

Rickard Enstroem*
Department of Decision Sciences
School of Business
MacEwan University
Edmonton AB T5J 4S2
E-Mail: EnstroemR@macewan.ca

Parminder Singh Khan
Department of Decision Sciences
School of Business
MacEwan University
Edmonton AB T5J 4S2

Bhawna Bhawna
University Institute of Applied Management Sciences (UIAMS)
Panjab University, Chandigarh
India

***Corresponding Author:**

Rickard Enstroem
EnstroemR@macewan.ca

The Harmonized Information-Technology and Organizational Performance Model (HI-TOP)

Abstract

Purpose

This study introduces the Harmonized Information-Technology and Organizational Performance Model (HI-TOP), which addresses the need for a holistic framework that integrates technology and human dynamics within organizational settings. This approach aims to enhance organizational productivity and employee well-being by aligning technological advancements with human factors in the context of digital transformation.

Design/methodology/approach

Employing a two-phased methodology, the HI-TOP model is developed through a literature review and text mining of industry reports. This approach identifies and integrates critical themes related to ICT integration challenges and opportunities within organizations.

Findings

This research indicates that successful ICT integration requires balancing technological advancements with human-centric considerations, including addressing technostress and promoting skills development. The HI-TOP model's four components—Workforce Empowerment and Resource Strategy (WERS), Technology-Enhanced Information Architecture (TEIA), Organizational Information Processing Strategy (OIPS), and Knowledge Sharing Platform (KSP)—demonstrate operational and strategic synergy required to achieve enhanced organizational performance and adaptability.

Originality

The HI-TOP model contributes to the body of knowledge by providing a structured framework for understanding the interplay between technology and organizational dynamics, with an emphasis on employee well-being and overall organizational performance. Its originality lies in the integrative approach to model development, combining theory with empirical insights from industry data, thus offering actionable guidance for organizations navigating the complexities of digital transformation.

Keywords: digital transformation, productivity, human-technology integration, technostress, ICT

Introduction

In the era of information and communication technologies (ICT), where knowledge management (KM) and augmented decision-making are becoming requisites (Parker *et al.*, n.d.), organizations are compelled to adapt their operational and strategic perspectives. This evolving vista presents opportunities to improve organizational productivity (Opazo-Basáez *et al.*, 2022) and decision-making (Jackson *et al.*, 2024) but also challenges in information architecture design (Ain *et al.*, 2019) and harmonizing human-technological capabilities (Moencks *et al.*, 2022).

When introducing ICT, organizations acquire innovative capacity and gain competitive advantage through data analytics and artificial intelligence (AI) (Kalaitzi and Tsolakis, 2022; Sullivan and Fosso Wamba, 2024). However, the challenges in managing information overflow (Lee *et al.*, 2016; Rutkowski and Saunders, 2018) and integrating human and technological capabilities (Lodgaard and Dransfeld, 2020; Moencks *et al.*, 2022) can erode technology's productivity gains. Bridging such technological advancements and mitigating their unintended consequences requires attention to the human-tech interface. The complex data and interfaces can lead to 'technostress' (Satpathy *et al.*, 2021; Tarafdar *et al.*, 2010) and cognitive overload (Kim *et al.*, 2022), potentially undermining employee well-being and straining mental and emotional reserves (Enstroem and Schmaltz, 2023), and diminish the digital asset's value. Addressing these issues necessitates a holistic reevaluation of organizational work design.

This paper proposes an adaptive and integrated approach to organizational modelling, which seeks to balance technology adoption with employee well-being to enhance overall organizational productivity. We introduce the Harmonized Information-Technology and Organizational Performance Model (HI-TOP). The HI-TOP model integrates a human-centric perspective—focusing on job performance, collaboration, and knowledge exchange—with a tech-process-centric perspective that prioritizes effective information flow, decision-making, and alignment of information processing capabilities with organizational needs. In presenting the HI-TOP model, the operational and strategic relationship between the four integral components of the model—*Workforce Empowerment and Resource Strategy* (WERS), *Technology-Enhanced Information Architecture* (TEIA), *Organizational Information Processing Strategy* (OIPS), and *Knowledge Sharing Platform* (KSP)—will be demonstrated. By adopting the HI-TOP model's integrated framework, organizations may overcome traditional barriers to ICT integration, facilitating technology's role in enhancing ergonomic efficiency, worker well-being, and satisfaction while reducing the risks of technostress and operational inefficiency.

The development of the HI-TOP model employs a two-phased approach. First, a literature review synthesizes insights into the dynamics between ICT and organizational structures. The literature review is complemented by text mining of forward-looking industry reports to identify the challenges and opportunities that lie ahead for organizations. The HI-TOP model is then presented, offering actionable insights by merging these viewpoints and integrating findings from extant models.

The structure of the paper is as follows. The next section examines the organizational outlook in the digital age, focusing on the role of IT and advanced technologies, followed by a discussion on integrating technology and human insights. The methodology section outlines the text-mining process of industry reports, leading to the presentation of empirical insights and clustering results. The subsequent section proposes the HI-TOP model based on traditional models and empirical findings. Finally, the paper concludes with a discussion of the findings, limitations, and recommendations for future research.

Organizational outlook in the digital age

The role of IT is critical for operational success and sustaining competitive advantage. Organizations increasingly leverage IT as a support function and strategic enabler to innovate and gain a competitive advantage. This reliance underscores the strategic importance of information and knowledge (Martinho *et al.*, 2015). Such importance has led to the adoption of advanced technologies, including cloud computing, AI, machine learning (ML), data analytics, and the Internet of Things (IoT), to enhance IT capabilities and organizational performance (Garrison *et al.*, 2015; Hsu *et al.*, 2014; Tallon *et al.*, 2020). Cloud computing has emerged as an essential technology, offering scalability, ubiquity, and cost efficiency for dynamic market responsiveness (Garrison *et al.*, 2015; Hsu *et al.*, 2014). Parallely, AI and ML enhance decision-making processes by providing deep insights from extensive datasets.

The deployment of IoT technologies marks a paradigm shift in real-time monitoring and data collection to optimize operational processes and enhance organizational efficiency. Additionally, Radio Frequency Identification (RFID) technology has refined inventory and supply chain management (Jo, 2023; Zare Mehrjerdi, 2011), while blockchain technology has strengthened the security and transparency of transactions (Swan, 2018; “The New ABC’s”, n.d.). Augmented reality (AR) and virtual reality (VR) technologies have transformed training and customer experiences to create immersive interactions that enhance engagement and satisfaction (Agrawal, 2018; Brown *et al.*, 2023; Farrell, 2018). Robotic process automation (RPA) and autonomous vehicles and industrial robots are further streamlining manufacturing and logistics operations (“Autonomous Robots and the Future of Supply Chain”, n.d.; “Human + machine: A new era of automation in manufacturing | McKinsey”, n.d.).

