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Tech revolution unleashed: Navigating the winds of digital transformation in the fast lane



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ABSTRACT

Building on the dynamic capability perspective, this study investigates effective digitalization and digital transformation strategies in the tech industry by highlighting the relevance of the digital divide among developed and developing economies. Further, the study identifies the key challenges, opportunities, and strategies for digitalization and digital transformation. The study embraced a qualitative approach for in-depth exploration of the phenomenon through a comparative study of two countries, i.e., Hong Kong and Pakistan. Data was collected using interviews and analyzed using content analysis to identify recurring patterns and critical insights for meaningful interpretations to address the study objective. We proposed a framework for effective digitalization and digital transformation in the tech industry from the perspective of developed and developing economies. The strategies identified in this research are categorized in technopreneurship and improved human resource practices to address the challenges faced by both developed and developing countries. The study findings contribute to a deeper understanding of the digital transformation phenomenon in the wake of changing workforce dynamics and technological disruptions, as well as the digital divide between developed and developing countries. Further, the study will help policymakers devise and implement resilient strategies in the tech industry, to help reduce the digital divide.

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Introduction

Digitalization and digital transformation encompass the adoption of cutting-edge technology to provide innovative technological solutions (Feliciano-Cestero et al., 2023; Kraus et al., 2021), which are essential for the survival and sustainable progress of organizations and industries (Porfirio et al., 2021). Moreover, sustainability in operations and functions is closely linked to digitalization and digital transformation across sectors (Vuchkovski et al., 2023). Digitalization involves leveraging technology to manage operations within the organization and ensure continuity effectively, even when employees need to work remotely, for example, using online video conferences

and communication portals for work synchronization (Chatterjee et al., 2023). Digital transformation, on the other hand, is the fusion of digital systems and innovative business models (Almeida et al., 2020). This digital landscape enables data-driven decision-making and operational efficiencies (Sumbal & Amber, 2024; Bhatti et al., 2024; Nazeer et al., 2023). Digital transformations have revitalized the industry and empowered technology to influence day-to-day lives through new businesses, manufacturing methods, and improved stakeholder interactions involving businesses, consumers, and suppliers (Feliciano-Cestero et al., 2023). In a nutshell, digitalization and digital transformation have a direct and widespread impact on business value creation, innovation, cooperation, and collaboration in the tech industry worldwide (Tariq et al., 2024; Benbya et al., 2020; Calderon-Monge & Ribeiro-Soriano, 2023; Veile et al., 2022) especially after the COVID-19 pandemic.

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The COVID-19 crisis has transformed organizational work dynamics (Sumbal et al., 2024; Li et al., 2022b). Virtual work, remote collaborations, and diverse teams are new approaches that promote the emerging concept of gig economy (Behl et al., 2021). In the same vein, innovative technology, artificial intelligence, automation, robotics, cloud computing, and the Internet of things (Nazeer et al., 2023) are changing the working patterns (gig/freelance work and hybrid work practices) and the ways organizations produce and deliver products and services to the customers (Sumbal et al., 2024). These changing dynamics bring several challenges, such as security and privacy concerns, social and ethical dilemmas, etc. (Almeida et al., 2020; Favaretto et al., 2020). Therefore, organizations must revamp their strategic stance for digitalization and digital transformation to meet the changing dynamics (Feliciano-Cestero et al., 2023). Another important aspect of this connection is that the role of technology is crucial in the modern world and cannot be disregarded; however, a digital divide is also evident between developed and developing countries (Van Dijk, 2020) regarding technology adoption and digital transformation. This divide includes technology illiteracy, knowledge deficits among citizens, and a lack of technological infrastructure in developing countries (Popkova et al., 2022). Developing countries also lack the institutions and infrastructure to support digitalization, teleworking, and e-commerce (Amankwah-Amoah et al., 2021). Efforts were made during the COVID-19 pandemic to improve technological infrastructure. For instance, in comparison to 2020, digital infrastructure has increased by 73 %, and digital technology applications have increased by 77 % in developing countries (Popkova et al., 2022). Despite that, a digital divide exists between developed and developing economies. The digital divide demonstrates the disparity in technology adoption by different social groups (Li & Kostka, 2024). Existing studies, in this regard, have discussed the digital divide with the perspective of bridging the digital divide through technopreneurship (Werthner et al., 2024), digital inclusion of the elderly in digital transformation (Li & Kostka, 2024), the digital divide in rural areas (Arion et al., 2024). Research in this direction has mainly focused on the societal level of inequalities and calls for research to explore the digital divide at the country level (Korovkin et al., 2023; Lythreitis et al., 2022). It is important to examine the realities of digitalization and digital transformation in both developed and developing countries to understand how to reduce the digital divide (Lythreitis et al., 2022) by devising appropriate implementation and managerial strategies.

To address the aforementioned research gaps through the lens of dynamic capability theory, which states "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" (Teece et al., 1997, p. 516), this study, explores digital transformation due to changing workforce dynamics and technological disruptions in both developed and developing countries that would help in devising implementation and managerial strategies for effective digitalization and digital transformation and also contribute to reduce digital divide. In the fast-moving digital transformation era, organizations must scan the environment and respond to it by quickly modifying resources and processes to sustain their competitive advantage over time, which is only possible if the organizations possess and practice dynamic capabilities (Capurro et al., 2022; Li et al., 2022a). Dynamic capabilities include the organization's capabilities to address changing dynamics by transforming a business model that correlates with the changing requirements (Capurro et al., 2022). As a knowledge-based economy, Hong Kong heavily relies on technological advancements (de Pablos & Edvinsson, 2020) and has made significant investments in IT-related projects (Lam & Yang, 2020). Conversely, the IT profession and tech industry in Pakistan experienced a boost after the COVID-19 pandemic, with evidence showing a positive impact on the sector (Mushafiq, 2023). IT companies in Pakistan offer their products and services to >100 countries (Kazmi, 2022). Given the technological

