increases exposure to cyber threats (Lee, 2021). Cybersecurity risk management consequently requires risk assessment, investment decisions, and continuous improvement processes rather than purely reactive technical measures (Lee, 2021). Digital transformation also increases the importance of cybersecurity for organizational resilience because disruptions to interconnected digital processes can affect continuity and performance across the organization (Saeed et al., 2023).

Cybersecurity increasingly intersects with broader organizational risk management objectives rather than remaining confined to information-technology departments (Türegün, 2025). Alignment between cybersecurity practices and wider risk management objectives improves organizational capacity to manage digital risk, while severe cybersecurity incidents can have negative financial consequences (Türegün, 2025). The financial and strategic implications of cybersecurity consequently make digital risk relevant beyond technical system protection (Lee, 2021; Türegün, 2025). Digital-transformation risk is nevertheless broader than cybersecurity because transformation involves organizational and human changes alongside technological innovation (Gabriel et al., 2021; Menzefricke et al., 2021). Gabriel et al. (2021) identify technological, organizational, and employee-related risks during Industry 4.0 implementation and incorporate all three dimensions into a socio-technical risk framework. Employee capabilities and organizational conditions are therefore treated as potential sources of implementation risk alongside technological weaknesses (Gabriel et al., 2021).

Digital transformation also alters operational risk after technologies have been implemented (Uddin et al., 2023; Yin et al., 2024). In banking, digital transformation changes operational-risk exposure through increased business volume, system dependence, process changes, and internal and external security disruptions (Uddin et al., 2023). Digitalization can simultaneously reduce some forms of operational risk through improved information processing and internal control, illustrating that its risk effects depend on organizational conditions and implementation mechanisms (Yin et al., 2024). These findings are particularly relevant because digital transformation itself has become embedded in strategic renewal and competitive adaptation (Bharadwaj et al., 2013; Warner & Wäger, 2019). Decisions concerning digital transformation influence value creation, organizational structures, technological capabilities, and financial resources, while their outcomes can affect the organization's competitive trajectory (Matt et al., 2015). Risks capable of disrupting transformation therefore have implications that extend beyond operational implementation when transformation initiatives support major strategic objectives (Matt et al., 2015; Warner & Wäger, 2019).

Organizational culture and risk culture further influence how these risks are understood and managed (Butler & Brooks, 2024). Rapid technological innovation can expose weaknesses in conventional operational-risk practices when organizations rely on fragmented models that inadequately capture behavioral, cultural, and organizational dimensions (Butler & Brooks, 2024). Digital risk management therefore increasingly requires attention to organizational

behavior and governance alongside technical risk controls (Butler & Brooks, 2024; Gabriel et al., 2021).

2.4 Resistance to Change as a Strategic Risk in Digital Transformation

The human and organizational sources of digital-transformation risk identified in socio-technical research overlap substantially with the mechanisms that generate employee resistance (Gabriel et al., 2021; Ito et al., 2021). Employee competence, perceived technological value, organizational support, changing work demands, and uncertainty influence employee responses to transformation while also affecting the conditions under which digital initiatives are implemented (Ito et al., 2021; Valtonen & Holopainen, 2025). Resistance therefore develops within the same socio-technical environment in which implementation risks arise (Gabriel et al., 2021; Menzefricke et al., 2021).

Competence provides a direct example of this relationship because insufficient workforce skills represent both an implementation concern and a source of employee resistance (Ghadimi et al., 2022; Zhao et al., 2026). Shortages of suitable talent increase the risk associated with Industry 4.0 implementation, while lower digital competence increases employee resistance during digital transformation (Ghadimi et al., 2022; Zhao et al., 2026). Digital-literacy interventions can reduce technostress and resistance, indicating that capability development can simultaneously address human adaptation difficulties associated with transformation (Bausch et al., 2024).

Perceived risk also directly influences employee reactions to digital transformation (Zhao et al., 2026). Employees who perceive greater technological uncertainty can experience anxiety and reduced confidence in their ability to manage transformation demands, while stronger digital competence can reduce the extent to which these perceptions develop into resistance (Zhao et al., 2026). Resistance therefore responds not only to objective technological conditions but also to employees' interpretations of uncertainty and their perceived ability to cope with it (Beaudry & Pinsonneault, 2005; Zhao et al., 2026). Employment uncertainty represents another important overlap between resistance and transformation risk (Ito et al., 2021; Cieslak & Valor, 2025). Employees may resist Industry 4.0 technologies because of fears concerning job loss, loss of organizational power, increased surveillance, or greater workload (Ito et al., 2021). Perceived job vulnerability similarly increases resistance when employees expect digital transformation to threaten valued employment resources or professional conditions (Cieslak & Valor, 2025).

Resistance generated by such concerns can extend beyond isolated individual attitudes because shared interpretations of technological threats can produce collective organizational responses (Lapointe & Rivard, 2005). Collective resistance becomes particularly significant when organizational groups delay adoption, maintain previous routines, or challenge changes required for technological implementation (Lapointe & Rivard, 2005; Berente et al., 2019). Institutional conflicts can further sustain resistance where new digital systems challenge established professional norms, authority structures, or organizational identities (Berente et al., 2019). Digital transformation can intensify these tensions because it often requires changes to organizational identity and value propositions rather than only incremental adjustments to existing processes (Wessel et al., 2021). Resistance rooted in institutional or identity-related concerns may therefore be more difficult to manage through technical training alone because the underlying conflict concerns how work and organizational roles are understood (Berente et al., 2019; Wessel et al., 2021). Participation and communication become particularly important in such circumstances because they allow employees to engage

with the organizational implications of transformation rather than merely learn how to operate a new technology (Ito et al., 2021; Valtonen & Holopainen, 2025).

Resistance can also affect transformation through delays and incomplete adoption, both of which influence the realization of expected organizational benefits (Lapointe & Rivard, 2005; Ghadimi et al., 2022). Implementation delays constitute a significant Industry 4.0 risk because they increase uncertainty concerning costs, returns, and organizational outcomes (Ghadimi et al., 2022). Resistance that intensifies or spreads collectively during implementation can therefore interact with risks associated with project timing and organizational adoption (Lapointe & Rivard, 2005; Ghadimi et al., 2022). The economic consequences become especially relevant when transformation requires substantial capital investment and is expected to produce strategic value (Matt et al., 2015; Ghadimi et al., 2022). Digital-transformation strategies include financial considerations and changes in organizational value creation, while uncertainty concerning economic benefits represents a significant implementation risk (Matt et al., 2015; Ghadimi et al., 2022). Employee resistance that reduces adoption or slows organizational adaptation can consequently affect the conditions under which expected transformation benefits are realized (Valtonen & Holopainen, 2025; Slassi-sennou & Elmouhib, 2025).