However, harnessing the full potential of these technologies requires a harmonized IT and organizational performance approach. The integration challenges and opportunities these technologies present necessitate adaptive organizational models that are resilient, flexible, and capable of driving sustainable competitive advantage by combining people, processes, and technology. While integrating advanced technologies has the potential to enhance efficiency and strategic positioning, organizations often encounter challenges such as cultural resistance, skill shortages, and complexities in systems integration. These hurdles need technical solutions and a change management approach that addresses human factors to fully realize technology's potential.

Synergizing technology and human insights

Successful organizational integration of AI is closely linked to employees' trust in AI technologies. Constantinides *et al.* (2024) demonstrate that the level of comfort individuals have with uncertainty plays a crucial role in the success of human-AI collaborative tasks, especially in tasks requiring precise delegation, monitoring, and control. This dynamic becomes particularly critical in sectors like healthcare, criminal justice, and financial trading, where the consequences of decisions are significant and extensive (Baird and Maruping, 2021). Further compounding this challenge, Endsley (2017) highlights the risk of reduced situational awareness in automated settings, where detachment from direct task engagement can diminish oversight and attention to detail.

From the vantage point of the Resource-Based View (RBV) (Barney, 1991, 2001), AI presents both opportunities and challenges for organizational strategy and resource management. The RBV framework is foundational in the HI-TOP model, guiding the strategic utilization of organizational resources to build competitive advantages. Specifically, the model leverages RBV principles by treating advanced technology and human expertise—and their coordination and interaction—as critical, inimitable resources that drive innovation and operational effectiveness. This approach enhances the organization's ability to adapt to technological changes and sustain its competitive position in the digital landscape. Brynjolfsson and McAfee (2014) delineate AI's potential to displace and enhance human cognitive functions, positing a strategic dichotomy where AI can undermine traditional human skill advantages due to its scalability and ease of replication. Conversely, integrating AI and human expertise could unlock strategic benefits, strengthening decision-making capabilities in supply chain and operations management, including demand forecasting and risk management (Agrawal, 2018; Jackson *et al.*, 2024).

The transformation of the workforce with increased collaboration between human employees (HE) and digital employees (DE) underscores the necessity for strategic alignment that nurtures effective cooperation. Utilizing interdependence theory, Le *et al.* (2024) stress the importance of visible coordination cues between HEs and DEs in forming customer perceptions of team cohesion and efficacy. These perceptions influence customer engagement and loyalty, underscoring the critical role of transparent and synergistic interaction in hybrid teams in achieving organizational objectives.

This context illustrates organizations' need to integrate technological innovations with human expertise. Combining AI's capabilities with human factors is essential for manoeuvring the challenges of digitalization while furthering organizational performance and sustainability (Turulja and Bajgoric, 2018). The insights discussed here inform the HI-TOP model, which operationalizes the synergy between human expertise and technological advancements to enhance organizational performance.

Empirical insights: text mining of industry reports

Method

Potential sources for industry reports were first identified. Given the extensive amount of data required and the need for consistent, high-quality insights, Boston Consulting Group (BCG) was selected as the primary source. BCG was selected due to its extensive coverage of relevant topics such as technological innovation and organizational change. Moreover, BCG has a long history of issuing comprehensive reports, which provides a long data timeline. The reports were also accessible and compatible with the analytical tools, guaranteeing reliable data extraction. Other consulting groups such as McKinsey & Company and Bain & Company were considered; however, technical barriers such as CAPTCHA verifications limited the ability to automate data extraction across multiple sources consistently. Notably, BCG, one of the Big Three consulting firms, is recognized for its rigorous approach to problem-solving and strategic focus (“The History of Boston Consulting Group”, n.d.).

A set of keywords (see Appendix A) was generated based on an analysis of the call for papers, which was confirmed through a review of the literature. Using Python, industry reports were scraped from BCG and analyzed for content. Text mining techniques were employed to extract and analyze qualitative text data from these industry reports, providing a basis for empirical insights. The Webdriver tool from Python's Selenium library was used to automate the interaction and downloading process. A total of 3163 reports were downloaded from BCG in PDF format dating back to 1968. However, the analysis focused on the 3122 reports published from 2008 onwards, aligning with the industry trend of intensified digitalization.

This initial data extraction was followed by the application of computer-assisted grounded theory. The predefined set of keywords served as analytical anchors, guiding the text-mining process. Each keyword was used to extract relevant text snippets from the corpus of BCG reports. This method allowed for the measurement of keyword frequencies and their co-occurrence within the dataset, providing a preliminary structure for clustering. The data was then critically interpreted to develop meaningful cluster descriptions. This interpretative process involved examining the patterns identified through text mining to distill the data into five distinct clusters. Each cluster reflects a core aspect of the dynamic between technology and human resources within organizational settings.

In the data preprocessing phase, reports were read from the PDFs to the Pandas DataFrame using the pdfreader routine from the pyPDF2 library in Python. These reports were further processed to separate the main text from the title, author information, abstract, table of contents, and references. The re-module in Python was used to remove all characters from each element in the 'Text Data' column that were not alphanumeric or whitespace characters. Also, text data was converted into lowercase to establish a standard format.

Finally, the keyword frequencies were generated based on the corpus from the previous step and the keywords identified. Identified keywords are clustered into different groups based on their relevance to the HI-TOP model. These keyword frequencies are visualized using the matplotlib.pyplot and seaborn libraries to represent frequencies and associated clusters.

Empirical insights

Figure 1 integrates information on the number of reports published during the temporal frame of analysis, 2008-2024, and a Pareto chart of the prominent themes for the period.