advancement in Hong Kong and the progressive growth of the tech industry in Pakistan, it is justified to compare the perspectives on technology adoption between Hong Kong (a developed economy) and Pakistan (a developing economy). The findings of this research contribute to the literature by demonstrating the underlying mechanism to support digitalization and digital transformation in the tech industry, focusing on the prevailing challenges, opportunities, and prospective strategies to overcome the challenges and to benefit from the available opportunities. The rest of the article is arranged as follows. Literature review discusses existing literature on digitalization and digital transformation. Methodology explains the methodology, Study findings and discussion demonstrates findings and discussion, and Conclusion concludes the study.

Literature review

Digitalization and digital transformation

With the increasing research interest on digital technologies, there is a rise on the literature focused on digitization, digitalization, and digital transformation. However, there are some conceptual overlaps among the three constructs (Gradillas & Thomas, 2023). These three terms are often used together and sometimes interchangeably, which could lead to the confusion if we just directly discuss them without further clarification in this study. Therefore, it is essential to define digitization, digitalization and digital transformation. Digitization is referred to the technical process of transforming the analogue information into the digital form, which results in the efficiencies in terms of time, cost and space (Begkos et al., 2023). Digitization necessitates the development of digital infrastructures and applications, making it a crucial first step towards digitalization, as it drives the marginal cost of producing information goods to near zero and reduces digital storage costs, allowing organizations to dramatically increase the amount of visible and available data (Borcan, 2021). Digitalization is defined as the ability of an enterprise to convert existing products and services into digital versions that offer greater advantages than their physical counterparts (Zhang & Chen, 2024). Through digitalization, enterprises' business can gain a competitive edge by introducing innovative services via digital channels or adopting new operation management systems that facilitate the smooth coordination among processes (Costa Melo et al., 2023). While digitalization involves the improvement of business processes through the use of technology, digital transformation entails the development of new business models by leveraging and combining emerging digital technologies such as artificial intelligence, cloud computing, blockchain, and big data (Malodia et al., 2023), and it is the organization-wide shift of business models to digital platforms by implementing digitalized business logic (Verhoef et al., 2021). In other words, digital transformation is regarded as a kind of digital strategy that reshapes an organization or a network of organizations across multiple dimensions, such as governance, leadership, culture, workforce and so on (Raza et al., 2023).

Regarding the impact and contribution, digitalization and digital transformation have transformed businesses and societies worldwide (Fernandez-Vidal et al., 2022; Popkova et al., 2022). In today's digital economy, digitalization and digital transformation are crucial for success in the digital landscape (Zhong & Ren, 2023) as they integrate technology and digital resources with enterprise business operations (Zoppelletto et al., 2023). Digitalization enhances business operations, such as supply chain management, product innovation, and workforce management (Bansal et al., 2023; Ferraris et al., 2020). It also brings about innovative changes to business models (Verhoef et al., 2021; Rialti et al., 2022), reduce transaction cost and financing (Zhou & Li, 2023), improves productivity, efficiency, and innovation (Abudaqa et al., 2022; Benitez et al., 2022; Chen et al., 2022), enhances entrepreneurship (Jafari-Sadeghi et al., 2021), and contributes to overall firm performance (Malodia et al., 2023). Especially in the

current post-pandemic era, digitalization and digital transformation have become critical factors for organizations seeking a competitive edge (Bansal et al., 2023; Tajvidi & Tajvidi, 2020). Digitalization platforms can also contribute to developing hard and soft skills, ensuring the acquisition of new and relevant knowledge for functional tasks (Amankwah-Amoah et al., 2021).

Strategies and challenges for digital transformation

Digital transformation shapes the ecosystem through new business models (Santos et al., 2023). In this direction, the literature discusses several strategies for effective digital transformation in organizations (Bargoni et al., 2024; Kraus et al., 2021). Linking digital transformation with digital entrepreneurship, Paul et al. (2023) have devised a strategy to convert traditional organizations into digital by effectively transitioning towards a digital ecosystem. They develop a conceptual framework for the digitalization process through a structured literature synthesis. The strategies they suggested are the creation of a digital knowledge base, adoption of digital technology, readiness of digital platform, business process transformation, business resources transformation, and business model transformation. Through a literature review, Trenerry et al. (2021) have identified supporting factors for digital transformation at the individual, group, and organizational levels. Individual-level strategies are technology acceptance and adoption, perceptions and attitudes, skills and training, workplace resilience and adaptability, and work-related stress and well-being. Team communication and collaboration, workplace relationship and team identification, and team resilience and adaptability are at the group level. Leadership, human resources, and organizational culture are the strategies that organizations have to consider for digital transformation. However, strategies for digital transformation need to be devised separately for SMEs (Bargoni et al., 2024) and large firms. Zoppelletto et al. (2023) have identified micro-level strategies for SMEs and large organizations. They suggested a peer-tutor approach for SMEs that promotes informal leadership to redesign and redistribute work tasks, foster an entrepreneurial approach, be enthusiastic about digital issues, and encourage workforce cultural shift. In large firms, they suggested a conductor approach that promotes digital transformation leadership with autonomy in decisions and decentralization in decision making, devises and promotes formal governance architecture for digital transformation, motivates and strengthens digital mindset, and encourages e-trainings. These strategies facilitate organizational growth and resilience specifically in post-COVID-19 context.