Digital transitions inevitably reshape daily workflows, creating operational vulnerabilities throughout the organization. Resistance can complicate these changes when employees retain previous routines, underutilize new systems, or experience difficulty adapting to new digitally enabled processes (Lapointe & Rivard, 2005; Slassi-sennou & Elmouhib, 2025). Internal organizational conditions consequently influence both employee responses to transformation and the operational-risk outcomes associated with digitalization (Kim & Kankanhalli, 2009; Yin et al., 2024). Therefore, failing to manage employee adaptation can transform routine operational friction into broader strategic exposure.

Organizational support represents one such condition because it reduces resistance by lowering perceived transition difficulties and strengthening employee confidence in the change process (Kim & Kankanhalli, 2009). Organizational support also shapes the relationship between psychological antecedents and resistance during digital transformation, particularly in relation to perceived risk, anxiety, change fatigue, and digital competence (Zhao et al., 2026). Supportive organizational conditions can therefore influence how uncertainty is translated into employee behavior during transformation (Kim & Kankanhalli, 2009; Zhao et al., 2026). Communication and participation similarly affect the development of resistance by improving employees' understanding of technological value and increasing their involvement in implementation decisions (Ito et al., 2021; Valtonen & Holopainen, 2025). Employee participation can reduce resistance associated with uncertainty and loss of control, while communication can address unclear expectations concerning technologies and their organizational consequences (Ito et al., 2021). Learning interventions further reduce resistance by strengthening the capabilities employees require to operate within transformed digital environments (Valtonen & Holopainen, 2025).

These mechanisms become strategically significant because digital transformation increasingly represents a process of organizational renewal rather than a peripheral technology project (Bharadwaj et al., 2013; Warner & Wäger, 2019). Digital-transformation strategies influence organizational value creation, structures, financial allocations, and technological capabilities, making implementation outcomes relevant to broader organizational objectives (Matt et al., 2015). Resistance that affects implementation, capability development, technology utilization, or organizational adaptation can consequently interact with risks surrounding those strategic objectives (Gabriel et al., 2021; Slassi-sennou & Elmouhib, 2025). Resistance can influence this strategic context because successful digital

renewal depends on organizational capabilities and employee adaptation as well as on technological investment (Warner & Wäger, 2019; Hanelt et al., 2021). Digital competence reduces resistance, while talent shortages increase implementation risk, making workforce capabilities relevant to both employee adaptation and transformation performance (Ghadimi et al., 2022; Zhao et al., 2026). Change fatigue and technology anxiety further complicate continuous transformation by increasing the likelihood of resistance during repeated organizational change (Zhao et al., 2026). The continuous nature of digital transformation also requires resistance-related risks to be understood dynamically rather than as conditions confined to the beginning of implementation (Hanelt et al., 2021; Lapointe & Rivard, 2005). Resistance evolves as employees reinterpret technological consequences and can change in intensity and collective scope throughout implementation (Lapointe & Rivard, 2005). Digital transformation simultaneously requires continuing reconfiguration of organizational capabilities, meaning that employee adaptation remains relevant beyond initial technology adoption (Warner & Wäger, 2019).

Socio-technical risk approaches provide a framework for considering these changing interactions because they explicitly incorporate technological, organizational, and human dimensions within the same risk environment (Gabriel et al., 2021; Menzefricke et al., 2021). Employee-related conditions can create risks independently or through interactions with technologies and organizational structures, making resistance relevant where it affects transformation objectives or implementation processes (Gabriel et al., 2021). Interactions among technical requirements, organizational conditions, and human capabilities can generate additional risks that remain invisible when these dimensions are considered separately (Menzefricke et al., 2021). Managing resistance within digital transformation therefore involves addressing its underlying technological, psychological, organizational, and institutional antecedents rather than merely responding to visible opposition (Berente et al., 2019; Cieslak & Valor, 2025). Competence development addresses resistance associated with inadequate skills and technology anxiety, while communication and participation respond to uncertainty, unclear value, and perceived loss of control (Ito et al., 2021; Zhao et al., 2026). Organizational support can further reduce perceived transition costs and strengthen employees' capacity to adapt to new systems and processes (Kim & Kankanhalli, 2009). In this way, resistance to change represents a strategic risk that requires a comprehensive organizational response rather than isolated technical measures.

3. RESEARCH METHODOLOGY

The study employed a bibliometric research design to examine the development and intellectual structure of the literature connecting digital transformation, risk and strategic risk, and resistance to change. Bibliometric analysis provides a systematic quantitative approach for examining large bodies of scientific literature and for identifying patterns in scientific production, citation activity, conceptual structures, and relationships among publications, journals, and research themes (Donthu et al., 2021; Zupic & Čater, 2015).

The bibliographic data were retrieved from the Web of Science Core Collection (WoS). Web of Science was selected because it represents one of the major citation databases used in bibliometric research and provides structured information suitable for bibliometric and citation analyses (Mongeon & Paul-Hus, 2016). The search strategy was developed around the three conceptual cores of the study: digital transformation, risk and strategic risk, and resistance to change. The final search query was:

(("digital transformation" OR "digitali?ation" OR "digital transition" OR "technological change" OR "digital technolog*" OR "digital change" OR "digiti?ation" OR "technolog*

transition" OR "digital reinvention" OR "digital renewal" OR "digital adoption" OR "technolog* adoption" OR "digital implementation" OR "technolog* implementation" OR "digital integration" OR "technolog* integration" OR "digital migration" OR "technolog* migration") AND ("risk*" OR "strategic decision*" OR "organi?ational risk*" OR "strategic risk*" OR "risk management" OR "risk governance" OR "risk event*" OR "risk factor*" OR "risk assessment" OR "risk evaluation" OR "risk control" OR "risk identification" OR "strategic threat*" OR "strategic uncertaint*" OR "strategic vulnerabilit*" OR "enterprise risk*" OR "operational risk*" OR "institutional risk*" OR "digital risk*" OR "technolog* risk*" OR "digitali?ation risk*" OR "digitiation risk" OR "implementation risk*" OR "transformation risk*" OR "innovation risk*" OR "change risk*" OR "IT risk*") AND ("resistance to change" OR "change management" OR "employee resistance" OR "user resistance" OR "organi?ational inertia" OR "human barrier*" OR "behavioral resistance" OR "change resistance" OR "organi?ational resistance" OR "technolog* resistance" OR "innovation resistance" OR "organi*ational change" OR "staff resistance" OR "personnel resistance" OR "opposition to change" OR "rejection of change" OR "change rejection" OR "refusal to change" OR "innovation rejection" OR "technology rejection" OR "reluctance to change" OR "unwillingness to change"))