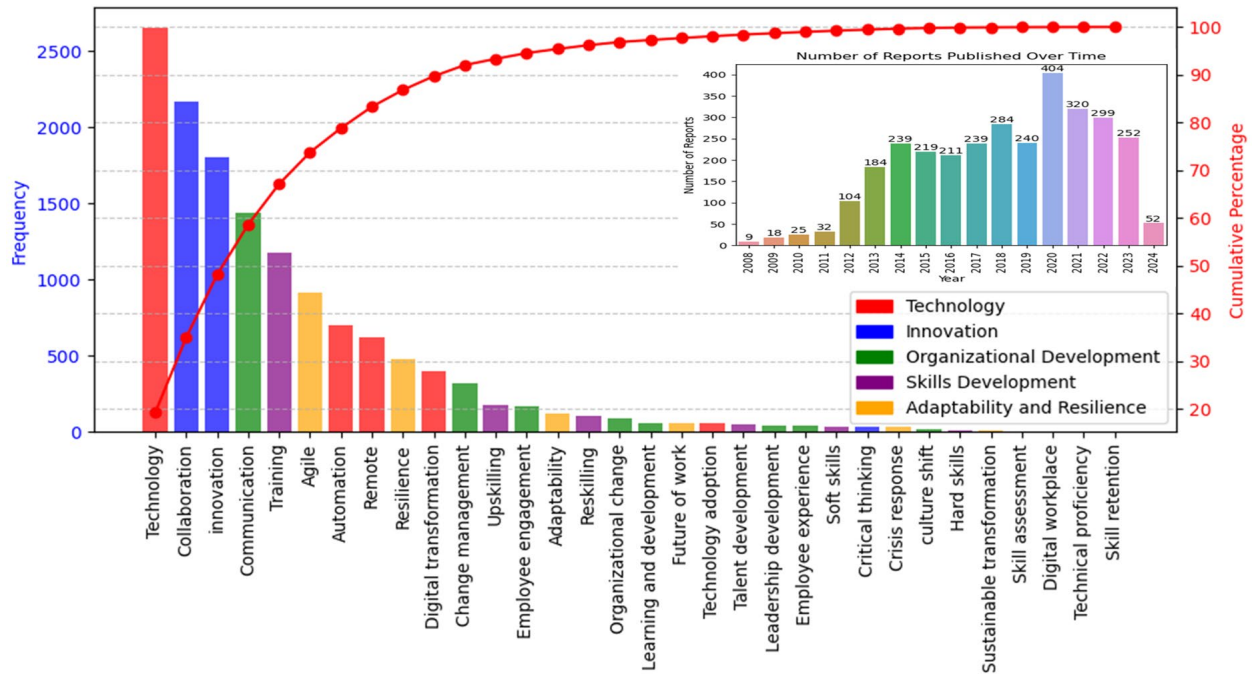


Figure 1: Distribution and key themes of industry reports (2008-2024)

Figure 1 shows an increase in reports covering four primary themes: technology, innovation, organizational development, skills development, adaptability, and resilience. These reports peaked around 2020, which could be due to several factors, such as technological advancements, changes in business environments, and global events like the COVID-19 pandemic, container shortages, port delays, Suez Canal blockage, and geopolitical conflicts. These factors have compelled businesses to be more adaptable and resilient.

Five clusters were identified based on the keyword frequency to provide relevant groupings:

Technology: Between 2012 and 2020, there were significant advancements in ICT, including AI, ML, and big data analytics. These advancements led to increased technology adoption to improve decision-making, automate processes, and enhance productivity. As a result, there has been a growing focus on digital transformation, automation, remote work and the digital workspace.

Skills development: This cluster highlights the importance of skills development in the context of technological advancements and organizational change. It includes keywords related to training, upskilling, reskilling, assessing and retaining skills, and the importance of both soft and hard skills. Skills development cannot be analyzed in isolation; technological advancements, such as ICT, AI, and ML, have transformed skills development with increased demand for digital skills like data analysis and programming. This shift

requires a greater focus on upskilling and reskilling employees to meet evolving technological demands while instilling a lifelong learning focus. Technology also enables personalized learning experiences concurrent with increased remote learning opportunities. The importance of integrating soft skills with technical skills and developing agile and adaptive skills to respond to new technologies and work environments is also recognized.

Innovation: This cluster identifies the role of innovation and creativity in driving organizational success. It includes keywords related to cultivating innovation through collaboration, critical thinking, and problem-solving. Innovation incorporates two critical elements: technology and people. Technological advancements, particularly in ICT, AI, ML, and big data analytics, have influenced innovation by providing organizations with new tools and capabilities. However, innovation cannot solely rely on technology; it should also integrate the human element. Skills development is important, as technological advancements contribute to a growing demand for digital skills such as data analysis and programming. Organizations that can prioritize the integration of technology and people in innovation are better positioned to thrive in the evolving business landscape, leading to the next cluster, ‘organizational development.’

Organizational development: This cluster focuses on organizational development and change, including keywords related to managing organizational change, improving employee engagement and experience, and developing leadership and team-building skills. This development can be built on technology, people, and innovation pillars by adopting a holistic view that combines systems thinking and effective leadership. Understanding how changes in one area can impact the entire organization can guide implementing change management strategies that engage all stakeholders and ensure organizational adaptability through technology and people.

Adaptability and resilience: Central for navigating technological and organizational changes, these qualities highlight skills like agile practices and crisis response for future work and sustainable transformation. These elements are integral to organizational development, innovation, and technology, helping organizations anticipate challenges and adopt a culture of continuous improvement. Prioritizing adaptability and resilience enhances flexibility and response to new technologies and markets, forming a feedback loop that can improve long-term performance by continuously adapting strategies.

Toward a unified framework: evolving from traditional models

Harmonizing technology and organizational performance necessitates understanding the dynamic between technology and human factors, and there are several foundational models that provide valuable insights.

However, these models typically address specific components of these complex organizational dynamics, often without the integrated perspective that fully captures the synergistic potential between technology and workforce strategies.

The job demands-resources model (JD-R) contrasts job demands—physical, psychological, social, and organizational stressors—with resources, which are factors that enable goal achievement and stress reduction. The JD-R model analyzes how these factors affect employee outcomes (Bakker and Demerouti, 2007). While workplaces increasingly adopt digital technology, employees often perceive technology as a demand when lacking adequate support (Alnoor *et al.*, 2022; Bereznoy *et al.*, 2021). Kim and Christensen (2017) apply the JD-R model to identify demands (mental distractions, ergonomics issues, and information overload) and resources (mental breaks, work-life balance, and creativity) associated with personal technology use. They propose that technology-based job autonomy enhances organizational performance by improving engagement, satisfaction, and commitment, thereby reducing turnover intentions. Conversely, job overload and monitoring increase turnover intentions through intensified job tension and reduced satisfaction without impacting commitment (Carlson *et al.*, 2017; Zaza *et al.*, 2022).