Keeping in view the COVID-19 context, while Santos et al. (2023) have discussed the strategies for effective digital transformation, i.e., creative digital pivoting, maintaining digital infrastructure and by creating social impact through digital technology, they indicated some barriers to digital transformation, i.e., physical and emotional demands of technology creating a burden for the adoption of digital technology. According to the study conducted by Jia et al. (2024), although about 70 % of Chinese SMEs have adopted the digital transformation, most of them are in the initial and adoption stages and have not yet achieved significant satisfactory status, which makes it a challenge to promote SMEs to actively process digital transformation. For SMEs, the lack of active digital thinking, weak digital foundation, employees' knowledge and skills, and limited funds make the road to digital transformation difficult (Teng et al., 2022). Some literature also analyzes the different challenges faced by different industries for the digital transformation (Akbari et al., 2024; Dal Mas et al., 2023). For example, Quy et al. (2023) identified four significant challenges faced by the higher education: legal basis, changing thinking and management capacity, information technology infrastructure, and the skills and access capabilities of IT. In the post-COVID-19 context, the challenges identified by Almeida et al. (2020) are the adoption of telework and distance working, the growth of e-commerce, cybersecurity, and privacy.

Coincidentally, the study investigated by Stewart (2023) also showed that as digital transformation gradually advances, security issues such as data leakage pose challenges, which cannot be ignored. Furthermore, recruiting and retaining employee who has digital technology knowledge has become a major obstacle for the enterprises during the digital transformation process (Dal Mas et al., 2023).

Methodology

To explore the strategy exploration and the extent of the digital divide for digitalization and digital transformation in the tech industry, an in-depth qualitative exploration of the phenomenon was conducted. Qualitative research methods were employed to gather rich and detailed insights into the experiences, perspectives, and practices of technology adoption in selected countries, i.e., Hong Kong and Pakistan. We comprehensively understood each country's context, challenges, opportunities, and strategies through interviews and analysis of relevant documents. This qualitative approach allowed for a nuanced examination of the factors influencing technology adoption and the specific dynamics in developed and developing countries. By delving into the intricacies of the phenomenon, this study aimed to provide valuable insights and contribute to the existing body of knowledge in the area of digitalization and digital transformation and address the digital divide.

Study participants

Based on the nature of the phenomena under study, a theoretical sampling approach is adopted, and respondents are carefully selected to be the most relevant and appropriate to respond to the study questions (Glaser & Strauss, 1967). It was ensured that the chosen respondents could provide rich insights about the challenges and opportunities faced by IT professionals and tech organizations. Our sample includes middle and top managerial IT professionals with rich experience in the tech industry. For the selection of our informants, we established four essential criteria. First, respondents must belong to a pure tech-based organization in the IT industry. Second, they must have at least five years of industry experience in a managerial position. Third, they have been in executive managerial positions for at least three years. Fourth, they must lead a team of at least five people.

Data collection – experts' interviews

By implementing a semi-structured interview approach and employing a well-crafted interview protocol, the research sought to acquire comprehensive and insightful data directly from the participants (Plaikner et al., 2023). This methodology provides the flexibility needed to delve into participants' unique experiences and perspectives while ensuring consistent coverage of relevant topics across interviews (Šakytė-Statnickė et al., 2023). The collected data contributes to a thorough understanding of the challenges, opportunities, and strategies encountered by organizations in the tech industry.

We included three main questions in the interview protocol: (1) What opportunities do organizations foresee that could impact technology adoption, i.e., automation, digitalization, AI, Data Science, and Big Data Analytics for improved decision-making and efficiency in the post-COVID-19 era? (2) What challenges are organizations facing in the adoption of technology? (3) Could you identify strategies for adopting effective and efficient technology? A total of eighteen semi-structured interviews were conducted from Hong Kong and Pakistan. The respondents were selected from the tech industry, specifically from organizations that provide tech solutions to public and private sector organizations. These respondents belonged to middle and higher management with details provided in Table 1. The respondents were approached using multiple sources, i.e., LinkedIn, email, phone calls, and messages (text and WhatsApp) to seek their consent

Table 1
Respondents' profile.

Hong Kong							Pakistan						
Code	Designation	Age	Experience	Gender	Duration	Mode	Code	Designation	Age	Experience	Gender	Duration	Mode
HK1	Chairman	54	20	Male	30:00	In Person	PK1	Vice CEO	48	16	Male	15:05	Online (MS-Teams)
HK2	Chairman	46	16	Male	25:00	In Person	PK2	Manager Cybersecurity	35	5	Female	48:00	In Person
HK3	Director	58	22	Male	20:00	In Person	PK3	Head Data Science	40	13	Male	15:26	Online (WhatsApp)
HK4	Head of Artificial Intelligence	42	8	Male	40:00	In Person	PK4	Network Planning Engineer	39	5	Male	18:33	Online (WhatsApp)
HK5	Head of Information Technology	53	12	Male	51:07	In Person	PK5	Project Manager	35	6	Male	20:55	Online (Zoom)
HK6	Director	38	5	Male	37:45	Online (WhatsApp)	PK6	Manager Systems	40	17	Male	15:25	Online (WhatsApp)
HK7	Chief Technical Officer	35	12	Male	20:36	Online (WhatsApp)	PK7	Manager Networks	44	16	Male	17:35	Online (Zoom)
HK8	Executive Director	53	14	Male	24:36	Online (MS-Teams)	PK8	Data Scientist	42	5	Female	40:00	In Person
HK9	IT Director	36	5	Female	35:00	Online (Zoom)	PK9	Chief Technology Officer	61	28	Male	25:00	In Person

and availability for an interview. After the informants agreed to an interview, they were given multiple options for an interview. Depending on the availability and convenience of participants, online and face-to-face interviews were conducted for both groups of respondents. According to the respondents' preference, various online video conferencing tools were used, such as Zoom, WhatsApp, and MS Teams. Data was collected over one year, from December 2022 to December 2023. All the interviews were recorded after seeking respondents' consent. The interviews were conducted in English; however, clarifications were provided in a few interviews conducted in local languages, i.e., Cantonese and Urdu.