The query was intentionally broader than the exact terminology used in the article title because relevant studies do not necessarily employ the expressions “digital transformation,” “strategic risk,” and “resistance to change” simultaneously. Bibliometric research requires careful identification of search terms and boundaries because the quality and representativeness of the resulting dataset depend directly on the retrieval strategy used to construct it (Zupic & Čater, 2015; Donthu et al., 2021). Research addressing digital transformation can instead use related terms such as digitalization, technological transition, digital adoption, technological implementation, or digital integration, while resistance can appear under concepts such as user resistance, organizational inertia, human barriers, innovation resistance, change management, or reluctance to change. A broad but conceptually bounded query reduces the probability of excluding relevant publications solely because authors use different terminology for closely related phenomena, while maintaining the three conceptual components required by the research topic (Donthu et al., 2021).

Application of the search query in Web of Science initially returned 255 records. The initial set was subsequently refined according to document type and language in order to create a more homogeneous dataset suitable for bibliometric analysis. Dataset definition and refinement constitute important stages in bibliometric research because subsequent performance and science-mapping results depend directly on the documents retained for analysis (Zupic & Čater, 2015; Donthu et al., 2021).

Only records classified as Articles and Proceedings Papers were retained. Articles were selected because they represent original scholarly research published through established academic outlets and constitute one of the principal research document types indexed in Web of Science (Clarivate, 2026). Proceedings Papers were retained because research on digital transformation, technological adoption, Industry 4.0, and emerging digital technologies is also disseminated through conference proceedings, and excluding them could remove relevant contributions from technologically oriented fields. The dataset was further restricted to publications written in English. This criterion was applied to maintain linguistic consistency in keyword, title, abstract, and thematic analyses and to reduce the effects of language variation on term co-occurrence and conceptual mapping.

Following the application of the document-type and language criteria, 229 records remained and constituted the final dataset used for the bibliometric analysis. No additional temporal restriction was imposed because the purpose was to capture the complete development of the

topic from its earliest indexed appearance to the most recent publications available at the time of data collection. The resulting temporal coverage begins in 1998 and extends through 2026, as reflected in the annual scientific-production analysis.

After refinement, the bibliographic records were exported from Web of Science for processing in Biblioshiny, the graphical interface of the R package bibliometrix. Bibliometrix was specifically developed as an open-source R environment for comprehensive bibliometric and science-mapping analysis and supports bibliographic records retrieved from Web of Science (Aria & Cuccurullo, 2017). Biblioshiny provides an interactive interface to bibliometrix and supports descriptive bibliometric indicators, citation analysis, co-word analysis, thematic mapping, thematic evolution, co-citation analysis, and relational visualizations (Aria & Cuccurullo, 2017).

The Web of Science records were exported with the bibliographic information required for the analyses, including authors, document titles, publication years, source titles, abstracts, author keywords, Keywords Plus where available, cited references, affiliations, countries, document types, and citation counts. Retaining cited-reference and keyword information was particularly important because the analytical design included both conceptual-structure analysis and intellectual-structure analysis, which require relational bibliographic metadata in addition to basic publication information (Zupic & Čater, 2015).

Before analysis, the exported records were inspected for consistency in bibliographic fields and terminology. Data preparation and preprocessing are important components of bibliometric analysis because inconsistencies in bibliographic metadata and term variants can create artificial fragmentation in networks and thematic structures (Moral-Muñoz et al., 2020). Terminological normalization is particularly relevant for co-word and thematic analyses because these methods construct conceptual relationships from the frequency and joint occurrence of terms (Callon et al., 1991; Cobo et al., 2011).

4. FINDINGS AND DISCUSSIONS

The results of the current paper about the risk of resistance to change in the digital age are illustrated below through tables and figures. First of all, Figure 1 shows the annual progression of scientific publications and citation dynamics from 1998, the year the concepts emerged, through 2026. The temporal distribution reveals an emergent, two-stage developmental trajectory. Throughout the initial two decades, research remained fragmented and quite limited, characterized by only a few outputs. A massive acceleration is observed after 2020, transitioning into an exponential expansion from 2023 onward. The highest peak occurred in the current year (2026), with 68 publications. The remarkable growth in recent years may be the result of the COVID-19 pandemic, which accelerated the development of digital transformation (Firican, 2023). Given the environmental instability of that period, organizations had to adapt and shift from digitization to strategic-level digital transformation (Popa et al., 2024).

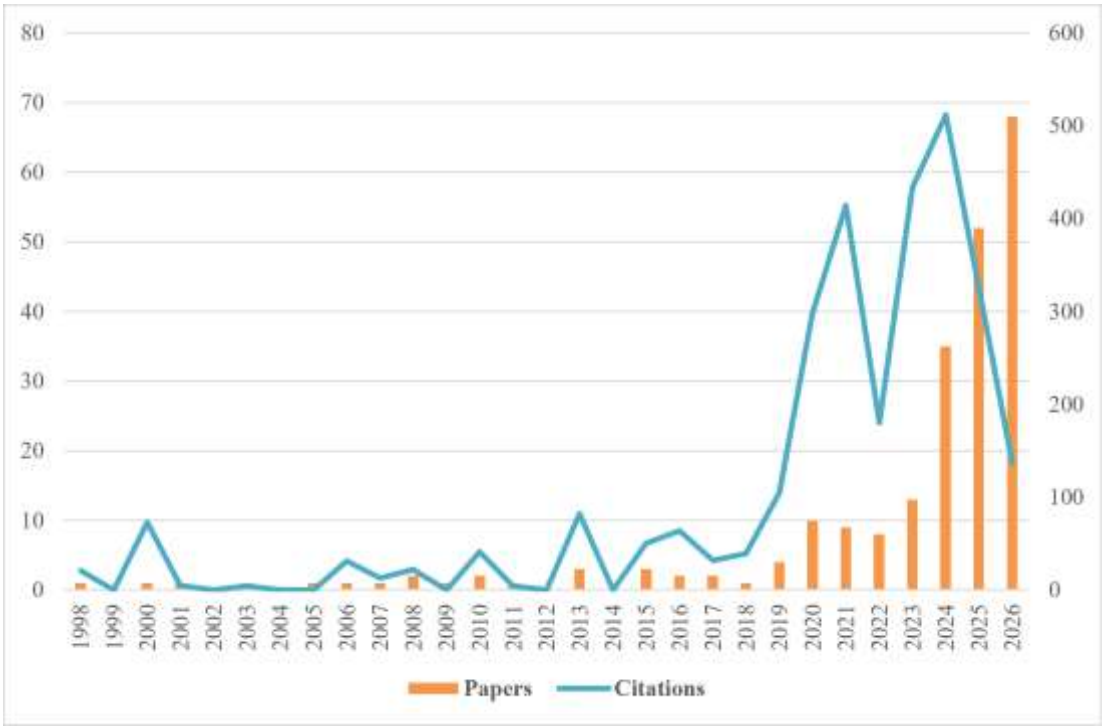


Figure 1. The evolution of papers and citations on digital transformation, strategic risk, and resistance to change

