



Digital transformation or digital divide? Smes' use of AI during global crisis[☆]

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ABSTRACT

There is a notable deficiency in empirical research examining how digital transformation, particularly through the adoption of technologies such as Artificial Intelligence (AI), can empower SMEs to navigate the challenges posed by global crises. While new technologies are frequently regarded as solutions, they can coexist with existing systems and potentially exacerbate the digital divide. This paper aims to investigate the factors that either facilitate or hinder digital transformation among SMEs and their impact on either bridging or widening the digital divide. To explore this issue, we employed a maximum variation sampling method and conducted 15 in-depth interviews with SMEs in the restaurant sector – encompassing small, medium, and large establishments – in London. Our findings indicate that technological factors (such as digital inertia), organisational aspects (including perceptions and collaboration), and external environmental influences (like lockdown measures) are critical in determining the extent of digital transformation or the continuation of the digital divide among SMEs during the pandemic. This paper contributes to understanding the interrelationships among innovative technologies, including AI, SMEs, and their external environments in the context of rapid digital transformation. It underscores the adverse effects of technology adoption on the equitable distribution of innovative practices and provides insights into promoting inclusive digital transformation to mitigate the digital divide among SMEs.

1. Introduction

Small and Medium Enterprises (SMEs) are essential to economies worldwide, serving as the backbone of regional and national markets (Cattaneo et al., 2010; Eggers, 2020; Raji et al., 2024). However, SMEs remain exceptionally vulnerable to disruptions caused by global crises, whether natural or human-made (Rajaram and Tinguely, 2024). Recent global events, including the COVID-19 pandemic and geopolitical tensions such as the ongoing Russia-Ukraine conflict, have exacerbated these vulnerabilities, challenging the resilience of SMEs across various dimensions, from supply chain disruptions to inflationary pressures and access to critical resources (Eggers, 2020; Weaven et al., 2021; AlQershi et al., 2023). For example, the COVID-19 pandemic led to

unprecedented disruptions in value chains and operational frameworks, prompting a necessary recalibration of SMEs' business models and technological capabilities (Lee and Trimi, 2021). Similarly, natural disasters, like the recent catastrophic flooding in Florida, have highlighted how digital divides can further exacerbate SME vulnerability during crises, illustrating that neither existing nor emerging technologies are inherently sufficient to ensure resilience (Papadopoulos et al., 2020; Gregurec et al., 2021).

Organisations must prepare for disruptive shocks. Government measures, such as lockdowns, significantly impact business operations and accelerate digital transformation, as seen during the pandemic. Such crises have underscored the crucial role of Industry 4.0 technologies, such as artificial intelligence (AI) and the Internet of Things (IoT), in

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facilitating the survival and recovery of businesses. These technologies are vital for maintaining continuous and sustainable economic development during difficult times. Among them, AI has been particularly instrumental in helping SMEs maintain operational functionality amid global crises, allowing them to remain effective (Xiao and Fan, 2020; Babu et al., 2020). Technologies such as IoT and smart systems not only enhance market competitiveness but also compel businesses to redefine their core competencies, fostering the development of new skills and the utilisation of emerging expertise (Bresciani et al., 2018). These advancements simultaneously create opportunities for human development and promote increased market efficiency (Thapa and Sæbø, 2014; Islam et al. (2020).

Nonetheless, access to and the effective utilisation of these technologies remain uneven, further exacerbating the digital divide (Van Dijk and Hacker, 2003; Loh and Chib, 2022; Vassilakopoulou and Hustad, 2023). This form of digital divide is not only characterised by access to technology but also by the skills, infrastructure, and resources necessary for effective implementation, and it is particularly pronounced among small and medium-sized enterprises (SMEs) in comparison to larger corporations (Van Dijk, 2006; Hwang and Nam, 2017). A YouGov survey conducted among 1003 small and medium-sized enterprises (SMEs) in the UK reveals that nearly one in four respondents (39 %) have found that technology has aided them in acquiring new customers. Furthermore, 64 % reported receiving positive feedback regarding their technological implementations, and almost three-quarters (74 %) expressed that they feel better equipped to handle future crises due to the technology they have adopted. The digital divide in the UK is frequently linked to a gap in digital literacy skills (López Peláez et al., 2020) as well as inequalities in access to technology (Soni et al., 2021).

The disparity in digital readiness among SMEs is further intensified by economic pressures, limited resources, and policy shortcomings regarding digital inclusion, which often leaves smaller firms at a disadvantage during crises (Khalil et al., 2022; Tsatsou, 2011; Kallmuenzer et al., 2024). Hence, digital transformation does not happen evenly across the board. Limited research has examined the extent to which digital transformation enables small and medium-sized enterprises (SMEs) to navigate the challenges posed by global crises, as well as how it may contribute to widening the digital divide (Ahamed, 2024). Hence, it is necessary to investigate the complexities surrounding digital transformation in SMEs, particularly in the context of global crises, by analysing the dual roles of digital technologies in either mitigating or exacerbating the digital divide. Although technological advancements provide opportunities for SMEs to adapt more effectively, they do not offer a one-size-fits-all solution; instead, they often highlight and even reinforce existing inequalities.

Additionally, the digital divide has evolved beyond access issues to include a range of disparities, such as differences in usage efficacy and adaptability (Tsatsou, 2011; Van Deursen and Van Dijk, 2019). Acknowledging this, we seek to explore how SMEs navigate technological adoption and transformation in the face of global crises, geopolitical tensions, and natural disasters, thereby contributing to the literature on the dynamics of the digital divide within SME ecosystems. Consequently, this study analyses the conditions under which digital transformation can enhance SME resilience while also identifying the underlying factors that influence the narrowing or widening of the digital divide. Our objectives are as follows:

1. To analyse how digital transformation helps SMEs address challenges during global crises and narrow the digital divide.
2. To analyse various management approaches SMEs, adopt towards digital transformation, with a particular focus on ethnic restaurants as a case in point.
3. To examine the factors that facilitate or inhibit digital transformation among SMEs, contributing to a nuanced understanding of the digital divide within the broader context of global crises.