The interviews lasted between forty to fifty minutes for Hong Kong respondents and thirty to forty-five minutes in length for respondents from Pakistan. Before the interview, the purpose of the interview was explained to the participants. Sometimes, interview questions were sent to the informants before the interviews. We adopted an approach of dialogue translation instead of exact word-to-word translation and ensured the minimum loss of original meaning as suggested in the literature (Temple & Young, 2004). However, word-to-word transcription has been performed where respondents responded in English, and translation was not required. In case of ambiguity, the respondents were approached for clarification during transcription.

Data analysis

Transcribed data was analyzed using content analysis, which "reveals both depth and meaning in participants' utterances" (Lindgren et al., 2020, p. 1). Content analysis is gaining acceptability among researchers because it facilitates "understanding a phenomenon by analyzing the presence of meaning and relationships through various forms of human activity and communications" (Selvi, 2019, p. 440). Among the multiple options for conducting content analysis, i.e., reading research in the domain, collaborating with experts, and directly examining the domain Slocum and Rolf (2021), we adopted collaboration with experts. Following the manual analysis approach, interview transcripts were read repeatedly, word by word, line by line, and paragraph by paragraph, to identify initial codes and themes. First-level codes are the rich collection of codes based on the original language used by the respondents. Comparison and relationship between codes are established until they reach the point of theoretical saturation, yielding no further insights (Glaser & Strauss, 1967). The discussions with the respondents lead us to overlapping concepts among the three dimensions of challenges, opportunities and strategies. It was, therefore, challenging to come up with a model that gives a clear picture of what strategies would be adopted by the tech industry to address the challenges. For this purpose, authors have done rounds of discussions on generated themes and codes. The themes of challenges, opportunities, and strategies have emerged with the subthemes of brain drain, security, and ethical issues; blended workforce and dawn of Gig economy and value creation from big data, artificial intelligence, and generative AI; and technology and improved human resource practices, respectively. These sub-themes have covered emerging issues identified by the respondents, which were initially coded and then described in detail with verbatim in the results section. After the themes and codes were finalized, the relationship between themes and codes was established. A separate analysis is performed for Hong Kong and Pakistan data using the same pattern. The results are then compared and contrasted to reach a conclusion.

Study findings and discussion

Digitalization and digital transformation: challenges

This section discusses the challenges IT professionals and tech organizations face regarding digitalization and digital transformation in Hong Kong and Pakistan.

Brain drain

Concerning the employee retention challenge, brain drain is the most pronounced issue in Hong Kong. Similarly, brain drain in the medical and health industry was also evident during the pandemic (Dzinamarira & Musuka, 2021; Lawal et al., 2022). Tech professionals frequently move to other countries from Hong Kong to pursue their careers and for better prospects. To overcome this challenge, a substantial salary rise is also evident during and after COVID-19. Contrarily, IT professionals in Pakistan opted for freelancing opportunities with international organizations, leaving a space in the local market. In contrast to the reverse brain drain in Europe (Bakalova et al., 2021), Hong Kong and Pakistan have faced severe brain drain of IT professionals, especially after the pandemic. Here is an example response from Hong Kong:

"Most of the companies improved infrastructure and require IT staff. They are willing to pay higher salaries, i.e., a 50 % increase in last year's salaries, to cope with the scarcity of IT professionals who moved to other countries. Employees also moved to other companies for better packages (30–40 %), creating a void in the industry. Even though we offered work from home, most of the employees refused. They prefer to go to other countries like the UK. There are opportunities for IT people everywhere, so they are moving to better places for better opportunities" (hk5)

The brain drain dilemma is a challenge related to COVID-19; however, it still exists after the pandemic phase is over. Despite exponential salary increases, the tech industry still struggles to acquire tech professionals, especially in Pakistan. The reasons are identified in the following example response:

"The boom of IT professionals' demands worldwide, along with other factors like economic crisis, political situation, inflation, etc., in Pakistan are the compelling factors for individuals to migrate to other countries. Moreover, IT professionals are also inclined towards remote and freelancing jobs, and it leaves a void in Pakistani industries" (pk2)

Besides the country's economic, political, and pandemic situation, the international market also promoted a brain drain in Pakistan. We can have an idea of how this situation is prevailing in the following example:

"Other than migration to other countries, local IT professionals are engaged with international organizations in both the capacity of freelancing and remote work. It facilitates local IT professionals with international competitive market salaries, and thus they prefer to work for international market rather than serve national organizations on a minimum salary" (pk8)

Brain drain poses another challenge for the tech industry, particularly after the pandemic, with a significant increase in market demand for IT professionals. It has become a global dilemma and a pressing issue in human history (Moody, 2021). Organizations can adopt multiple strategies to address this issue, such as improving work practices and creating a conducive work environment to foster employee retention. Establishing better work practices, nurturing an organizational culture, and providing a favorable work environment create goodwill for organizations and attract professionals (Greimel et al., 2023). Offering market-competitive salaries and other benefits appeals to professionals in developed and developing countries.