Source: authors, based on WoS data

Furthermore, the volume of citations has shown rapid growth, exceeding 500 citations in 2024. This intense accumulation in citations may reflect the concept's importance as a determinant of organizational efficiency (Zhao et al., 2024). Regarding citation dynamics, two declines can be observed. First, the drop between 2021 and 2022 has appeared because 2021 included a few exceptionally cited papers, while academic publishing faced temporary slowdowns right after the pandemic (Popa et al., 2024). Second, the decline in 2025–2026 can be normal because newly published papers simply need more time to be read and cited by other researchers (Dragomir & Ciocoiu, 2025). Moreover, the record number of publications in 2026 can show that how employees adapt to digital tools is a topic of growing interest (Mojoiu et al., 2026). This growth reflects the fact that digital transformation extends beyond formal operational changes and fundamentally affects organizational structures, routines, and identity (Wessel et al., 2021; vom Brocke et al., 2021). Wessel et al. (2021) distinguish digital transformation from conventional IT-enabled organizational transformation by showing that digital transformation can redefine both an organization's value proposition and its identity. Technology-driven organizational transformation can therefore alter not only how activities are performed but also how organizations understand their purpose, capabilities, and relationships with their environments (Wessel et al., 2021).

Presented in Figure 2 is the conceptual structure of the analyzed field, derived from the co-occurrence network of authors' keywords. It is notable that the research field was divided into three clusters connected by bridges. The first and most prominent cluster (red) represents the organizational and strategic dimension of the domain, anchored by digital transformation, change management, management, and artificial intelligence. This result may reflect that a digital adaptation requires prepared management to address strategic and operational risks (Tohănean et al., 2020). The next cluster (blue), in terms of both order and size, is represented by the behavioral and psychological factors, centering on technology adoption, user

acceptance, and resistance to change. More specifically, employee hesitation may stem from certain psychological obstacles, such as perceived risks and work routines (Ajina et al., 2024). In this context, resistance develops through interacting individual, organizational, and technological factors rather than through a single cause (Valtonen & Holopainen, 2025). Learning, communication, and employee participation have been identified as important mechanisms for reducing resistance during digital transformation because they improve understanding, capabilities, and involvement in transformation processes (Valtonen & Holopainen, 2025). Similar mechanisms have been identified in Industry 4.0 implementation, where communication, participation, and training reduce resistance associated with uncertainty, inadequate competence, and unclear technological value (Ito et al., 2021). The structural connection between these technical and human dimensions reflects a broader theoretical consideration. A socio-technical perspective emphasizes that risks can originate not only within individual technological, organizational, or human dimensions but also from interactions among them (Menzefricke et al., 2021). Risk management approaches that assess these dimensions separately may overlook risks generated when technological requirements conflict with organizational structures or employee capabilities (Menzefricke et al., 2021). Digital transformation consequently requires risk assessment that considers dependencies between technologies, organizational arrangements, and human behavior (Gabriel et al., 2021; Menzefricke et al., 2021). Implementation risk represents a particularly relevant category because transformation projects require substantial organizational investment before expected benefits can be realized (Ghadimi et al., 2022). Major Industry 4.0 risks include inadequate standards and methodologies, investment uncertainty, shortages of appropriately skilled employees, uncertain economic benefits, and implementation delays (Ghadimi et al., 2022). These risk factors demonstrate that unsuccessful transformation can result from organizational and human limitations even when the underlying digital technologies are technically viable (Ghadimi et al., 2022). The third cluster (green) emerges at the bottom of the network, connecting supply chain, circular economy, and blockchain technology. This smaller cluster illustrates the applied operational context, showing that digital tools are frequently deployed to support sustainable and resilient operations across supply networks (Liu et al., 2026).

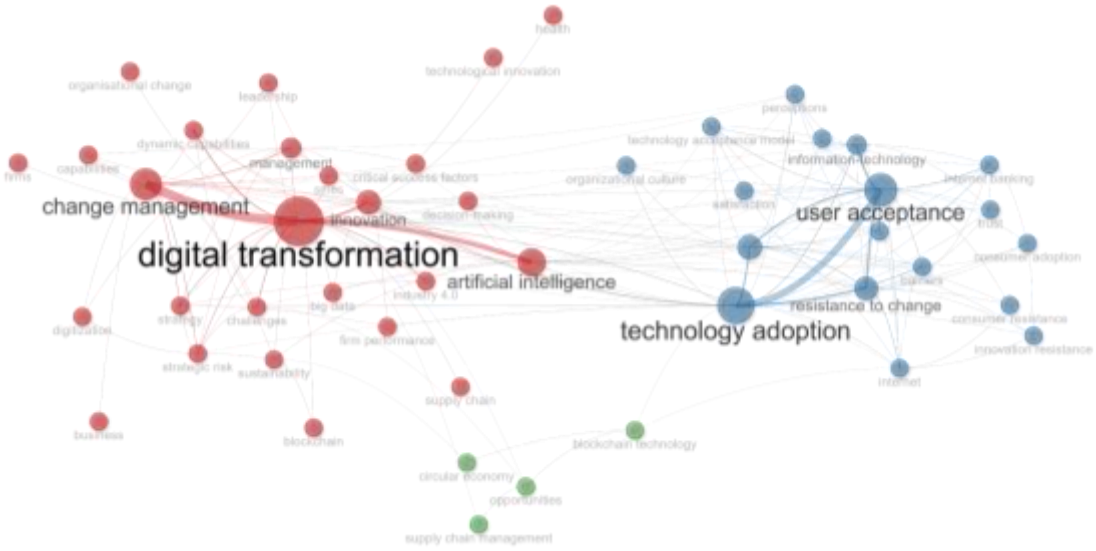


Figure 2. Keyword co-occurrence network on digital transformation, strategic risk, and resistance to change

Source: authors with Biblioshiny, based on WoS data.