We have selected the UK restaurant sector for this study. The hospitality industry in the UK, particularly restaurants, has been significantly impacted by recent crises, facing greater credit constraints than larger businesses. Moreover, they were more susceptible to the effects of the pandemic due to lower capital reserves and productivity (Papadopoulos et al., 2020). Additionally, their adoption of innovative technologies and approaches to digital transformation has been limited. While the hospitality sector – including restaurants, hotels, and catering services – was among the most severely affected during the COVID-19 pandemic, SMEs in other sectors also experienced considerable disruptions and unique challenges. For instance, retail SMEs had to swiftly embrace e-commerce solutions to connect with customers during lockdowns and social distancing measures. This study contributes to the existing literature by examining the intricate interplay between emerging technologies particularly artificial intelligence (AI) in SMEs, and their external environments amidst accelerated digital transformation. By addressing the unequal diffusion of technological innovation, the paper provides novel insights into the challenges and opportunities associated with inclusive digital adoption. In doing so, it offers a nuanced understanding of how policy and practice can narrow the digital divide and enhance the resilience and competitiveness of SMEs in an increasingly digital economy.

The remainder of this paper is organised as follows: Section 2 reviews the relevant literature, establishing the theoretical foundations of the study. Section 3 offers contextual background on SMEs and their engagement with emerging technologies. Section 4 outlines the research methodology employed. Section 5 presents the empirical findings, which are further examined in the discussion in Section 6. Finally, Section 7 concludes the paper by outlining key theoretical and practical implications, acknowledging its limitations, and proposing directions for future research.

2. Literature review

2.1. Digital divide

The digital divide, first identified in the 1990s (Antonelli, 2003; Bach et al., 2013), was initially linked to the limited access to early information and communication technologies (ICT) for both businesses and households (Van Dijk and Hacker, 2003). As ICTs have become increasingly prevalent, the discussion surrounding the digital divide has evolved from mere access issues to encompass concerns about effective utilisation and relevant content (Attewell, 2001). A common misconception within government agendas is the belief that simply providing internet access will resolve the digital divide (Van Deursen and Van Dijk, 2019). In advanced information societies with near-complete internet penetration, the digital divide cannot be conventionally defined as a straightforward dichotomy between the “haves” and “have-nots” (Van Dijk, 2006; Hwang and Nam, 2017). The scope of the digital divide debate has expanded beyond access and usage of ICTs (Tsatsou, 2011), with scholars now viewing the digital divide as a continuum (Hilbert, 2011; Livingstone and Helsper, 2007; Selwyn et al., 2004). Therefore, it is evident that addressing the digital divide necessitates a multifaceted approach, as a binary assessment of accessibility is no longer sufficient (Hwang and Nam, 2017).

By employing an innovative data analysis methodology grounded in AI techniques, Hidalgo et al. (2020) achieve an accurate classification of the primary predictors of the digital divide, providing new insights into socioeconomic factors. Their use of advanced machine learning techniques, such as classification trees, identifies key variables – namely education level, age, occupation, and household income – as significant predictors of the population’s digital skills. Furthermore, their findings underscore the necessity for policymakers to integrate essential digital competencies that citizens require to navigate the digital landscape effectively (World Economic Forum, 2016; Hwang and Nam, 2017; van Deursen et al., 2011). Combining traditional socioeconomic analysis

with advanced machine learning techniques can serve as a valuable tool for assessing whether a country and its population possess the appropriate training needs and resources related to their digital competencies.

The digital divide is an evolving concept that parallels the advancements in information and communication technology (ICT). A recent study by [Loh and Chib \(2022\)](#) introduced a framework for assessing the digital divide through a comprehensive index of ICT predictors, focusing on the perceptions of “access,” “usage,” and “appropriation” among both underemployed and employed residents in Singapore. Employing [Selwyn et al.’s \(2004\)](#) analytical method, the study revealed that the reasons behind accessing, using, and appropriating technology significantly influence the definition of various levels of ICT engagement. Beyond [Selwyn et al.’s \(2004\)](#) three-tier model, digital inclusion initiatives at both local and national levels can contribute to bridging the divide by providing access to ICT and enhancing users’ abilities to engage with technology ([Araque et al., 2013](#); [Bui, 2017](#); [Duncan, 2013](#)). Nonetheless, there remains a limited understanding of the processes, expectations, and outcomes associated with the digital divide, particularly regarding how advanced technologies may empower small and medium-sized enterprises (SMEs) to gain competitive advantages and reshape market dynamics during global crises, such as the Ukraine war, Middle Eastern instability, and the COVID-19 pandemic.

[Arendt \(2008\)](#) posited that the digital divide within organisations arises from disparities in ICT usage between large and small firms. This gap exacerbates the vulnerability of SMEs to financial and market fluctuations, underscoring the vital importance of ICT adoption in bridging the divide ([Arendt, 2008](#); [Stiakakis et al., 2009](#)). The adoption of ICT is crucial for job creation, growth, and competitiveness in SMEs. Similarly, [Hashim \(2007\)](#) recognised that many SMEs remain excluded from advancements in digital technology, resulting in a division between those firms that are digitally connected and those that are not.

The digital divide exacerbates disparities in business resilience during crises. For small and medium-sized enterprises (SMEs), this gap extends beyond mere access; it also includes inequalities in digital capabilities and outcomes ([Scheerder et al., 2017](#); [Fisk et al., 2023](#)). Businesses that lack AI-driven forecasting and online automation tools often suffer greater revenue losses and operational setbacks, primarily due to inadequate investment in digital capabilities ([Bhaskar, 2021](#)). Unlike larger firms, SMEs typically operate with limited budgets, which makes it difficult for them to afford advanced technologies such as AI-enabled analytics or automated supply chains. This situation contributes to a bifurcated digital economy, where well-resourced SMEs flourish, while others struggle to keep pace. For instance, during the COVID-19 pandemic, many SMEs faced significant challenges in developing their internal digital infrastructure due to financial constraints and a lack of skilled personnel ([OECD, 2021](#)). Additionally, leveraging online platforms involves both direct and indirect costs, including platform fees, data-sharing obligations, and dependence on opaque algorithmic systems that are beyond the control of SMEs.

In addition to financial limitations, small and medium-sized enterprises (SMEs) encounter notable gaps in digital literacy. Closing this digital divide necessitates not only access to digital tools but also opportunities for skill development and capacity building ([Van Dijk, 2020](#)). Many SME owners and their employees lack the expertise to implement digital transformation effectively, often utilising tools in a superficial manner. For example, they may depend on third-party platforms, giving up control over customer data and user engagement, which raises significant concerns regarding data privacy ([Papadopoulos et al., 2020](#)). These shortcomings in digital engagement further widen the divide. Moreover, transforming the mindsets of SME owners may serve as a crucial leverage point for facilitating systemic change ([Abson et al., 2017](#)).