Technology-enhanced information architecture represents an approach to organizing, storing, and sharing information efficiently within organizations. In discussing technology-enhanced information architecture, aligning with the Organizational Information Processing Theory (OIPT) is critical, which stresses the importance of information flow within organizations. The main result of OIPT is that the effectiveness of an organization's information processing capabilities must match its information processing needs to ensure optimal decision-making and maintain operational efficiency (Kowalczyk and Buxmann, 2014; Premkumar *et al.*, 2005). This theory is foundational for understanding how organizations can effectively manage and utilize information to meet diverse operational demands, especially in highly uncertain and complex environments.

However, an overemphasis on technology could lead to the neglect of essential human and organizational dynamics, such as leadership roles and team interactions, potentially diminishing the effectiveness of information processing (Constantinides *et al.*, 2024). Replacing human decision-making with ML may impact organizational learning by reducing the richness of background knowledge since humans and ML process experiences differently. Such a technological shift can lead to overlooked long-term considerations and routine interdependencies (Balasubramanian *et al.*, 2022). Integrating data-centric methods with OIPT requires a critical merger of analytical skills and domain expertise to reduce decision-making ambiguity (Kowalczyk and Buxmann, 2014). OIPT also underscores the importance of aligning information

processing requirements with organizational capabilities to improve supply chain performance (Premkumar *et al.*, 2005). The Human-AI joint task performance model demonstrates that augmentation and automation are closely interlinked and co-evolve. It highlights how different AI usage modes are influenced by human responses to uncertainty, including adjustments in tolerance levels. This result illustrates the need for thoughtful AI system design, delegation policies, and data harnessing to account for these interactions for improved learning under uncertainty (Constantinides *et al.*, 2024). Additionally, firms that adopt advanced digital technologies in their business networks demonstrate enhanced resilience and learning abilities (Xie *et al.*, 2022).

Jay Galbraith (1973, 1974) posits that effective information management is crucial for organizations dealing with uncertain and interdependent tasks. OIPT outlines that companies can navigate ‘exception scenarios’ by minimizing information processing demands, either through employing slack resources and self-contained tasks or by enhancing processing capabilities with improved lateral and vertical communication systems (Srinivasan and Swink, 2015). It also stresses the importance of IT in organizational information flow and decision-making to balance information processing requirements and capabilities, especially under uncertainty, to improve performance (Zhu *et al.*, 2018). According to OIPT, this balance is critical to adapting and mitigating uncertainty.

Knowledge sharing (KS) entails the systematic acquisition, collection, and distribution of tacit knowledge, making it explicit (Ben Arfi *et al.*, 2019). Modern firms embrace the ‘Open Innovation’ (OI) paradigm, employing both internal and external knowledge to improve their technology and innovation capabilities. Knowledge Sharing Platforms (KSPs) are designed to address organizational innovation challenges by requiring coordinated member connections (Ben Arfi *et al.*, 2019), while IT support within organizations facilitates knowledge sharing and innovation performance (Kumar *et al.*, 2024). Moreover, advanced knowledge management systems integrate big data into strategic planning, which can improve managerial decision-making and lead to innovative and sustainable business models. This strategic integration provides a competitive advantage and strengthens stakeholder relationships (Vaio *et al.*, 2021).

KSPs serve as strategic tools to improve job resources by offering employees access to knowledge, expertise, and learning opportunities through digital platforms and social networks. This arrangement enriches the organization’s collective resource pool by facilitating the exchange of information, best practices, and lessons learned. However, KSPs may also introduce job demands related to the cognitive effort and time required for knowledge sharing and collaboration. Effectively streamlining KSPs can mitigate these demands, improve access to information, and foster a culture of collaboration and learning

culture. Also, enabling employee contributions via KSPs enhances autonomy, competence, and workplace meaningfulness, aligning with the JD-R model's principles.

Contrasting the models presented, the JD-R model illustrates how balancing job demands with resources impacts employee well-being and performance, a critical consideration for effective technology integration in workplaces. The OIPT explains how aligning information-processing capacities with organizational needs supports effective decision-making and enhances operational efficiency. Additionally, KS and KSPs focus on mechanisms that facilitate efficient knowledge management, collaboration, and innovation.

The Technology-Organization-Environment (TOE) framework (e.g., Awa *et al.*, 2017) complements the other models and the HI-TOP by offering an integrated macro-level perspective on the factors influencing organizational technology adoption. This framework considers three critical aspects: the technological context, which encompasses the tools available within and outside the organization; the organizational context, which includes structural and resource-based characteristics; and the environmental context, which consists of industry dynamics, competitive pressures, and regulatory frameworks. In contrast, the HI-TOP model offers an integrated micro perspective, focusing on how these technologies are internally aligned and utilized to enhance performance and well-being in organizational settings. The TOE framework can help understand how external environmental factors interact with internal strategic decisions to enhance understanding of the complexities involved in digital transformation.

The HI-TOP model

The Harmonized Information-Technology and Organizational Performance (HI-TOP) model offers a framework for exploring the potential synergies between technology and workforce strategies in improving organizational performance. This integrative model joins human-centric aspects—such as productivity, well-being, and resource allocation—with tech-process-centric views that include IT alignment with business strategies, streamlined decision-making, operational efficiencies, and advanced information management.

Central to the HI-TOP model are four interconnected components to develop organizational productivity and adaptability. The Workforce Empowerment and Resource Strategy (WERS) function is to balance job demands and resources to improve efficiency with the intent to impact employee well-being and overall job performance positively. The Technology-Enhanced Information Architecture (TEIA) supports the digital ecosystem to enable effective information management. In contrast, the Organizational Information Processing Strategy (OIPS) optimizes information processing and decision-making to mitigate uncertainty.

Lastly, Knowledge Sharing Platforms (KSPs) promote knowledge exchange and integration for innovation, collaboration, and learning.

Empirical foundations and dynamic view

The HI-TOP model brings together insights from a literature review, traditional models, and text mining of industry reports. The literature review highlighted the challenges and opportunities with ICT integration, particularly in integrating and harmonizing human and technological capabilities for overall productivity gains while mitigating technostress and the need for robust, adaptable information architecture. Traditional models, such as the JD-R model and OIPT, frame these issues within established theoretical contexts for a foundational understanding of the balance between organizational demands and employee resources and the alignment of information processing capacities with organizational needs.

Text mining of industry reports offered a current, data-driven perspective on these themes. Analysis of these reports revealed the need for organizational agility and resilience, especially in response to rapid technological changes and market uncertainties. These reports also underscored the growing importance of data analytics and machine learning in enhancing decision-making processes within organizations.