Regarding the thematic evolution of the analyzed field, it can be observed in Figure 3. The analysis was conducted across three distinct time slices: 1998-2009, 2010-2020, and 2021-2027 to capture how technologies have evolved from limited operational implementations towards a strategic and integrated vision of organizational transformation. In the foundational period (1998–2009), the focus was limited and concentrated around baseline themes such as adoption and general change management.

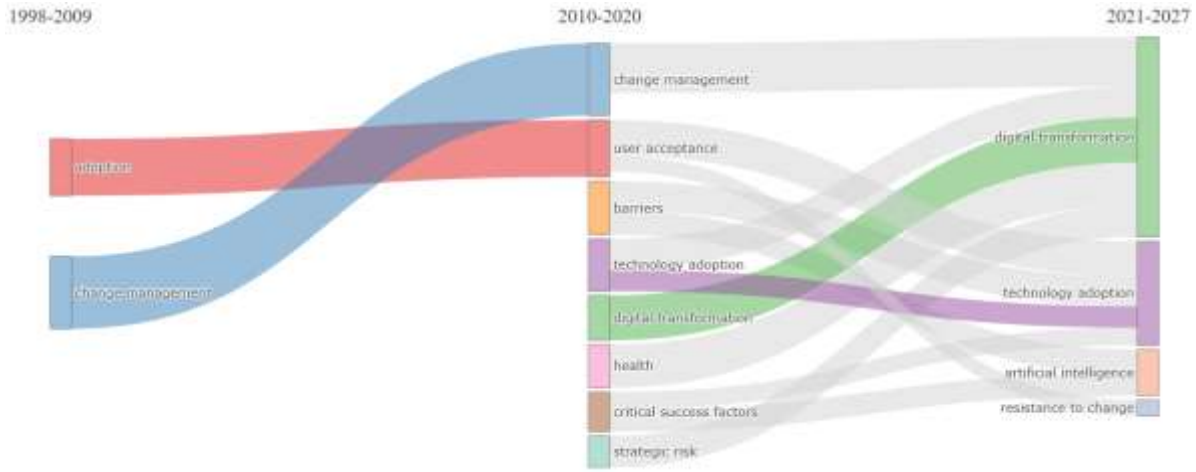


Figure 3. Thematic evolution based on all keywords regarding digital transformation and resistance to change

Source: authors with Biblioshiny, based on WoS data.

Moreover, during the transitional period (2010-2020), the conceptual landscape diversified significantly. Instead of analyzing change as a single event, the field began to branch out into specific themes such as user acceptance, critical success factors, barriers and so on. This conceptual expansion reflected the realization that adopting technology cannot be separated from various human resource-related obstacles (Silva et al., 2026). In the contemporary period (2021–2027), the field has been narrowed down, consolidating into four primary thematic streams: digital transformation, technology adoption, artificial intelligence, and resistance to change. This temporal transition confirms that digital transformation is consequently characterized by continuous adaptation rather than by a single technological implementation event with clearly defined temporal boundaries (Hanelt et al., 2021). As the field evolved, organizations realized that repeated technological changes require dynamic capabilities and continuous employee learning.

Moving from conceptual content to the dissemination structure, Figure 4 shows the current positioning of the mentioned themes, divided into quadrants. These quadrants are structured by centrality (the topic's relevance across the field) and density (its internal development), delineating motor, basic, niche, and emerging themes (Popa et al., 2024). In the upper-right quadrant (Motor Themes), the brown node grouping strategic risk, sustainability, and innovation displays high centrality and density, suggesting that managing risk supports sustainable business models (Tohănean et al., 2020). Further down, towards the centre is the red cluster combining digital transformation, artificial intelligence, and technological innovation, which can act as catalysts to improve operational efficiency and organizational performance (Zhao et al., 2024). In the lower-right quadrant (Basic Themes), the green cluster represents technology adoption, blockchain technology, and barriers display high centrality but lower density. This could mean that the concepts are foundational operational topics that connect with other research areas across the network. In the upper-left quadrant (Niche

Themes), the grey cluster consists of technology acceptance model, project management, and construction 4.0. These are specialized, technically mature concepts that are not widely debated.

In the lower-left quadrant (Emerging or Declining Themes), three nodes stand out: (1) the small cyan node of sharing economy, (2) the pink node about adoption, dynamic capabilities, and strategy, and (3) the purple node situated nearby the vertical threshold, bringing together resistance to change, perceived risk, and consumer resistance. Although considered emerging concepts, this cluster captures a practical reality regarding the failure of technology projects due to resistance (Ajina et al., 2024). In this context, technostress provides an additional psychological mechanism through which extensive digitalization can generate resistant behaviors (Bausch et al., 2024). Furthermore, digital-literacy facilitation, higher digital competence, and organizational support can significantly lower employee hesitation during transformation (Bausch et al., 2024; Zhao et al., 2026). However, when workers face technology anxiety, perceived risks, or change fatigue, resistance is more likely to emerge if adequate support is missing (Zhao et al., 2026).

Finally, two clusters lie on the boundary lines: (1) the orange cluster (industry 4.0, esg, circular economy) sits on the vertical boundary between niche and motor themes, reflecting how industrial technologies are expanding toward broader strategic sustainability goals, and (2) the blue cluster (change management, organisational change, technological change) rests on the horizontal boundary between basic and motor themes. This means that the concepts act as transversal bridge, they are foundational disciplines that take on the active role (motor) when applied to transformation processes.