2.2. Theoretical background

The current literature provides a comprehensive theoretical framework for technology adoption, incorporating models such as the Technology Acceptance Model (TAM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), and the Unified Theory of Acceptance and Use of Technology (UTAUT), along with its various extensions. These frameworks are widely utilised to assess technology adoption ([Davis, 1989](#); [Venkatesh et al., 2003](#); [Venkatesh et al., 2016](#)). Additionally, previous studies have examined multiple aspects of technology adaptation, including adaptation behaviors, adaptive structuration, appropriation, user coping strategies, and the temporal patterns of adaptation ([Roy et al., 2025](#); [Muhammad et al., 2024](#); [Muhammad et al., 2021](#); [Beaudry and Pinsonneault, 2005](#); [DeSanctis and Poole, 1994](#)). Furthermore, [Kamal \(2006\)](#) and [Babu et al. \(2020\)](#) identify a range of factors – such as perceived technology, organisational support, collaboration, and external pressures – that influence organisational decisions regarding the adoption of IT innovations.

Some studies characterise adaptation as the process of aligning technology with specific tasks, while others emphasize individual perceptions, readiness for change, reactions to technological disruptions, and coping strategies ([Muhammad et al., 2024](#); [Muhammad et al., 2018](#); [Majchrzak et al., 2016](#)). However, these theories often neglect factors such as global crises, the unique contexts of small and medium-sized enterprises (SMEs), and external environmental influences. They also fail to adequately address the digital divide and the effects of recent economic and political disruptions both in the UK and worldwide. As a result, this research adopts the Technology, Organisation, and Environment (TOE) framework proposed by [Tornatzky et al. \(1990\)](#). This approach allows for a consideration of organisational factors specific to SMEs while also examining external environmental dynamics that are beyond their control. The TOE theory offers a comprehensive perspective by acknowledging both internal organisational contexts in technology adoption and the complex, constantly evolving nature of external environmental factors.

The concept of disruptive innovation has garnered significant attention from both practitioners and scholars ([Antonio and Kanbach, 2023](#); [Henderson, 2006](#); [Ansari et al., 2016](#)). The global proliferation of innovative technologies has played a crucial role in socio-economic advancement ([Nganga and Mwachofi, 2013](#)). Research demonstrates that successful technology adoption can lead to value co-creation ([Pralhad, 2012](#); [Kapoor et al., 2015](#); [Dwivedi et al., 2016](#); [Alalwan et al., 2017](#)). Moreover, the diffusion of innovation can facilitate new product development while fostering a deeper understanding of market dynamics, thereby promoting the exchange of ideas and support, as highlighted in the literature ([Soni et al., 2021](#); [Dey et al., 2019](#)).

The profound impact of smart technologies on core firm processes transcends mere efficiency enhancements, establishing new foundations for economic and social sustainability ([Carmela Annosi et al., 2020](#); [Porter and Heppelmann, 2014](#)). [Fadahunsi \(2012\)](#) discovered that small business owners equipped with advanced technological capabilities experienced greater growth than their counterparts lacking such advancements. Therefore, a comprehensive analysis of the effects of digital transformation on UK SMEs is essential. While existing research has explored various challenges associated with the adoption and adaptation of innovative technologies ([Weersink et al., 2018](#); [Kozubikova and Kotaskova, 2019](#); [Carmela Annosi et al., 2020](#)), a significant gap remains regarding the specific obstacles SMEs encounter amidst current global economic and political crises. There is a pressing need for scholarly work that offers a clear framework for understanding digital transformation and the effects of the digital divide on the resilience of SMEs during periods of adversity and uncertainty.

2.3. Technology, organisation and environment model

The adoption of ICTs by organisations is a complex process that

encompasses more than just individual actors; it also includes environmental factors that affect adaptation at both the organisational and innovative levels (Rogers, 1995). Many adoption models focused on small and medium-sized enterprises (SMEs) emphasize the importance of perception, attitude, and beliefs (Akkeren and Cavaye, 1999). This underscores the need to consider technological, organisational, and environmental factors rather than relying solely on user-centered approaches (Souza et al., 2017; Tornatzky et al., 1990).

To facilitate studies on the digital divide, the TOE framework, developed by Tornatzky et al. (1990), identifies key contextual factors that influence the adoption of technology innovation. This framework is categorised into three main areas: technology, organisation, and external environment (Dewan and Riggins, 2005). Within the technological domain, the focus is on infrastructure and market resources that affect ICT adoption by SMEs (Souza et al., 2017). The organisational context includes characteristics such as firm size, centralisation, formalisation, complexity, the quality of human resources, and informal employee relationships. The external environment encompasses market segments, competitors, resource accessibility, customer dynamics, and governmental factors. These external variables, which are integrated into the TOE framework, can motivate SMEs to adopt ICTs in response to both threats and opportunities – such as government support initiatives like the UK's furlough scheme introduced during the global pandemic (Oliveira and Martins, 2010; Abrahamson, 1991).

In today's global landscape, understanding technology adoption among SMEs (Small and Medium-sized Enterprises) goes beyond merely assessing user perceptions; it requires a comprehensive approach that considers structural, resource-based, and external environmental factors. The TOE framework offers this broad perspective, making it an ideal model for exploring SME digital transformation and AI adoption, especially in times of uncertainty. Global crises tend to widen the competitive gap between SMEs and larger firms (Van Deursen and Van Dijk, 2019). Large enterprises possess the financial flexibility to invest in AI and automation, enhancing their resilience. In contrast, SMEs often struggle with limited financial and technological resources, causing them to fall further behind and intensifying the digital divide. The TOE framework illuminates how crises exacerbate the technology adoption gap, primarily driven by imbalances in market power rather than merely by individual user attitudes, as suggested by the TAM and the UTAUT.

TOE encapsulates the macro-level challenges that SMEs encounter in a volatile global economy, including supply chain disruptions, policy shifts, and intensifying competition. Furthermore, it provides a structured roadmap for policymakers to narrow the digital adoption gaps faced by SMEs by not only enhancing access to technology but also by establishing financial incentives, skill development initiatives, and regulatory support.