Furthermore, governments can foster a supportive ecosystem by investing in education, research and development, technology infrastructure, entrepreneurship, and technopreneurship projects (Jafari-Sadeghi et al., 2021). Retaining talent within the country can be achieved through policies that create more opportunities, improve salary ranges, promote industry-academia collaboration, and provide

tax incentives to companies engaged in research and development. Collaboration between developed and developing countries for education, research and development, skill development, and exchange programs can also help to decrease the existing brain drain. Additionally, promoting reverse brain drain by creating employment opportunities with internationally competitive income, funding research and development projects, and offering tax breaks can be effective (Bakalova et al., 2021).

Government policies aimed at creating a supportive ecosystem should address the root causes and be aligned with the realities of each country. For instance, in developing countries, the leading cause of brain drain is IT professionals' inclination towards freelancing and remote jobs with international organizations, driven by the desire for higher income through favorable currency exchange rates. This deviation can be managed by offering high salaries and attractive work environments. On the other hand, in developed countries, brain drain primarily stems from talent migration to other countries, which can be addressed by creating more and better opportunities and improving the work environment. Creating a supportive ecosystem is the only way to minimize the brain drain dilemma in tech organizations. It requires multidimensional investments, employee retention policies, international collaborations from different perspectives, and fostering reverse brain drain in developed and developing countries.

Security and ethical concerns

Another critical challenge identified from our findings relates to security and ethical values. Security concerns, data breaches, cybersecurity, phishing, cybercrime, etc., are the focus of every tech organization and IT professionals these days (Christiansen et al., 2022; Stamoulis, 2022). This concern is more pronounced, especially when the COVID-19 crisis is over. Tech organizations, specifically, are faced with severe security concerns (Almeida et al., 2020; Hanisch et al., 2023). Respondents from both countries have demonstrated their concerns about security issues in tech organizations. For example:

"Technology adoption creates information security and data privacy concerns. We usually can't apply too much information security control to the solution. We have to rely on workers to handle company data and some of our client data. We cannot have a perfect system; however, our company is very concerned about privacy." (hk5)

"With data protection and cybersecurity risks, organizations must align their priorities with data protection and security in the next few years and months. It helps you to implement digitalization in a much better sense" (pk1)

Ethics are the core concern for tech organizations as they are linked to the system's security and organizational data. Ethical concerns are mainly rooted in ethical values in all processes and activities of organizations, especially human resource management. Have a look at how our respondents explained it:

"Ethical values in recruitment: organizations have to ensure and take such measures to include whether a candidate possesses ethical values or not, but as we see, talent is scarce in Hong Kong, so at times, we have to hire people and later on train them and ensure that they work according to the organizational rules and regulations" (hk6)

"...People who have personal integrity will not compromise on the organizational concerns" (hk7)

"Data is crucial for making decisions. So, protecting data is extremely important if you work with outside organizations. So, from my point of view, continuous focus on cybersecurity and information security are the areas Pakistani organizations have to focus on. So that people understand data privacy, data loss, data protection and take true measures to protect data in organizations" (pk1)

Security concerns range from data breaches to various cyber-crimes, including phishing, cyber-attacks, and malware (Christiansen et al., 2022; Stamoulis, 2022). Organizations must address these concerns through multiple strategies, such as implementing robust security measures, keeping employees informed about security threats, and providing training and development on the latest security trends (Hanisch et al., 2023). Security and ethical concerns for digital transformation need practitioners to focus on developed and developing countries. However, policymakers in developing countries need to put more emphasis on this.

Digitalization and digital transformation: opportunities

This section discusses the opportunities for digitalization and digital transformation that have emerged for IT professionals and tech organizations in Hong Kong and Pakistan. The era of the Gig Economy and blended workforce, along with value creation by artificial intelligence, robotics, and generative AI, have become two key elements that support digitalization and digital transformation today.

Blended workforce and the dawn of the gig economy

The gig economy is not a new concept and can be traced back to 1920. However, the idea has gained momentum after the pandemic (Shaw et al., 2022). These concepts will not end with COVID-19 but are giving new dimensions for the new normal to all employees at all levels and all industries, especially IT professionals and the tech industry. It has changed the work dynamics and emerged as an opportunity for widespread digitalization and digital transformation in organizations, especially tech organizations. Organizations preferred hiring skilled resources available anywhere in the world. The whole process of team hiring, team development, and team management is shifting towards virtual recruitment, which is why digital transformation in organizations is inevitable. Our respondents from both countries highlighted this concern as:

"The entire recruitment process shifts to virtual mode, interviews virtually, meeting people you never met physically, virtual hiring of full-time and part-time staff, and virtual team meetings multiple times a week. It changed the work dynamics; you have to work online or do no work" (hk7)

"Another challenge is employee retention. Organizations failed badly in retaining their people. It becomes straightforward for people to switch jobs. People are now having more opportunities with higher salaries working as freelancers, and it completely changed the industry scenario" (pk2)

Both of these responses from Hong Kong and Pakistan broadly demonstrate the shift in work dynamics; however, they have different approaches to opportunity and challenge from the respondents from Hong Kong and Pakistan. The concept and term used for working with the diverse workforce in Hong Kong is Lego teams, where teams are working with varied and scattered team members, explained by a respondent as:

"Gradually, IT organizations started building teams virtually. Also, virtual services. It's like a Lego team building, so everybody is scattered, and you do it through your communication skills. Communication was important in building virtual teams and getting things done virtually. That's how we ensured team performance" (hk8)

The concept of virtual teams and remote work is also evident in Pakistan. However, the difference is that tech organizations build and manage virtual teams in Hong Kong. In Pakistan, IT professionals are part of the worldwide virtual teams through options such as freelancing and remote jobs.