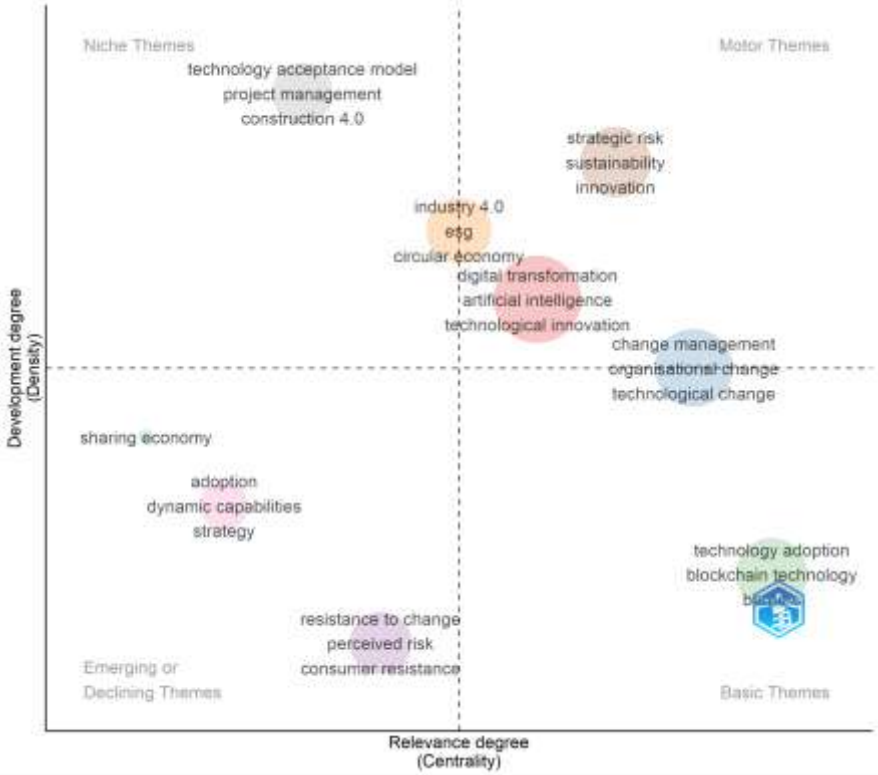


Figure 4. Thematic map of research on digital transformation, strategic risk, and resistance to change

Source: authors with Biblioshiny, based on WoS data.

Furthermore, Table 1 shows the sources where the previously mentioned concepts are published. The journal Systems leads the ranking with four articles, while the other nine sources have published three papers each. This balanced distribution shows that the topic is discussed across multiple fields, from engineering and manufacturing to management and organizational change. This interdisciplinary distribution explains how different publication outlets approach the multifaceted nature of risk. Technical and manufacturing journals (such as Systems, IEEE Transactions on Engineering Management, and Journal of Manufacturing Technology Management) emphasize system dependencies and technological integration, while business-oriented outlets address operational and administrative governance. As highlighted in the literature, internal-control quality and supply-chain network characteristics dictate how digitalization influences operational-risk outcomes (Yin et al., 2024). Furthermore, management-focused journals (such as Management Decision and International Journal of Organizational Analysis) reflect how managerial ability, strategic deviance, and asset utilization shape corporate risk-taking behavior during digital transformation (Luo et al., 2024). The diversity of these leading journals confirms that analyzing transformation risks requires an integrated perspective that bridges operational engineering with managerial decision-making.

Table 1. Top 10 most relevant publishing sources on digital transformation, strategic risk, and resistance to change

Rank	Journal title	Number of articles
1	Systems	4
2	Administrative Sciences	3
3	Cogent Business & Management	3
4	Humanities & Social Sciences Communications	3
5	IEEE Transactions on Engineering Management	3
6	International Journal of Organizational Analysis	3
7	Journal of Business Research	3
8	Journal of Manufacturing Technology Management	3
9	Journal of Organizational Change Management	3
10	Management Decision	3

Source: authors with Biblioshiny, based on WoS data.

Additionally, Figure 5 presents a synthesis of the countries of origin, key concepts, and publication sources. China and the USA contribute the largest share of publications, connecting most strongly to core themes like digital transformation, artificial intelligence, and technology adoption. The central keywords summarize the essence of the field, showing that research focuses both on technology implementation (AI, innovation) and human adaptation (change management, organizational change). In turn, these main concepts flow directly into the top journals identified previously, representing how global research converges toward key publication outlets.

This global convergence across macro-level initiatives and organizational change may reflect underlying tensions identified in the literature. Factors that inhibit technology use should also

be distinguished from factors that encourage adoption because inhibitors can operate independently from positive technology evaluations (Cenfetelli, 2004). The presence of perceived benefits does not necessarily eliminate barriers such as uncertainty, complexity, loss of control, or perceived risk, making resistance management different from simply promoting the advantages of new technologies (Cenfetelli, 2004). This distinction is particularly relevant in transformation projects in which employees may acknowledge potential organizational benefits while simultaneously perceiving significant individual costs (Kim & Kankanhalli, 2009; Cenfetelli, 2004). Resistance also develops through the interaction between technological change and established organizational institutions (Berente et al., 2019). Enterprise systems can conflict with existing institutional logics, generating responses that range from faithful appropriation to loose coupling, resistance, and attempts to modify the implemented system (Berente et al., 2019). Resistance can therefore reflect incompatibility between a digital initiative and established professional norms, organizational identities, authority structures, or assumptions concerning how work should be performed (Berente et al., 2019).

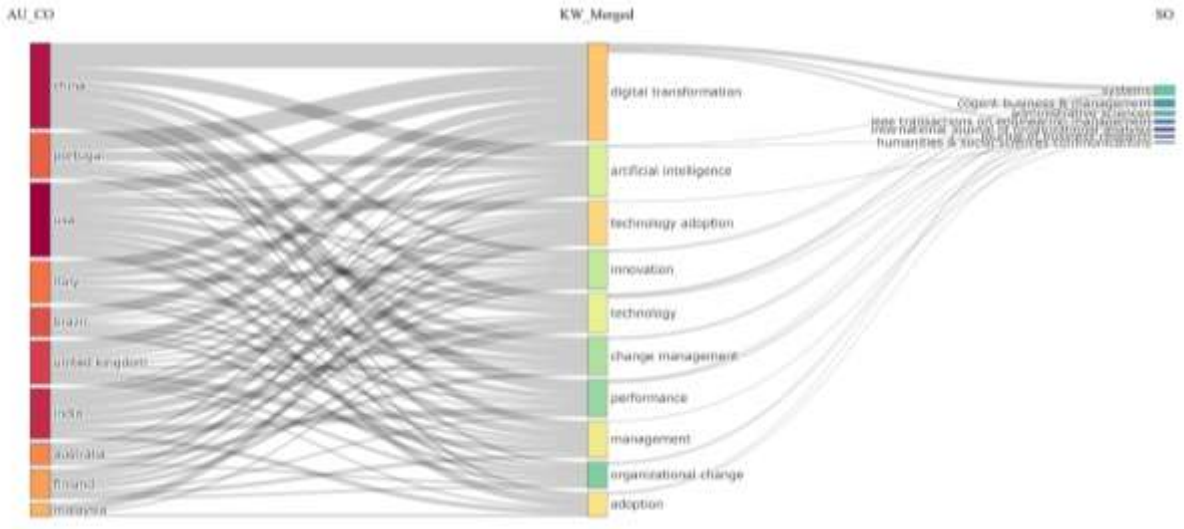


Figure 5. Three-field plot illustrating the relations between authors' countries (left), core keywords (middle), and publishing sources (right)

Source: authors with Biblioshiny, based on WoS data.