Integrating these insights into a management model, the HI-TOP model synergizes human-centric strategies with technology-driven processes to enhance organizational performance. Specifically, the model's Workforce Empowerment and Resource Strategy (WERS) component addresses job demands by equipping employees with the necessary resources to balance demands and resources and mitigate technostress, drawing from the JD-R model's principles. Meanwhile, the Technology-Enhanced Information Architecture (TEIA) and Organizational Information Processing Strategy (OIPS) components incorporate the findings from text mining, focusing on creating resilient and adaptable information systems that support strategic decision-making and operational efficiencies aligned with insights from OIPT.

The HI-TOP model has a dual temporal lens to analyze organizational dynamics. The immediate, operational perspective encompasses the day-to-day component interactions. In contrast, the strategic perspective concentrates on long-term planning and organizational evolution. This dual view allows for an understanding of immediate actions and long-term implications.

In the short term, the model has reciprocal interactions between WERS and TEIA and between OIPS and KSP. These dynamics illustrate how immediate design and usability aspects of technology (TEIA) and knowledge-sharing platforms (KSP) interact with workforce empowerment (WERS) and information

processing strategies (OIPS). Such interactions reflect the mutual reinforcement between the organizational environment and its technological and informational infrastructure.

From a long-term perspective, strategic influences become more pronounced and predominantly unidirectional. From WERS to TEIA, insights gleaned from empowering the workforce and strategically managing resources gradually shape the design and functionality of the technological architecture (TEIA). Similarly, a unidirectional influence from WERS to KSP represents that long-term workforce empowerment strategies and resource allocations inform the development and refinement of knowledge-sharing platforms, enhancing their effectiveness and alignment with organizational needs. Additionally, sustained insights from the application of OIPS also contribute to the strategic evolution of TEIA, ensuring that the technological infrastructure evolves in tandem with the organization's information processing needs.

These strategic, long-term adjustments signify the importance of aligning technological infrastructure (TEIA and KSP) with evolving organizational needs, workforce dynamics, and information processing strategies. This deliberate, forward-looking approach aims to ensure that the organization's digital ecosystem supports and enhances performance through ongoing adaptation and strategic foresight. Incorporating both immediate and long-term dynamics in the HI-TOP model illustrates the complex, evolving nature of the organizational system. The model promotes a comprehensive and integrated approach to managing technology, information, and human resources, where adaptability and strategic alignment are central to achieving organizational excellence. Figure 2 presents the HI-TOP model and its operational and strategic dynamics.

HI-TOP MODEL: OPERATIONAL & STRATEGIC DYNAMICS

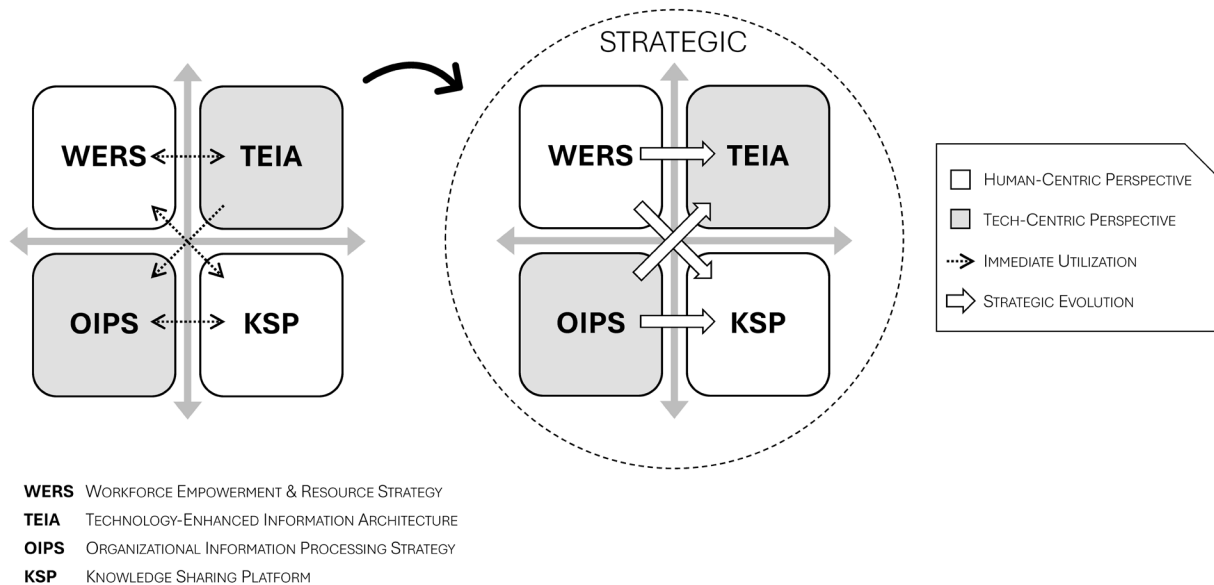


Figure 2. The HI-TOP model and its operational and strategic dynamics

Source: Authors' own creation

Discussion

The Harmonized Information-Technology and Organizational Performance (HI-TOP) model presented in this paper responds to the need to understand the symbiotic relationship between technology, human workers, and organizational dynamics. Developed through a two-phased approach combining a literature review and text mining of industry reports, the HI-TOP model offers a comprehensive and integrated perspective on organizational work design. The model addresses the operational and strategic needs of future organizations to combine human-centric and technology-driven approaches to impact productivity, innovation, adaptability, resilience, and risk management. It demonstrates the importance of a systematic and balanced approach to managing the interplay between technological advancements and human factors in organizations to achieve productivity gains and maintain a competitive advantage.

The HI-TOP model's focus on integrating technological advancements with strategic organizational planning is particularly relevant in light of the escalating importance of digital transformation. As such, this research resonates with the insights of *Martinho et al. (2015)* and *Opazo-Basáez et al. (2022)*, who stress the strategic importance of technology for organizational success. Our findings extend this discussion by providing a structured model that organizations can adopt to harness the benefits of ICT while mitigating

associated challenges like technostress and cognitive overload, as identified by Satpathy *et al.* (2021) and Kim *et al.* (2022).

As proposed by the HI-TOP model, the need for a harmonized approach to human-technology integration reflects current discussions on this topic, including the importance of trust and comfort with AI technologies in human-AI collaboration (Constantinides *et al.*, 2024). The model provides a framework for organizations to navigate these complex dynamics, ensuring that technology adoption contributes to rather than diminishes organizational productivity and employee well-being.