Economic downturns impose significant financial constraints on SMEs, hampering their capacity to invest in new technology (Kallmuenzer et al., 2024). In times of crisis, SMEs often prioritise short-term survival over long-term investments, resulting in delayed AI adoption and digital transformation efforts (Papadopoulos et al., 2020). For example, during the COVID-19 pandemic, many SMEs in the hospitality sector paused digital investments due to falling revenues, while larger firms utilised AI to optimise costs and maintain operations (Tortorella et al., 2019). Additionally, crises often reveal organisational weaknesses in digital readiness (Oliveira and Martins, 2010). SMEs with employees skilled in digital technologies can more easily transition to AI-driven models, whereas those without in-house expertise face challenges in adapting.

The TOE framework explains how institutional and regulatory factors directly shape technology adoption, particularly for SMEs navigating financial instability and compliance burdens. By considering systemic, organisational, and environmental barriers together, the TOE framework offers a more realistic and comprehensive explanation of why some SMEs adopt AI and digital tools during crises while others fall behind. Understanding these dimensions enables policymakers and

business leaders to craft targeted interventions that address not only technology access but also the financial, skill-based, and regulatory barriers that shape SME digital transformation.

The TOE framework has demonstrated its theoretical robustness, empirical support, and practical utility in analysing the readiness, adoption, and deployment of various innovations across disciplines (Aboelmaged, 2014). Researchers have applied the TOE framework in conjunction with other theories to investigate ICT adoption at the organisational level. For instance, Teo et al. (1997) integrated TOE with contingency theory to explore Internet adoption among companies, while Awa et al. (2015) combined TOE with the TAM to better understand organisational characteristics. The empirical evidence indicates that the TOE framework provides a solid foundation for examining the digital transformation of SMEs and their responses to the challenges posed by the digital divide. This study adds to the existing body of scholarship on ICT adoption at the organisational level and clarifies the impacts of the global crisis on SMEs in the context of the digital divide.

3. Research methodology

An appropriate research methodology was developed as a framework to guide the research process. Rudestan and Newton (1992) utilise the metaphor of a "research wheel" to depict the research journey, highlighting that it is not a linear sequence but rather a recursive cycle, where empirical stages are continuously validated against theoretical frameworks from which theoretical concepts arise. Flick (1998) emphasizes the necessity for qualitative research procedures that are both rigorous and flexible, in order to respect the complexity of the social contexts being explored. Drawing upon Jankowicz's (2000) three-stage research methodology – (a) research design, (b) data collection, and (c) data analysis – this study adheres to these phases as shown in Fig. 1.

3.1. Research design

The research design, representing the initial independent phase, commenced with the acquisition of background knowledge, a thorough review of pertinent literature, and the identification of the problem area. This process highlighted several research gaps, which facilitated a more refined focus and the establishment of a specific research need. Following this, a conceptual model was crafted to illustrate the intended empirical research, concentrating on aspects warranting in-depth examination. An exploratory research design utilising qualitative methods was deemed most appropriate. In line with the approach taken by Wu (2012), this study embraced an inductive, flexible, and pragmatic research design, merging existing theories with patterns that emerged from the interview data.

3.2. Data collection

Widely acknowledged research methods involve various tools such as documentation, archival records, interviews, direct observation, participant observation, and physical artifacts for empirical data collection. Yin (1994) identified these as 'sources of evidence' which, when combined, strengthen the research's conclusions through a multifaceted approach. This study used in-depth interviews and direct observation with SME restaurants in London, ensuring triangulation and enhanced validity of findings (Eisenhardt, 1989). A maximum variation sampling strategy (Given, 2008) was employed to capture diverse perspectives across ownership types, business models, and levels of digital readiness. A total of 15 interviews were conducted, with participants selected to represent a wide range of demographic and operational profiles. This sample size was deemed appropriate for an exploratory qualitative study, in line with recommendations by Guest et al. (2006), who suggest that saturation often occurs within the first 12 interviews in homogeneous groups. In our study, data saturation was achieved, as no new themes or insights emerged after the 13th interview, and the

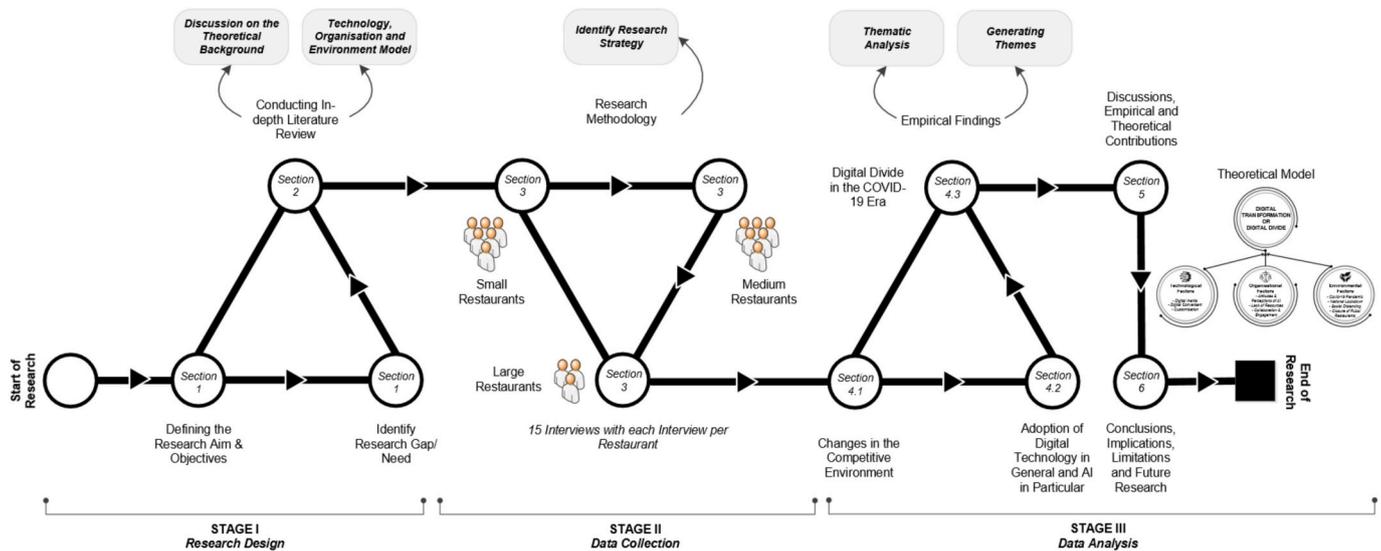


Fig. 1. Research Method.

remaining two interviews served to confirm existing patterns (Corbin and Strauss, 2014). This level of saturation ensured that the research captured sufficient depth and breadth of the phenomenon under investigation. The interviews were guided by a protocol informed by the TOE framework and digital divide literature, ensuring consistency and relevance. Each interview lasted approximately 25 min, was digitally recorded, transcribed, and analysed using NVivo 12.