Moreover, Table 2 presents the five most cited papers in the analyzed collection, based on how well managers handle employee hesitation and organizational change in digital transformation. In first place, George and Wooden (2023) records the highest number of citations and their paper analyzes artificial intelligence in higher education. At the same time, the research suggests that while automated tools might improve institutional efficiency, they may also create new concerns regarding work roles and individual acceptance. In addition, Vuksanović Herceg et al. (2020) examine the manufacturing sector and their findings indicate that efficiency could be the main reason for adopting Industry 4.0. However, increased efficiency is not enough if the force of the obstacles (lack of skills, financial constraints) is greater. Complementary to these ideas, Van Looy (2021) discusses business models. The author argues that new digital tools might require dynamic capabilities so that organizations can adjust their daily routines without losing flexibility. In fourth place, Prakash and Das (2021) focus directly on user adoption. Their research suggests that technical systems might not be accepted easily if individual hesitation and workplace barriers are not addressed early.

Finally, Chatterjee et al. (2022) analyze how employees react to intelligent technologies. Their results show that perceived risks and user resistance might influence whether a digital initiative succeeds or struggles.

Table 2. Most globally cited documents on digital transformation, strategic risk, and resistance to change

Rank	Authors, Paper, Source	DOI	Total citations	Total citations per year
1	George, B., Wooden, O. (2023). *Managing the Strategic Transformation of Higher Education through Artificial Intelligence*. Administrative Sciences	10.3390/admsci13090196	206	51.5
2	Vuksanović Herceg, I., Kuč, V., Mijušković, V. M., Herceg, T. (2020). *Challenges and Driving Forces for Industry 4.0 Implementation*. Sustainability	10.3390/su12104208	112	16.0
3	Van Looy, A. (2021). *Exploring digitally-induced business model innovation and dynamic capabilities*. Information & Management	10.1016/j.im.2020.103413	108	18.0
4	Prakash, A. V., Das, S. (2021). *Understanding the barriers to technology adoption*. Information & Management	10.1016/j.im.2021.103524	106	17.7
5	Chatterjee, S., Rana, N. P., Dwivedi, Y. K. (2022). *Assessing users' resistance and behavioral intention in digital adoption*. Journal of Business Research	10.1016/j.jbusres.2022.08.019	95	19.0

Source: authors with Biblioshiny, based on WoS data.

The results conclude by highlighting the main research fields, represented by the three clusters of co-cited journals that underpin the research (Figure 6). The first cluster (green) brings together classic management and strategy journals among which Strategic Management Journal, Academy of Management Review, Management Science. This group might suggest that organizational planning and capability provide the foundation for digital transformation, where firms need dynamic capabilities to adjust their business models (Van Looy, 2021). In addition, the second cluster (red) centers on information systems and human behavior, with sources like MIS Quarterly, Computers in Human Behavior, and Journal of Business Research. This connection could indicate that technological systems may struggle if employee attitudes and user resistance are not taken into account (Chatterjee et al., 2022). Complementary to these areas, the third cluster (blue) links engineering, operational transition, and environmental concerns, with journals such as Technological Forecasting and Social Change and Sustainability-Basel. This might reflect that technological shifts are tied to operational challenges and resource barriers during industry-wide implementation (Vuksanović Herceg et al., 2020).

The interconnected suggestions above reflect the fact that there is a continuous link within the literature about strategic risks, human behavior, and technological implementation. Moreover, the relationship among resistance, transformation, and organizational risk has been examined directly by Slassi-sennou and Elmouhib (2025). Their empirical model connects ICT adoption and resistance to change with digital transformation and with financial and operational risk management outcomes (Slassi-sennou & Elmouhib, 2025). Resistance has a negative relationship with digital transformation, while digital transformation mediates relationships between resistance and financial and operational risk outcomes (Slassi-sennou & Elmouhib, 2025). Operational risk is particularly relevant because digitalization alters organizational processes and increases dependence on technological systems (Uddin et al., 2023). Resistance can complicate these changes when employees retain previous routines, underutilize new systems, or experience difficulty adapting to new digitally enabled processes (Lapointe & Rivard, 2005; Slassi-sennou & Elmouhib, 2025). Internal organizational conditions consequently influence both employee responses to transformation and the operational-risk outcomes associated with digitalization (Kim & Kankanhalli, 2009; Yin et al., 2024).

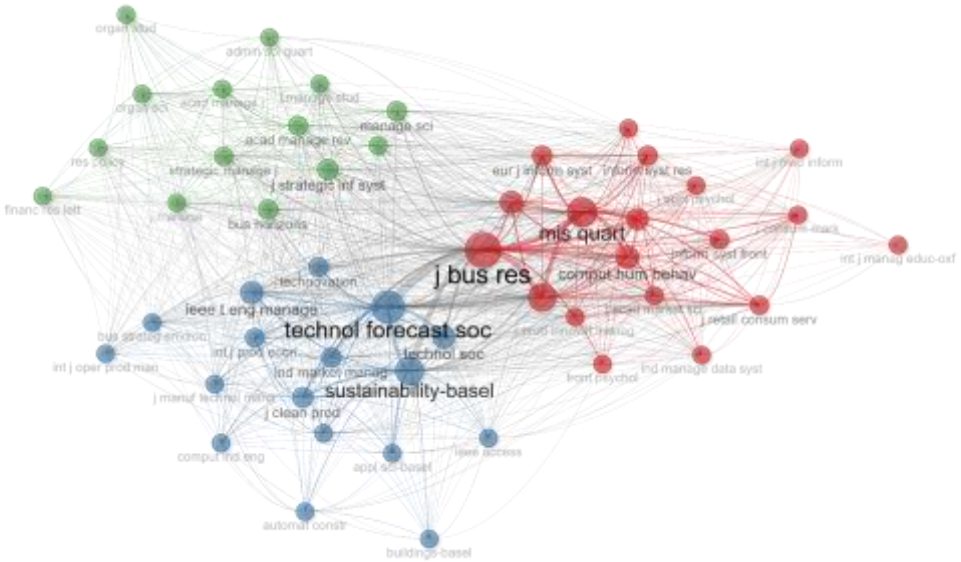


Figure 6. Co-citation network of referenced sources regarding digital transformation, strategic risk, and resistance to change

Source: authors with Biblioshiny, based on WoS data.