The clusters identified through text mining, particularly those related to skills development and organizational development, illustrate the evolving requirements for employee training and development necessitated by the digital age. These insights align with the growing recognition of the need for ongoing skill development and adaptability within the workforce, as Agrawal (2018) and Le *et al.* (2024) noted. The HI-TOP model's focus on knowledge sharing and learning development as central components accentuate the importance of creating organizational environments that foster collaboration, continuous learning, and adaptability.

For practitioners, the HI-TOP model offers a strategic framework to address and manage the challenges associated with digital transformation and integrating advanced technologies such as AI, ML, and IoT within their operational and strategic frameworks. The model stresses the value of promoting ergonomic efficiency, worker well-being, and satisfaction to mitigate technostress and operational inefficiencies. In presenting the model, we highlight the immediate operational interconnections among its four components and the strategic, extended dynamics that support informed managerial decision-making for long-term organizational strategies for work design.

Technostress arises from challenges in adapting to new technologies, manifesting as anxiety, fatigue, and reduced job satisfaction due to information overload, constant connectivity, and tool complexity (Tarafdar *et al.*, 2010; Kim *et al.*, 2022). The HI-TOP model addresses these issues by integrating human-centric considerations with technological advancements. HI-TOP mitigates technostress by balancing job demands with resources through the Workforce Empowerment and Resource Strategy (WERS). It includes continuous training, a culture of knowledge sharing, and user-friendly tools aligned with employees' needs. This focus on well-being and adaptability ensures that technology enhances productivity. Organizations can implement stress management workshops and feedback mechanisms to foster a supportive environment

that improves job satisfaction and overall performance. The HI-TOP model promotes a technologically advanced yet humane and adaptable organizational culture.

The HI-TOP model transcends the balanced scorecard by integrating both technological and human factors to address ICT integration and technostress (cf. Kaplan and Norton, 2010). Unlike the balanced scorecard, which primarily focuses on performance metrics across organizational perspectives, HI-TOP emphasizes the synergy between technology and workforce dynamics. This holistic approach ensures that technological advancements are harmonized with employee well-being and organizational adaptability. Additionally, HI-TOP is grounded in validated behavioural and organizational models, such as the JD-R and OIPT. A balanced scorecard can still be developed within HI-TOP to measure specific performance outcomes, ensuring comprehensive organizational assessment.

Future research should explore the HI-TOP model's application across industries and organizational scales to assess its generalizability and effectiveness in different contexts. Longitudinal studies could also provide insights into the model's adaptability, particularly in response to rapid technological changes and evolving organizational needs. Additionally, qualitative studies could deepen the understanding of the human factors influencing the successful integration of ICT within organizations. Exploring the tradeoffs among the four components of HI-TOP would facilitate an in-depth understanding of localized Key Performance Indicators (KPIs)—specific to the individual quadrants—and holistic KPIs that reflect the broader organizational success metric, ultimately resulting in a balanced scorecard for HI-TOP.

Limitations

While the HI-TOP model presented in this paper offers a comprehensive framework for integrating technology and human dynamics within organizational settings, it has limitations. The reliance on industry reports may introduce a bias toward broad industry themes. Specific needs and challenges can vary significantly across organizational cultures and structures, which the current empirical analysis cannot fully capture. Furthermore, balancing technological advancements and human factors can be challenging in practice, particularly in organizations with rigid legacy systems or industries where technology adoption is still nascent.

Conclusion

The Harmonized Information-Technology and Organizational Performance (HI-TOP) model presented in this study offers a strategic framework for integrating technology and human dynamics within organizations. Developed through a literature review and text mining of industry reports, the model

addresses the challenges of digital transformation, focusing on an integrated approach that prioritizes organizational productivity and employee well-being. The HI-TOP model addresses the complexities of ICT integration, identifying key areas such as technostress mitigation, skills development, and the need for adaptability and resilience. Its practical implications provide insights into potential pathways for leaders to improve digital infrastructures while emphasizing the importance of human capital as a crucial element of organizational success. Future research should examine the model's applicability and adaptability to technological evolutions across different contexts.

References

- Agrawal, A. (2018), "Putting VR/AR to work", *IEEE Computer Graphics and Applications*, Vol. 38 No. 1, pp. 115–118. doi: 10.1109/MCG.2018.011461532.
- Ain, N., Vaia, G., DeLone, W.H. and Waheed, M. (2019), "Two decades of research on business intelligence system adoption, utilization and success – A systematic literature review", *Decision Support Systems*, Vol. 125, p. 113113. doi: 10.1016/j.dss.2019.113113.
- Al-Mahasneh, S. and Harb, Y. (2023), "The assimilation of ICT knowledge management practices in organizations: an empirical study", *Journal of the Knowledge Economy*, Vol. 14 No. 2, pp. 752–779. doi: 10.1007/s13132-022-00938-7.
- Alnoor, A., Abdullah, H.O., AL-Abrow, H., Wah Khaw, K., Al-Awidi, I.A., Abbas, S. and Omrane, A. (2022), "A fuzzy Delphi analytic job demands-resources model to rank factors influencing open innovation", *Transnational Corporations Review*, Vol. 14 No. 2, pp. 178–192. doi: 10.1080/19186444.2021.1956854.
- "Autonomous robots and the future of supply chain". (n.d.). Deloitte United States, available at: <https://www2.deloitte.com/us/en/pages/manufacturing/articles/autonomous-robots-supply-chain-innovation.html> (accessed 3 March 2024).
- Awa, H.O., Ojiabo, O.U. and Orokor, L.E. (2017), "Integrated technology-organization-environment (T-O-E) taxonomies for technology adoption", *Journal of Enterprise Information Management*, Vol. 30 No. 6, pp. 893–921. doi: 10.1108/JEIM-03-2016-0079.
- Bakker, A.B. and Demerouti, E. (2007), "The job demands-resources model: state of the art", *Journal of Managerial Psychology*, Vol. 22 No. 3, pp. 309–328. doi: 10.1108/02683940710733115.
- Balasubramanian, N., Ye, Y. and Xu, M. (2023), "Substituting human decision-making with machine learning: implications for organizational learning", *SSRN Electronic Journal*, doi: 10.2139/ssrn.4543450.
- Barney, J. (1991), "Firm Resources and Sustained Competitive Advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99–120. doi: 10.1177/014920639101700108.
- Barney, J. (2001), "Resource-based theories of competitive advantage: A ten-year retrospective on the resource-based view", *Journal of Management*, Vol. 27 No. 6, pp. 643–650. doi: 10.1177/014920630102700602.
- Ben Arfi, W., Enstroem, R., Sahut, J.M. and Hikkerova, L. (2019), "The significance of knowledge sharing platforms for open innovation success: a tale of two companies in the dairy industry", *Journal of Organizational Change Management*, Vol. 32 No. 5, pp. 496–516. doi: 10.1108/JOCM-09-2018-0256.
- Bereznoy, A., Meissner, D. and Scuotto, V. (2021), "The intertwining of knowledge sharing and creation in the digital platform based ecosystem. A conceptual study on the lens of the open innovation approach", *Journal of Knowledge Management*, Vol. 25 No. 8, pp. 2022–2042. doi: 10.1108/JKM-10-2020-0769.
- Brown, C., Hicks, J., Rinaudo, C.H. and Burch, R. (2023), "The use of augmented reality and virtual reality in ergonomic applications for education, aviation, and maintenance", *Ergonomics in Design: The*