"Organizations working in the US and other countries are now more flexible to hire people from Pakistan because of no physical boundary requirement" (pk1)

Another opportunity has emerged as part of the gig economy, i.e., boundaryless collaboration and coordination. People from different cities, countries, and continents collaborate and help each other without having physical interaction. Online coordination and collaboration at inter and intra-organizational levels require digital transformation in organizations. During the pandemic, online communication platforms and social media were used extensively, resulting in substantially increased online collaboration and coordination in both developed and developing economies, as shown in the below quotes:

"The conception was to start completely online work, which got well and smooth, and it never matters where you are physically. You can give recommendations to friends who live in other countries. That is a big opportunity" (hk7)

"The greatest benefit of the post-COVID-19 era is that it removes the physical boundaries. Organizations believed that employees should be present in the office vicinity, now this approach does not exist" (pk1)

The gig economy is an evolving concept of flexible, digitally mediated employment arrangements (Shaw et al., 2022). It offers organizations flexible labor by hiring independent employees to cope with real-time demand (Allon et al., 2023). Knowledge workers in the gig economy face challenges such as low pay, lack of job security, reduced ability to communicate or bargain collectively with employers, and ill-adapted regulatory structures (Sumbal et al., 2023; Shaw et al., 2022). It is, therefore, imperative for practitioners and policymakers to come up with policies that support gig IT professionals and tech organizations both in developed and developing countries. Digital transformation is inevitable in the tech industry to support the gig economy and help IT professionals. Based on these arguments, the first preposition demonstrating the opportunity for tech organizations and IT professionals is:

P1: Gig workers are part and parcel of Tech organizations. Both developed and developing countries should focus on devising effective digital transformation policies that support gig workers and tech organizations to support the gig economy.

Value creation from big data, artificial intelligence and generative AI

Adopting technology also increased awareness of the extensive use of data for decision-making to enhance organizational and individual efficiency and productivity. Artificial intelligence, big data, the Internet of Things, and robotics have been extensively deployed in organizations and have become the way forward for efficient digitalization and digital transformation in tech organizations (Almeida et al., 2020). Tech organizations in Hong Kong have already implemented a decision support system built on organizational data, especially big data. However, the tech industry in Pakistan is moving in this direction. A respondent from Pakistan stated this as:

"Organizations are producing enormous amounts of data they can use for constructive purposes and to have strong decisions. Our industry is effectively moving in this direction" (pk3)

Moreover, generative AI is an evolving concept changing the landscape of employees and organizations (Sumbal & Amber, 2024; Naz-eer et al., 2023). It is accepted and adopted in the world, either developed or developing. However, individuals and organizations are deciding on its use by simultaneously avoiding the associated cons. The literature demonstrates its impact on organizations and

organizational decision-making (Sumbal & Amber, 2024; Dwivedi et al., 2023; Nazeer et al., 2023). Our respondents from developed and developing countries also highlighted the importance and utilization of generative AI in organizations. For example:

"... ChatGPT is a great revolution, especially for IT professionals. We can get enormous benefits like code writing, error, and bugs identification and corrections" (hk9)

"Tech organizations need to integrate their system with the generative AI ... to get enormous benefits of their digital system" (pk8)

The development and growing use of artificial intelligence and generative AI are now rapidly changing organizational dynamics (Dwivedi et al., 2023). Using natural language processing, artificial intelligence, and machine and deep learning, generative AI is the next milestone for tech organizations and IT professionals to achieve productivity and efficiency. Its blessings are discussed in different dimensions of organizational practices, for instance, customer support, marketing, communication, knowledge management, etc. (Dwivedi et al., 2020; Nazeer et al., 2023). Now is the time for tech organizations and IT professionals to fully grab the opportunities of generative AI and integrate it with the digital system to improve work dynamics. These arguments lead to the second proposition:

P2: Generative AI has the potential to improve work dynamics in organizations. Tech organizations and IT professionals from developed and developing countries must benefit from this emerging technological breakthrough and maximize the use of their digital systems.

Digitalization and digital transformation: strategies

This section discusses the strategies IT professionals and tech organizations adopt for digitalization and digital transformation in Hong Kong and Pakistan.

Technopreneurship

Technopreneurship is the recently emerging concept combining technology and entrepreneurship, which refers to technology-based organizations or high-tech ventures (Halim et al., 2023; Okorie et al., 2014). Technopreneurial organizations have "(1) the ability to innovate; (2) the ability to create, (3) dare (4) enter into unexplored paths, (5) an enthusiastic spirit, (6) be curious, (7) no fear of failure, (8) can overcome internal fears, (9) ability to use technology as a key and integrated component of goods and services" (Abbas, 2018, p. 563). Although tech-based products were the focus of developed economies even before the pandemic, heavy investments have been made by industry and governments in technopreneur projects in Hong Kong. However, this aspect was found missing in the context of Pakistan's developing economy. However, the trend of technology adoption is on the rise. Keeping in view how technological solutions are developed in the wake of the Covid-19 pandemic and how new businesses and products were developed, digital entrepreneurship seems an inevitable phenomenon in the future (Feliciano-Cestero et al., 2023; Kraus et al., 2018; Sufyan et al., 2023). Digital transformation is inevitable for high-tech ventures, as well as both intra- and inter-industry collaboration. Our respondents from Hong Kong have touched on the point:

"Collaboration of tech industry with other industries like medical, agriculture, etc. for improving the 5IR processes, for the adoption of AI-based solutions and development and implementation of data-based decision support system becomes a new trend" (hk1)

Evidence from Hong Kong demonstrates that after the pandemic, tech organizations and IT professionals are more focused on

achieving higher productivity and innovation in their organizations and developing tech-based products and services. For example:

"Post COVID-19, we are now more focused on innovation. We encourage our staff to propose any innovation, whether to improve wording, amend a form to make it easier to understand people, use some technology to make it faster, or improve the accuracy of data, etc. We encourage them to propose anything we can do. We also picked 3–4 projects to watch [monitor] innovation" (hk5)

Technopreneurship or digital entrepreneurship is a proactive approach to overcome the challenges brought by COVID-19 for IT professionals and the tech industry. It is crucial to rethink entrepreneurship in the post-pandemic era (Sharma et al., 2022). Technopreneurship is essential for competitive advantage, economic growth, and social development (Halim et al., 2023). The more digitalized the tech organizations are, the more they can support other industries for technopreneurship. To achieve optimum competitiveness and other advantages through digitalization and digital transformation in tech organizations, the best approach is to embrace technopreneurship at all levels, including government, organizations, and individuals. These arguments lead to the third proposition:

P3: Technopreneurship or digital entrepreneurship is needed to attain an optimal competitive advantage through digitalization and digital transformation in tech organizations. It is well implemented in developed countries but needs prompt action in developing countries.

Improved human resource management practices

Tech organizations are now concerned about their employees. Rapid technological advancement and the COVID-19 crisis have negatively impacted employees in every field of life, especially those in the IT profession. Because of this, tech organizations are now more focused on their recruitment strategies, employees' satisfaction, motivation, and engagement to achieve productivity and to ensure employee retention. For example:

"Maintaining equity in organizations and ensuring access to basic living standards can help organizations to attract and retain competent minds that will ensure implementation of the technological revolution in organizations" (hk2)

"Focus, now, is shifted on strategic hiring. Building up more commercialization expertise and hiring of more global mindset either foreign or returnees is inevitable" (hk2)

"We now live in a globalized and well-connected era where you need to devise a strategy that everyone should know why he/she is doing something so that they are more productive and adaptive to technology. Through that thinking, they [organizations] must build a strategy to fulfill their employees' needs while working with the technology. By investing in their employee's satisfaction and engagement" (pk5)

Literature, in this vein, has suggested technological solutions for the complete recruitment process, i.e., tech-led hiring, tech-led onboarding, tech-led training and development, tech-led performance management, tech-led employee engagement, tech-led rewards and incentive (Bansal et al., 2023) which creates a more efficient and better system to manage the human resources.

Information security and ethical concerns are the most significant issues for organizations worldwide to ponder (Dragan, 2021; Fletcher & Griffiths, 2020). Developed countries in this direction ensure information security in three dimensions: strengthening the system,

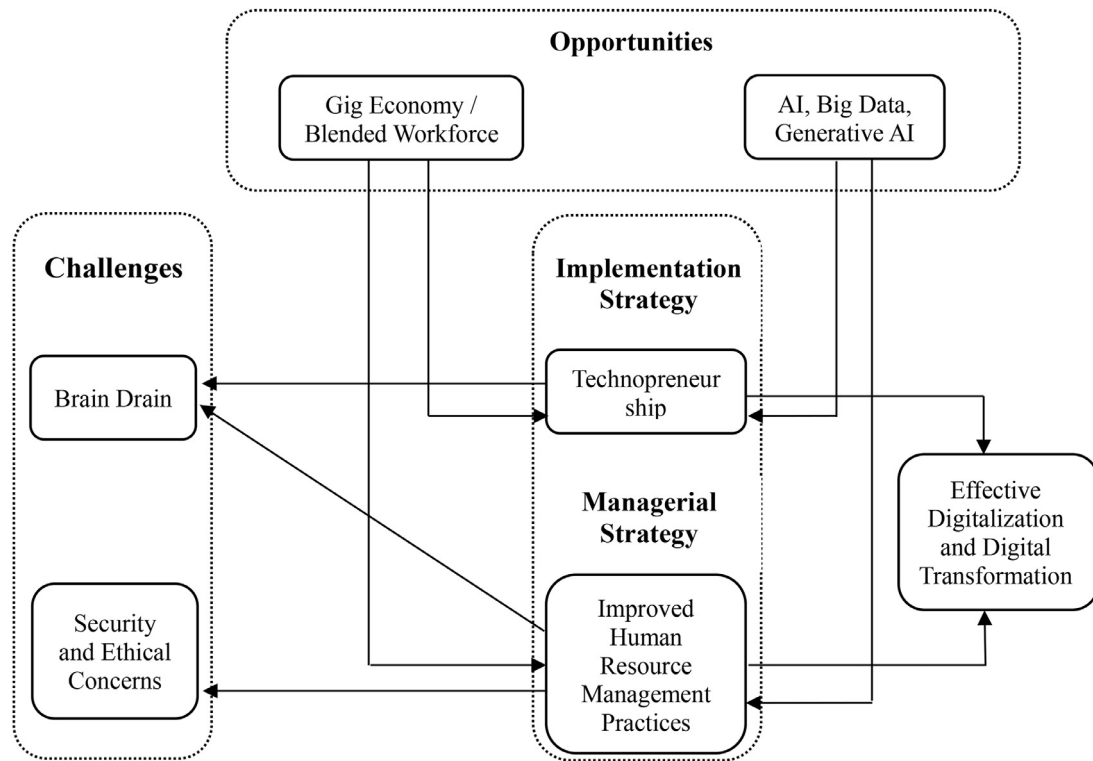


Fig. 1. Framework for effective digitalization and digital transformation.

onboarding the right people, and developing mutual trust. Our respondents from Hong Kong highlighted these dimensions as:

"When employees work in an office environment, we have strict control and restrictions, such as they can't bring USBs, copy files, etc. But when they worked from home, in the beginning, we didn't have much control over employees, and there was no information security mechanism. We must rely on them ... We ask them to keep the data safe. We trust them. No signing of any documents. It was just mutual trust. But gradually, we improved our system and strengthened our platform. They can't copy anything from remote access as we disabled it" (hk5)

"Trust is the major element. There is mutual trust between employees and organizations that work more than signing forms. There are secure coding platforms like GitHub that maintain a history of individuals working on codes and downloading the codes ... Verbal and written consent is taken from employees to ensure that they will not share organizational data and codes with any individuals and parties" (hk8)

"The responsibility of organizations, I think, is to build trust and find the right people, which implies even before digital transformation. Maybe this need is now more transparent and apparent. Find the right employee who has moral values and building trust with them is the only solution" (hk7)

Among other strategies, the most important is training to inculcate ethical values in employees. In the same direction, Zoppelletto et al. (2023) have suggested e-skills training at the peer-to-peer level before and after the development of digital projects. One of our respondents highlighted this as:

"Training is the best and most effective way to ensure ethical values in employees. Change the mind and create awareness among employees about the ethical concerns of the organizations ... Organizations always try to ensure work ethics; however, after taking

several measures, there are still chances of a data breach, and organizations have to tackle this concern on an ongoing basis" (hk7)

Improved human resource management practices in terms of tech-led recruitment, improvement in employee engagement, loyalty, commitment, mutual trust, and appropriate training are essential to address the security and ethical concerns of tech organizations. Moreover, inter-disciplinarity, multi-disciplinarity, and cross-disciplinarity teams are not options anymore but become necessary and inevitable to mitigate the pandemic's negative impact (Dube et al., 2022). Based on these arguments, the last proposition of the study is:

P4: Improved human resource practices are the way forward to address security and ethical concerns and help control the brain drain in both developed and developing countries.

Based on the discussion, it is concluded that tech organizations need to revamp their strategy, focus more on technopreneurship, and redesign human resource management practices to address the challenges of brain drain, security, and ethical issues. Moreover, organizations must focus more on grabbing emerging opportunities, i.e., artificial intelligence, big data, generative AI, and blended workforce/gig economy. The framework is illustrated in Fig. 1.

Conclusion

Developed countries are well established; however, developing countries are accustomed to digital transformation. Moreover, COVID-19 became a "blessing in disguise" (Rehman et al., 2022) for all industries, including the tech industry in developing and developed countries. Due to global collaboration, boundaryless communication and collaborations, virtual work environment, rapid development of technological breakthroughs, i.e., artificial intelligence, big data, and generative AI, and other factors, the gap between tech organizations in developed and developing countries has

narrowed. They are similar in technology adoption, advancement in work practices, global communication and coordination, improved work pace, efficiency, and productivity. However, developed countries still excel in certain areas, such as research and development, a greater focus on technopreneurship and action research, innovation and creativity, better security measures, and stronger government and industry collaboration, which are less prominent in developing countries. Based on the findings, this study proposes strategies for the tech industry and IT professionals in developed and developing countries to achieve optimal productivity and reduce the digital divide.

Theoretical and practical implications

This study provides a theoretical foundation for formulating digital strategies for a fast-paced, revolutionized post-pandemic era. This era is characterized by several changes and challenges in multiple dimensions and thus requires a robust strategy that could meet the challenges of this new era. This study provides a baseline for being aware of the underlying challenges and opportunities in the current context and how these challenges are addressed by adopting appropriate strategies. Moreover, it highlights the different challenges developed and developing countries face in adopting and implementing technology, which leads to the formulation of pertinent and relevant policies and practices to reduce the digital divide. Our findings offer practical implications. First, it provides insights into implementation and managerial strategies practitioners and policymakers can use to draw policies. Second, this study paved the way for how digitalization and digital transformation impact organizations from a broader perspective of brain drain, security, and ethical concerns. Third, it highlights the changing economic dynamism towards the gig economy and exponential growth of technological breakthroughs, i.e., artificial intelligence, big data, and generative AI. Fourth, it suggests implementation and managerial strategies for adopting technopreneurship and human resource management practices and how they benefit from the available opportunities to address the current challenges. Fifth, particularly in developing countries, accepting and implementing technopreneurial strategies is significant, which is the need of the hour. In this vein, creating awareness and discussions about specific behaviors and actions will provide a pathway to successfully implement technological breakthroughs (Santos et al., 2023).

Limitations and future research directions

This study acknowledges the limitation of conducting a cross-country level comparative analysis with the dataset from two countries, each from developed and developing countries. Though it covers in detail the study phenomenon using in-depth semi-structured interviews and theoretical exploration using in-depth analysis of the data, future research with the inclusion of data from multiple developed and developing countries will help a broader coverage of the said phenomenon with the inclusion of more factors. Furthermore, it would be interesting to conduct quantitative research to explore IT professionals' perceptions of digitalization and digital transformation with the perspective of challenges and required strategies identified in this study, such as the role of technopreneurship in effective digital transformation. Large-scale surveys could also focus on diverse contextual settings to ensure external validity.

CRedit authorship contribution statement

Muhammad Saleem Sumbal: Funding acquisition, Formal analysis, Data curation, Conceptualization. **Adeel Tariq:** Writing – review & editing, Writing – original draft, Methodology, Data curation. **Quratulain Amber:** Writing – review & editing, Writing – original draft,

Methodology, Formal analysis, Data curation. **Kamila Janovská:** Writing – review & editing, Methodology, Conceptualization. **Alberto Ferraris:** Writing – review & editing, Resources, Project administration.

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