3.3. Data analysis

The empirical data collected from case studies were triangulated and analysed to draw substantive conclusions. Miles and Huberman (1994) note that qualitative data analysis often lacks formalised methods and is inherently non-mathematical. In this study, the primary goal of analysis was to interpret the meaning of participants' words and actions and identify overarching themes. Accordingly, thematic analysis was employed, with themes categorised based on research objectives and existing literature (Bell, Harley and Bryman, 2022). The qualitative analysis revealed key constructs and their interrelationships, leading to a typology for digital transformation or digital divide among SMEs (restaurants). This typology was used to explore the technological, organisational, and environmental factors influencing digital transformation or the digital divide during the pandemic global crisis.

We identified the first-order codes given in Table 1 corresponding to the key themes of this research, as defined by our research objectives. Two researchers independently generated a list of codes, which were then screened and categorised according to the themes. Following this, the second-order codes given in Table 1 were developed by revising them in relation to the thematic contexts and relevant academic literature, in accordance with established methodologies (e.g., Muhammad et al., 2024). The two researchers convened to discuss the themes and reach a consensus, which ultimately led to the final coding order given in Table 1.

4. Findings

This paper presents findings from a study of 15 ethnic restaurants across the UK. Through interviews with owners and staff, along with an examination of their digital business platforms, we gain valuable insights into their strategies and operations during the global crisis, including the COVID-19 pandemic. As detailed in the methodology section, our research encompasses a diverse range of ethnic restaurants, spanning from very small establishments to large chains. We classify

Table 1 List of codes and coding process.

Themes	1st order codes	2nd order codes	Final constructs
Technological factors	Lack of initiative	Inertia of using technology	Digital inertia
	Inertia		Digital conversant
	Able to adopt digital technology	Conversant	Digital conversant
	Prompt adoption		Digital conversant
Organisational factors	Adaptation	Adaptation	Customisation/Adaptation
	Customisation		Employees' perceptions and attitude of AI
	Interpretation	Perceptions	Lack of resources
	Attitude		Collaboration and engagement
Environmental factors	Intention	Collaboration and engagement	COVID-19 pandemic
	Collaboration		Lockdown
	Engagement	COVID-19 pandemic	Social distancing
	COVID-19 pandemic		Closure of pubs and restaurants
	Lockdown	Lockdown	Social distancing
	Social distancing		Closure of pubs and restaurants

these restaurants into three broader categories: small, medium, and large.

We divided the first year of the COVID-19 period in the UK into five

Table 2 Five phases of UK Government measures during the COVID-19 pandemic.

Phase	Implications for restaurants
Phase 1: First Nationwide Lockdown (from March 2020 to June 2020)	A nationwide lockdown leading to closure of all restaurants
Phase 2: Ease on Restrictions (July 2020 to August 2020)	Restaurants were permitted to operate while observing social distancing measures. The government encouraged and incentivised the public to dine out to support the catering industry.
Phase 3: Region Specific Tier System (September 2020 to December 2020)	Regional lockdown was imposed leading to ambiguity and confusion.
Phase 4: Second Nationwide Lockdown (from January 2021 to April 2021)	Second national lockdown following another wave of the pandemic
Phase 5: Phased Relaxation of Restrictions (May 2021 onward)	Phased-return to normalisation.

major phases given in Table 2 in relation to government regulations on restaurant and catering industries:

- 1) **Phase 1: First Nationwide Lockdown** (from March 2020 to June 2020) – During this period, the country encountered its initial wave of the COVID-19 outbreak. The government implemented a lockdown that led to the abrupt closure of all restaurants, pubs, and cafes. People were prohibited from traveling long distances and were required to follow stringent social distancing regulations.
- 2) **Phase 2: Ease on Restrictions** (July 2020 to August 2020) – In June 2020, the UK government eased COVID-19 restrictions and launched a generous initiative aimed at encouraging dining in restaurants. This program, known by the slogan “Eat Out to Help Out,” provided consumers with cash incentives for dining at restaurants and pubs. Consequently, there was a notable increase in restaurant business during this period of the COVID-19 pandemic.
- 3) **Phase 3: Region Specific Tier System** (September 2020 to December 2020) – During this period, the UK Government implemented a region-based tier system to manage the spread of the virus. While there was reluctance to enforce a full nationwide lockdown in order to safeguard the economy, such a measure was briefly enacted in November. There was a lack of clarity regarding certain measures, and significant uncertainties arose due to sudden spikes in cases across various regions.
- 4) **Phase 4: Second Nationwide Lockdown** (from January 2021 to April 2021) – This was the second round of a full lockdown, imposed to address the second wave of the COVID-19 outbreak. Once again, pubs and restaurants were closed during this phase.
- 5) **Phase 5: Phased Relaxation of Restrictions** (May 2021 onward) – With the fast-paced vaccination program underway and the spread of the virus under control, the UK government decided to gradually relax restrictions. As a result, restaurants were permitted to serve customers, although they could initially only do so outside their premises.

Recognising the phases is essential for this research, as they relate to the diverse strategies and operations that businesses deployed during this time. The dynamic and unpredictable macro-environmental conditions, coupled with changing consumer preferences, greatly impacted their strategic initiatives and operational responses. Much like other enterprises, their strategic focus during the global crisis prioritised the adoption of technology.

4.1. Changes in competitive environment

A notable transformation within the industry during the COVID-19 period has been its profound redefinition. The lockdown measures and social distancing protocols implemented in response to the pandemic have altered long-standing classifications in the broader catering sector, which includes restaurants, fast food chains, and takeaways. Consequently, many service providers were forced to pivot exclusively towards takeaway options, resulting in the loss of their signature ambiance and the high-quality customer service they were known for. This shift also brought changes to competitive advantages and pricing structures. As one owner (Part_1) remarked during an interview:

“Nepalese cuisine holds a unique position within the broader Indian food industry, and I actively promote this in my marketing materials. My medium-sized restaurant boasts appealing décor and a welcoming atmosphere that attract customers. They come not only for the food but also for the experience of dining in a pleasant environment. However, during the COVID-19 pandemic, I was unable to provide that physical experience. This led to increased competition, as people turned to delivery apps like Uber Eats, Just Eat, and Deliveroo, where they could find many other dining options. As a result, we lost our competitive advantages.” (Part_1). This is consistent with studies like Gu et al. (2021), which highlight the shifting consumer behaviour during the pandemic as customers increasingly relied on digital delivery

platforms, reducing physical experiential factors in competitive differentiation.