Quarterly of Human Factors Applications, Vol. 31 No. 4, pp. 23–31. doi: 10.1177/10648046211003469.

Carlson, J.R., Carlson, D.S., Zivnuska, S., Harris, R.B. and Harris, K.J. (2017), “Applying the job demands resources model to understand technology as a predictor of turnover intentions”, *Computers in Human Behavior*, Vol. 77, pp. 317–325. doi: 10.1016/j.chb.2017.09.009.

Constantinides, P., Monteiro, E. and Mathiassen, L. (2024), “Human-AI joint task performance: learning from uncertainty in autonomous driving systems”, *Information and Organization*, Vol. 34 No. 2, p. 100502. doi: 10.1016/j.infoandorg.2024.100502.

Di Vaio, A., Palladino, R., Pezzi, A. and Kalisz, D.E. (2021), “The role of digital innovation in knowledge management systems: a systematic literature review”, *Journal of Business Research*, Vol. 123, pp. 220–231. doi: 10.1016/j.jbusres.2020.09.042.

Enstroem, R. and Schmaltz, R. (2023), “A Juggler’s manifesto: elevating creativity to stay productive amid uncertainty”, *Journal of Management Development*, Vol. 42 No. 5, pp. 340–351. doi: 10.1108/JMD-04-2023-0101.

Farrell, W.A. (2018), “Learning becomes doing: applying augmented and virtual reality to improve performance”, *Performance Improvement*, Vol. 57 No. 4, pp. 19–28. doi: 10.1002/pfi.21775.

Galbraith, J.R. (1973), *Designing Complex Organizations*, Addison-Wesley Pub. Co, Reading, Mass.

Galbraith, J.R. (1974), “Organization design: an information processing view”, *Interfaces*, Vol. 4 No. 3, pp. 28–36.

Garrison, G., Wakefield, R.L. and Kim, S. (2015), “The effects of IT capabilities and delivery model on cloud computing success and firm performance for cloud supported processes and operations”, *International Journal of Information Management*, Vol. 35 No. 4, pp. 377–393. doi: 10.1016/j.ijinfomgt.2015.03.001.

Hsu, P.-F., Ray, S. and Li-Hsieh, Y.-Y. (2014), “Examining cloud computing adoption intention, pricing mechanism, and deployment model”, *International Journal of Information Management*, Vol. 34 No. 4, pp. 474–488. doi: 10.1016/j.ijinfomgt.2014.04.006.

“Human + machine: a new era of automation in manufacturing | McKinsey”. (n.d.) , available at: <https://www.mckinsey.com/capabilities/operations/our-insights/human-plus-machine-a-new-era-of-automation-in-manufacturing> (accessed 3 March 2024).

Jackson, I., Ivanov, D., Dolgui, A. and Namdar, J. (2024), “Generative artificial intelligence in supply chain and operations management: a capability-based framework for analysis and implementation”, *International Journal of Production Research*, pp. 1–26. doi: 10.1080/00207543.2024.2309309.

Jo, S. (2023), “Automating with RFID and Blockchain”, *DevPro Journal*, 27 June, available at: <https://www.devprojournal.com/technology-trends/blockchain/automating-with-rfid-and-blockchain/> (accessed 3 March 2024).

Kalaitzi, D. and Tsolakis, N. (2022), “Supply chain analytics adoption: determinants and impacts on organisational performance and competitive advantage”, *International Journal of Production Economics*, Vol. 248, p. 108466. doi: 10.1016/j.ijpe.2022.108466.

- Kaplan, R.S. and Norton, D.P. (2010), *The Balanced Scorecard: Measures That Drive Performance*, Harvard Business Review Press, Boston, Mass.
- Kim, S. and Christensen, A.L. (2017), “The dark and bright sides of personal use of technology at work: a job demands–resources model”, *Human Resource Development Review*, Vol. 16 No. 4, pp. 425–447. doi: 10.1177/1534484317725438.
- Kim, S.Y., Park, H., Kim, H., Kim, J. and Seo, K. (2022), “Technostress causes cognitive overload in high-stress people: eye tracking analysis in a virtual kiosk test”, *Information Processing & Management*, Vol. 59 No. 6, p. 103093. doi: 10.1016/j.ipm.2022.103093.
- Kowalczyk, M. and Buxmann, P. (2014), “Big data and information processing in organizational decision processes: a multiple case study”, *Business & Information Systems Engineering*, Vol. 6 No. 5, pp. 267–278. doi: 10.1007/s12599-014-0341-5.
- Kumar, M., Mamgain, P., Pasumarti, S.S. and Singh, P.K. (2022), “Organizational IT support and knowledge sharing behaviour affecting service innovation performance: empirical evidence from the hospitality industry”, *VINE Journal of Information and Knowledge Management Systems*, Vol. 54 No. 2, pp. 256–279. doi: 10.1108/VJIKMS-07-2021-0124.
- Le, K.B.Q., Sajtos, L., Kunz, W.H. and Fernandez, K.V. (2024), “The Future of work: understanding the effectiveness of collaboration between human and digital employees in service”, *Journal of Service Research*, p. 10946705241229419. doi: 10.1177/10946705241229419.
- Lee, A.R., Son, S.-M. and Kim, K.K. (2016), “Information and communication technology overload and social networking service fatigue: a stress perspective”, *Computers in Human Behavior*, Vol. 55, pp. 51–61. doi: 10.1016/j.chb.2015.08.011.
- Lodgaard, E. and Dransfeld, S. (2020), “Organizational aspects for successful integration of human-machine interaction in the industry 4.0 era”, *Procedia CIRP*, Vol. 88, pp. 218–222. doi: 10.1016/j.procir.2020.05.039.
- Martinho, J.L., Gomes, C.F. and Yasin, M.M. (2015), “Enhancing organisational performance through information technology: an organisational and social strategic context”, *International Journal of Business Information Systems*, Vol. 20 No. 1, p. 95. doi: 10.1504/IJBIS.2015.070887.
- Moencks, M., Roth, E., Bohné, T., Romero, D. and Stahre, J. (2022), “Augmented workforce canvas: a management tool for guiding human-centric, value-driven human-technology integration in industry”, *Computers & Industrial Engineering*, Vol. 163, p. 107803. doi: 10.1016/j.cie.2021.107803.
- Opazo-Basáez, M., Vendrell-Herrero, F., Bustinza, O.F. and Marić, J. (2022), “Global value chain breadth and firm productivity: the enhancing effect of Industry 4.0”, *Journal of Manufacturing Technology Management*, Vol. 33 No. 4, pp. 785–804. doi: 10.1108/JMTM-12-2020-0498.
- Parker, J., Lowe, A., O’Regan, D., Gorniakowski, M., Hardisty, L., Morrison, C. (n.d.), “Operational optimisation: decision-making beyond human capability”, available at: <https://kpmg.com/au/en/home/insights/2023/09/operational-optimisation-decision-making-with-ai.html> (accessed 11 March 2024).