Moving from operational concerns to broader governance, the strategic implications of digital transformation are also reflected in its relationship with corporate risk-taking (Tian et al., 2022; Luo et al., 2024). Greater digitalization can increase organizational risk-taking through improved operating flexibility and financing availability, while managerial ability and strategic deviance further shape this relationship (Tian et al., 2022; Luo et al., 2024). Risk during digital transformation therefore concerns not only possible technological or operational losses but also the strategic decisions through which organizations pursue opportunities under uncertainty (Tian et al., 2022; Luo et al., 2024). In the same way, risk management responses to digital transformation similarly require consideration of organizational conditions rather than exclusive attention to technological controls (Butler & Brooks, 2024; Menzefricke et al., 2021). Organizational and risk cultures influence the effectiveness of risk management in technology-intensive environments, while interactions among human, organizational, and

technological dimensions create risk exposures that require integrated treatment (Butler & Brooks, 2024; Menzefricke et al., 2021). Employee resistance is therefore most consequential where psychological, organizational, and technological barriers affect implementation processes that support strategically important transformation objectives (Gabriel et al., 2021; Slassi-sennou & Elmouhib, 2025). Overall, these empirical findings show that technical deployments cannot achieve strategic success without actively mitigating the risk of employee hesitation.

5. CONCLUSIONS

This study sought to advance the understanding of resistance to change as a potential source of strategic risk in digital transformation, while also examining how these interconnected subjects have evolved within the scientific literature. Its relevance extends to both organisational practice and academic research. For organisations, digital transformation involves decisions that affect not only technological infrastructure but also business processes, workforce capabilities, and the achievement of long-term objectives. The growing reliance on digital technologies has intensified the need to adapt established practices, often under conditions of uncertainty and competing operational demands. Employees may question the value of new systems, experience difficulties in developing the required competencies, or perceive changes in their responsibilities as threats to professional stability. Such responses become strategically relevant when they hinder the implementation of initiatives on which organisational development increasingly depends. Resistance may contribute to delayed adoption, inefficient use of technological investments, and difficulties in realising anticipated transformation benefits. Its management therefore requires attention to the organizational conditions that shape employee responses, including communication, participation, competence development, and managerial support. Incorporating these considerations into strategic risk management can strengthen an organization's ability to anticipate implementation difficulties and address them before they affect broader transformation objectives. The central implication is that managing resistance should form part of the governance of digital transformation rather than remain a corrective activity undertaken only after opposition becomes visible.

The bibliometric findings reveal a research area that has expanded substantially as digital transformation has become more prominent in organisational practice. Scientific production was comparatively limited during the earlier part of the period examined, followed by a marked increase after 2020 and particularly rapid growth from 2023 onwards. Beyond this quantitative expansion, the conceptual structure of the literature points to the convergence of several research directions. The keyword co-occurrence network distinguishes an organisational and strategic dimension, a behavioural dimension concerned with technology adoption and resistance, and a more application-oriented dimension associated with digital technologies in operational settings. The thematic evolution analysis similarly indicates a movement from general questions of technology adoption and change management towards more specific discussions of digital transformation, artificial intelligence, and employee adaptation. An important observation emerges from the thematic map, where resistance to change and perceived risk occupy a comparatively less consolidated position than several established technological and managerial themes. This positioning does not necessarily indicate a lack of practical importance; rather, it points to opportunities for further theoretical development concerning the strategic implications of employee responses to digital transformation.

The distribution of scientific publications across journals provides another indication of the field's developing character. Research relevant to the topic is disseminated through outlets

covering management, organisational studies, information systems, engineering, and technological innovation. Although Systems accounts for the largest number of publications within the analysed collection, the differences among the leading sources are relatively small. This distribution suggests that no single disciplinary perspective dominates the discussion. Instead, the field brings together research traditions that examine different aspects of transformation, ranging from technological integration and operational performance to managerial decisions and organisational behaviour. Such diversity is particularly relevant to the present research topic, since resistance-related risks arise through interactions between technologies, organisational arrangements, and employees rather than within any one of these dimensions independently.

The three-field analysis further illustrates the relationships between the geographical origins of publications, the concepts addressed, and the journals in which research is disseminated. The identified patterns indicate that the research agenda extends across national contexts and disciplinary boundaries. They also suggest that technological development and organizational adaptation are recurring concerns within the international literature, even though the emphasis placed on individual themes may differ between research communities. The analysis provides evidence of connections among countries, subjects, and publication outlets, without establishing direct institutional collaboration or explaining the factors underlying geographical differences.

The co-citation analysis offers a complementary understanding of the intellectual structure supporting this research area. The identified clusters reflect three broad perspectives: strategic management and organisational capabilities, information systems and human behaviour, and technological implementation together with operational and sustainability-related concerns. Their coexistence indicates that the relationship between resistance to change and digital transformation is situated at the intersection of several established research traditions. Strategic management provides a perspective on organisational objectives and adaptation, information systems research addresses technology acceptance and employee responses, while technological and operational studies examine implementation requirements and related constraints. Taken together, these intellectual connections support the relevance of a socio-technical interpretation of transformation-related risks. Nevertheless, the bibliometric relationships identified in this study should not be interpreted as direct empirical evidence that employee resistance causes strategic failure. They instead reveal a research landscape in which the conceptual foundations for investigating such relationships are already present, although their integration remains incomplete.

Further research is needed to establish more clearly how resistance develops during digital transformation and under which conditions its consequences extend beyond operational implementation to affect strategic objectives. The increasing use of artificial intelligence, automation, and interconnected digital systems creates new questions concerning employee capabilities, professional roles, organisational support, and the management of uncertainty. Empirical and longitudinal studies could provide a more detailed understanding of how resistance changes throughout successive stages of transformation and how organisations respond to emerging difficulties. Comparative research across industries and organizational settings would also help determine whether similar mechanisms operate under different technological and managerial conditions. The present study is subject to limitations associated with its reliance on the Web of Science database and the inclusion of English-language articles and proceedings papers. Consequently, relevant contributions published in other databases, languages, or document formats may not be represented. Future bibliometric investigations could extend the dataset by incorporating Scopus and applying complementary approaches to scientific mapping. A systematic literature review would be particularly useful

for examining the mechanisms through which employee resistance interacts with implementation risks and strategic decision-making. Combining these approaches with organizational case studies or quantitative empirical research could contribute to the development of more comprehensive frameworks for identifying, assessing, and managing resistance-related risks. Advancing this line of inquiry would strengthen the connection between research on organizational change and strategic risk management, while offering a more informed basis for decisions concerning digital transformation.

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