Hence, the competitive scenario had a seismic shift during this period, forcing businesses to think and recalibrate their strategic directions. Restaurant owners resorted to the use of technology to cope with the dynamic changes. As one of the respondents (Part_2) mentioned during the interview:

“Our takeaway business consistently generated healthy revenue. In early to mid-March 2020, as some European countries began declaring total lockdowns, I started to worry that the UK would follow suit. Although the government seemed hesitant to take that step, I feared it was inevitable. I spoke with my business partner, and we discussed various options. We concluded that the takeaway business would need to take a leading role. I then evaluated different possibilities and decided to collaborate with Deliveroo.” (Part_2). This aligns with findings from Rajala and Hautala-Kankaanpää (2023), who emphasize the significance of platform-based digital connectivity in enhancing operational performance under turbulent conditions.

The other respondent (Part_3), an owner of a small restaurant, found it challenging to cope with the new delivery-based takeaway business. As they mentioned:

“It was very challenging. We did not have a huge set-up for a complete takeaway business. We had a limited capacity in terms of both our ability and resources. Due to a limited availability of delivery staff, I had to much of the delivery myself. However, our business through Uber Eats was very helpful. We got more coverage than we would have got in normal cases.” (Part_3). This echoes the research by Hossain et al., (2022), which discusses the adoption of third-party delivery platforms by SMEs serving as a strategic response to expand market coverage during the COVID-19 pandemic, despite facing significant resource constraints. This shift highlights a broader trend of digital transformation, where leveraging digital platforms became a crucial strategy for SMEs to navigate operational disruptions and sustain their businesses during the crisis.

Adapting to the challenges posed by COVID-19 required restaurants to change their strategies. While some establishments experienced consistent business during this period, others needed to take action to increase orders. Innovation, experience, and knowledge emerged as the three key drivers for achieving and maintaining business growth during this time.:

“I had to be innovative with my approach to running the business. I completely revamped the menu and reworked the website. The menu that I put on Deliveroo highlights the most preferred dishes. I reworked the website to highlight those dishes. Previously, the website focussed mostly on the internal décor and location of the restaurant. However, in the changed situation, I increased the number of photographs of the dish and put a banner highlighting our prompt and quality service.” (Part_4).

While the excerpt above shows evidence of innovative and creative decision-making, the owner also appears to have heavily relied on their experience and knowledge, underpinned by long-term relationships with their customers:

“I have been running this business for almost ten years. Normally, I have a large customer base, and many of them are regular. During the COVID-19 time, I noticed my regular customers prefer to place their order through phone calls rather than using mobile apps. They want their food to be properly customised and palatable to their tastes. For instance, some people would like extra hot curries and some like flamed poppadum. These customisations are often difficult if not impossible on various apps.” (Part_5). This observation is reinforced by the systematic review from Castell et al. (2023), which discusses how digital platforms necessitate new approaches to customer orientation, highlighting the crucial role of personalisation and strong customer relationships in retaining loyalty amidst the rise of impersonal digital ordering platforms in the evolving digital economy.

4.2. Adoption of digital technology in general and AI in particular

Before the global crisis outbreak i.e., COVID-19, the use of digital

technology, such as restaurant management systems (RMS) and web-based takeaway ordering, had already become popular among UK restaurants. However, there was variability in how restaurant owners and employees perceived and adopted this digital technology. As one small restaurant owner (Part 6) mentioned during the interview:

“I was slow to adopt a Restaurant Management System (RMS). To be fair, many other restaurants of my size hardly use any sophisticated digital technology, and their owners often feel it’s unnecessary. I held a similar opinion for a long time. However, I gradually realised its importance. After implementing the system, my order-taking and inventory management became much easier and more efficient. Ultimately, it’s about recognising the need for such technology, understanding the benefits it offers, and recognising how it creates value for the business.” (Part 6).

The excerpt emphasizes the idea of technological inertia in certain restaurant businesses, which often arises from a limited understanding of the benefits that technology can provide, along with a hesitance to adopt change. Conversely, an alternative scenario exists. This phenomenon is not necessarily tied to the size or profitability of the establishment; rather, it depends on the entrepreneurial and transformative mindset of the owners.

As discussed, this global crisis forced some restaurants to rethink their strategies and adopt technology or technology-mediated solutions they had not previously considered. However, restaurants already familiar with digital technology managed to navigate the crisis more effectively than those that exhibited digital inertia. As one of the owners (Part 7) pointed out:

“We work with a third-party data management company that keeps the database of all our customers who provided their details through the website. It came in very handy during the COVID-19 time. We sent out promotional messages on their mobile phones. Again, we must be inventive in making use of the communication. We send messages on Friday late afternoon, which is normally when people start thinking about their Friday dinner. The timing and strategy both have been working well for us. In the past, we used to send out flyers in local neighbourhoods; now, we send messages – much more efficient and effective.” (Part 7). This experience relates to the research published by Sharma et al. (2021), who report that short message service advertising perceptions significantly influence consumer purchase intentions, either directly or indirectly, emphasizing the continued relevance of this service as a marketing tool.

In contrast, another restaurant with limited adoption of digital technology faced significant challenges during the global crisis:

“It wasn’t easy. Although by the grace of God, the business went well throughout the time, I faced struggle and uncertainty. We experienced a lot of food waste on some days, while on other days, we struggled to keep up with excessive demands. The market is unlike usual, when we have a fixed pattern. I guess every day is a weekend for many customers, as they stay home. As you know, the restaurant business is typically dependent upon weekend business. But during the COVID-19 time, it wasn’t like that.” (Part 8).