- Premkumar, G., Ramamurthy, K. and Saunders, C.S. (2005), "Information processing view of organizations: an exploratory examination of fit in the context of interorganizational relationships", *Journal of Management Information Systems*, Vol. 22 No. 1, pp. 257–294. doi: 10.1080/07421222.2003.11045841.
- Rutkowski, A.-F. and Saunders, C.S. (2018), *Emotional and Cognitive Overload: The Dark Side of Information Technology*, 1st ed., Routledge. doi: 10.4324/9781315167275.
- Satpathy, S., Patel, G. and Kumar, K. (2021), "Identifying and ranking techno-stressors among IT employees due to work from home arrangement during Covid-19 pandemic", *Decision*, Vol. 48 No. 4, pp. 391–402. doi: 10.1007/s40622-021-00295-5.
- Sullivan, Y. and Fosso Wamba, S. (2024), "Artificial intelligence and adaptive response to market changes: a strategy to enhance firm performance and innovation", *Journal of Business Research*, Vol. 174, p. 114500. doi: 10.1016/j.jbusres.2024.114500.
- Srinivasan, R. and Swink, M. (2015), "Leveraging supply chain integration through planning comprehensiveness: an organizational information processing theory perspective", *Decision Sciences*, Vol. 46 No. 5, pp. 823–861. doi: 10.1111/deci.12166.
- Swan, M. (2018), "Blockchain for business: next-generation enterprise artificial intelligence systems", *Advances in Computers*, Vol. 111, pp. 121–162. doi: 10.1016/bs.adcom.2018.03.013.
- Tallon, P.P., Mooney, J.G. and Duddek, M. (2020), "Measuring the business value of IT", Lynn, T., Mooney, J.G., Rosati, P. and Fox, G. (Ed.s), *Measuring the Business Value of Cloud Computing*, Springer International Publishing, Cham, pp. 1–17. doi: 10.1007/978-3-030-43198-3_1.
- Tarafdar, M., Tu, Q. and Ragu-Nathan, T.S. (2010), "Impact of technostress on end-user satisfaction and performance", *Journal of Management Information Systems*, Vol. 27 No. 3, pp. 303–334. doi: 10.2753/MIS0742-1222270311.
- "The History of Boston Consulting Group". (n.d.). *BCG Global*, available at: <https://www.bcg.com/about/overview/our-history> (accessed 22 March 2024).
- "The New ABC's: Artificial Intelligence, Blockchain and How Each Complements the Other". (n.d.). *Morrison Foerster*, available at: <https://www.mofo.com/resources/insights/200312-new-abcs-ai-blockchain> (accessed 3 March 2024).
- Turulja, L. and Bajgoric, N. (2018), "Information technology, knowledge management and human resource management: investigating mutual interactions towards better organizational performance", *VINE Journal of Information and Knowledge Management Systems*, Vol. 48 No. 2, pp. 255–276. doi: 10.1108/VJIKMS-06-2017-0035.
- Xie, X., Wu, Y., Palacios-Marqués, D. and Ribeiro-Navarrete, S. (2022), "Business networks and organizational resilience capacity in the digital age during COVID-19: a perspective utilizing organizational information processing theory", *Technological Forecasting and Social Change*, Vol. 177, p. 121548. doi: 10.1016/j.techfore.2022.121548.
- Zare Mehrjerdi, Y. (2011), "RFID and its benefits: a multiple case analysis", *Assembly Automation*, Vol. 31 No. 3, pp. 251–262. doi: 10.1108/01445151111150596.

Zaza, S., Riemenschneider, C. and Armstrong, D.J. (2022), “The drivers and effects of burnout within an information technology work context: a job demands-resources framework”, *Information Technology & People*, Vol. 35 No. 7, pp. 2288–2313. doi: 10.1108/ITP-01-2021-0093.

Zhu, S., Song, J., Hazen, B.T., Lee, K. and Cegielski, C. (2018), “How supply chain analytics enables operational supply chain transparency: an organizational information processing theory perspective”, *International Journal of Physical Distribution & Logistics Management*, Vol. 48 No. 1, pp. 47–68. doi: 10.1108/IJPDLM-11-2017-0341.

Appendix A

Keywords for text mining of industry reports

1. Digital and Technological Transformation	2. Organizational Change and Development
Digital transformation	Organizational change
Technology adoption	Change management
Digital workplace	HRM adaption
Automation	Culture shift
BYOD (Bring Your Own Device)	Crisis response
Technical proficiency	Sustainable transformation
	Future of work

3. Employee Focus and Engagement	4. Skills and Competencies
Employee engagement	Skill gap analysis
Employee experience	Soft skills
Talent development	Hard skills
Leadership development	Skill assessment
Team-building	Competency modeling
	Learning and development
	Skill acquisition
	Skill retention
	Training
	Upskilling
	Reskilling

5. Workplace Adaptability and Efficiency	6. Innovation and Growth
Remote	Innovation
Agile	
Resilience	
Adaptability	
Communication	
Collaboration	
Problem-solving	
Critical thinking	