Although the adoption of digital technology remains a challenge for many ethnic restaurants in the UK, the integration of AI still seems like a distant prospect. Nonetheless, we have identified a few establishments that have begun to embrace machine learning tools for data management and chatbots to improve customer interactions. One noteworthy example from our sample group is a larger Indian restaurant that has utilised machine learning to analyse customer feedback on TripAdvisor. The owner (Part 9) emphasizes the tangible benefits of this approach:

“I appointed a data analytics company to investigate our customer feedback and ratings on TripAdvisor to find any potential pattern. Customers appeared to have positive comments about our more authentic Indian cuisines as opposed to traditional Anglicised dishes such as Chicken Tikka Masala. We are in London and cater to more cosmopolitan customers. These days, the curry industry in large cities face intense competition from what they call ‘authentic’ Indian restaurants who tend to position themselves in a certain segment and challenge more conventional dishes that the curry industry has been offering to the British customers for decades.” (Part 9). This echoes the research by Salem et al. (2024), who investigate how different

dimensions of authenticity and customer knowledge impact overall perceptions of authenticity and the intention to revisit ethnic restaurants.

In response to the global crisis, the restaurant adopted advanced data analytics tools to analyse the geographic distribution of its customer base. By identifying its most frequent and high-revenue customer segments and examining ordering patterns – such as preferred dishes, quantities, and timing – the restaurant was able to optimise its supply chain effectively. While many small restaurants faced challenges due to fluctuating demands, this Indian restaurant improved its demand forecasting using business intelligence tools.

“We used IBM Cognos, AI-enabled data analytics to assess the pattern of our customer orders. The same organisation that helped us analyse the TripAdvisor data was commissioned to investigate our online sales data during the first three months of the COVID-19 outbreak when we experienced a high volume of delivery requests. Although the situation improved in the second half of 2020, and people started to visit our restaurant after the lockdown was lifted, we still had almost 50% of the business through deliveries. I then realised the situation would continue to be like for a while and asked my data management provider to help me.” (Part 10).

The utilisation of IBM Cognos and various forms of customised cloud-based data analytics is prevalent among large restaurants and chains. Mainstream restaurants, multinational fast-food and coffee chains, as well as extensive bar chains, frequently rely on these tools to address demand, manage inventories, and place supply orders. However, discussions with owners and staff of ethnic restaurants revealed a significant gap in technology adoption among small to medium-sized ethnic establishments. This sentiment was echoed by one manager (Part 11) of an Italian restaurant:

“Yes, I have heard about such tools. My friend works for a large Italian chain. He told me, they are regularly briefed by their top management about which items to be prioritised, what quantity of supplies to be required and when to keep more staff members. I know these are the results of some advanced data analysis. However, this is not necessary in our small restaurant. Neither the boss is interested, nor do we have the expertise to deal with such data.” (Part 11).

The excerpt indicates a notable absence of interest and expertise. This may stem from a combination of ignorance and arrogance on the part of the ownership, who believe that their business practices require no changes or modernisation. A young owner (Part 12) of a Thai restaurant, who recently assumed control from his father, illustrates this point effectively:

“My father was never interested in trying new technological or methodical experiments. He ran this business for almost twenty years and made a healthy profit. This is the only and oldest Thai restaurant in this town. Everyone knows us. A lack of competition and challenge discourage us from innovation.” (Part 12).

However, the young owner of a Thai restaurant in a small town near London is currently assessing to introduce a chatbot on their restaurant website. As he further explains:

“Necessity in the mother of invention. Since the lockdown was relaxed in April 2021, we keep receiving a lot of queries regarding the rules, which keep changing. Customers keep calling to reserve tables, but they often do not know how many people can dine together. We also have a reduced capacity. So, I plan to bring automation in the booking, by modernising the website. I have also searched the Internet and found different chatbots that can address customer queries. In future, the chatbots can be used to get customer feedback and support booking and online orders.” (Part 12).

A similar opinion is shared by another respondent (Part 13), who has a strong database for his restaurant:

“As I said, restaurant food is somewhat different from fast food chains. Even these days, fast food restaurants offer highly personalised food offers. With a chatbot, we can ensure customisation. It will also save time. During busy periods, a staff taking orders over the phone is not very helpful.” (Part 13).

4.3. Digital divide in the COVID-19 era

As discussed in the previous section, the adoption of smart and digital technologies – such as machine learning, AI-driven data analytics, and chatbots – has significantly supported and enhanced various businesses. However, it has also created a notable divide within the restaurant and catering industry. The global crisis took many businesses by surprise, and the catering sector was among the hardest hit. Our findings indicate that while a handful of restaurants have embraced advanced digital solutions, driven by the entrepreneurial and innovative spirit of their owners, the majority still rely on basic digital tools, including electronic point-of-sale systems and outdated management software. One owner (Part_14) of a Middle Eastern restaurant commented:

“In my business, I never used so much technological stuff before the outbreak of COVID-19. I use WhatsApp and Zoom to talk to my customers, drivers, and suppliers. I bought a new tablet to check my inventory. Yes, it has now given me the confidence to embrace more smart technology. You mentioned AI – yes, that’s something I may try in the future.” (Part_14).

The global crisis brought on by the pandemic has highlighted the digital divide within the industry, yet it may also encourage many owners and managers to consider the gradual adoption of AI. Small businesses, such as restaurants, which typically rely heavily on unskilled or semi-skilled labor, encounter significant challenges in this area. Even when owners have a solid understanding of AI, their management teams and staff may lack the expertise and capacity to effectively leverage AI-enabled technologies. As one manager we interviewed remarked:

“The boss (owner) does not visit the restaurant very often, so I must manage the business on my own. Who will take the initiative? Despite our healthy business, we do not even have a website. We got into Deliveroo and Uber Eats only because of COVID-19. The boss is still not very happy, as he does not get a good margin with those two apps. Who will analyse data or apply any of the advanced tools that you mentioned?” (Part_15).

The excerpt highlights the stark reality of implementing advanced technology in a sector where many businesses struggle with innovation

and ambition. The emergence of AI can exacerbate the digital divide within this industry. While this study concentrates on ethnic restaurants, the themes identified – such as challenges related to digital readiness, cost concerns, and the perceptions of owner-managers – echo broader issues faced by SMEs across various sectors. The TOE framework has illuminated structural and environmental factors that extend beyond the immediate sector under examination. Consequently, the insights gained from this study provide a valuable perspective for understanding the challenges of digital transformation and the digital divide in the wider SME landscape.

5. Discussion

Our research sheds light on the myriad ways ethnic restaurants across the UK have embraced and harnessed digital technologies in response to evolving customer expectations for online services during the global crisis. As the catering industry transforms to navigate shifting regulations and consumer behaviors, the integration of digital initiatives and the embrace of cutting-edge technological advancements have become vital for enhancing competitiveness and boosting business performance. To unravel the complexities of how ethnic restaurants tapped into technology during this tumultuous period, we employed the Tornatzky et al. (1990) TOE model. This analytical framework enabled us to construct a nuanced model (refer to Fig. 2) that pinpoints the essential drivers behind the technological, organisational, and external environmental factors shaping the adoption and adaptation of innovative technologies. This includes burgeoning fields such as machine learning and artificial intelligence, which ethnic restaurant owners and their teams have increasingly integrated into their operations to thrive in a rapidly changing landscape.

5.1. Empirical contributions

Our study provides robust empirical insights into the adoption and utilisation of digital technology, including AI, within ethnic restaurants.

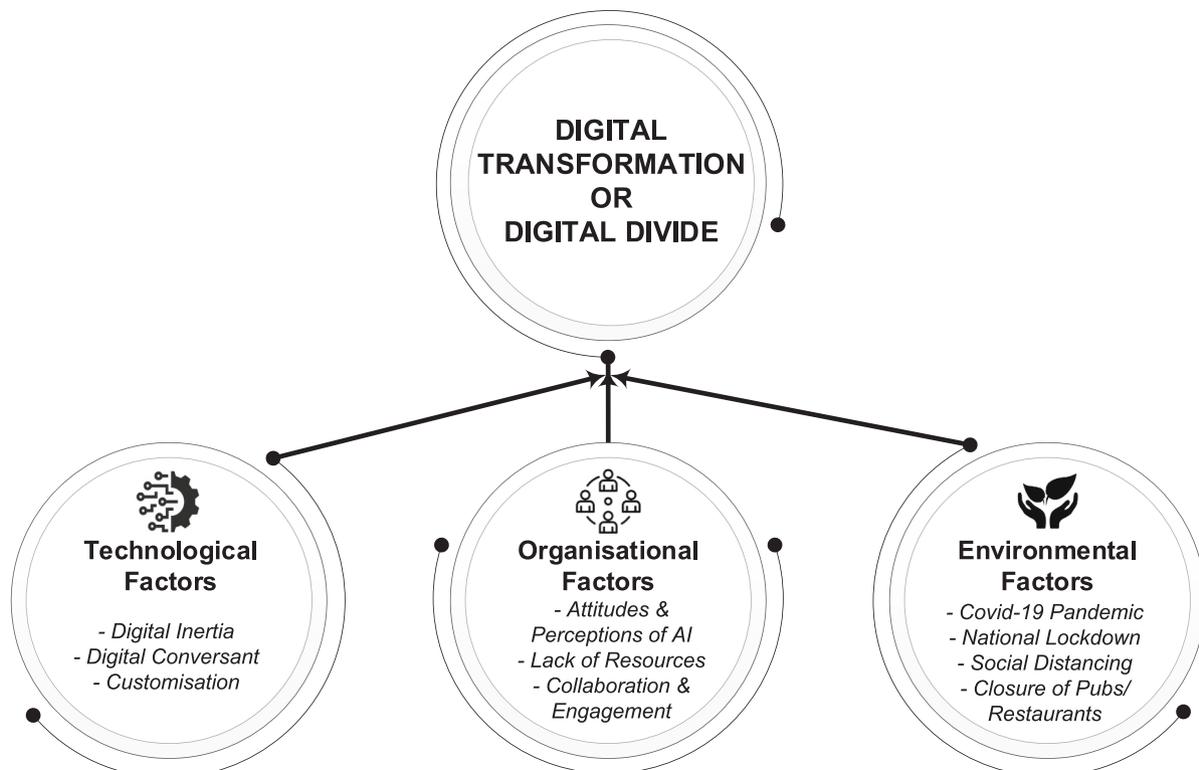


Fig. 2. Theoretical Model based on TOE Framework.

We thoroughly examined the drivers and factors that either facilitate or hinder this adoption process. As outlined, we employ the TOE model as a theoretical framework for our analysis. Consequently, we explore the dynamics of technology use and adoption in relation to technological, organisational, and external environmental aspects.

5.1.1. Technological

Our study significantly enriches the existing body of knowledge by offering insightful implications within the TOE framework. The factor analyses, detailed in Table 3, illuminate the intricate ways in which SMEs across the UK navigated the complexities of technology access, utilisation, and adoption during the tumultuous pandemic crisis. This assessment resonates deeply with Selwyn et al.'s (2004) concept of the three-dimensional divide – access, usage, and appropriation. Our findings reveal that innovation, knowledge, and experience emerged as pivotal catalysts for business growth during this unprecedented period. Yet, amidst this landscape of opportunity, there was a striking revelation: many respondents from the SME restaurant sector exhibited a palpable lack of expertise and enthusiasm towards embracing new technologies. This phenomenon echoes previous research indicating that businesses often fall into a pattern of reliability-based inertia, which acts as a barrier to the exploration and adoption of cutting-edge solutions (Paulino, 2004).

As illustrated by the candid reflections of a young owner of a Thai restaurant, there exists a steadfast commitment to upholding traditional practices over the allure of innovation or change. This scenario underscores a broader tendency within the sector to cling to established methods, ultimately stifling the potential for transformation and growth in an ever-evolving market.

We observe a growing recognition among larger restaurants regarding the use of AI and machine learning. These establishments are enhancing and investing in promotional efforts, customisation, and sales through tools such as chatbots. Additionally, the implementation of data analytics and personalised services has enabled these businesses to streamline operations and establish a robust management system, allowing them to achieve healthy profit margins even during the global crisis to satisfy customer demands. The discrepancies noted in our study may contribute to a widening digital divide, as discussed by previous scholars (Arendt, 2008; Hidalgo et al., 2020; Bach et al., 2013; Souza et al., 2017; Van Deursen and Van Dijk, 2019). These findings indicate a shift away from a user-centric approach in the technological adoption process, emphasizing the significance of a fluid, dynamic, and multidirectional framework within the TOE model to fulfil our research objectives.

5.1.2. Organisational

At the organisational level, the behaviour surrounding technology adoption encompasses a rich tapestry of activities, processes, and outcomes, shaped significantly by the entrepreneurial mind-set of business owners towards emerging technologies (To and Ngai, 2007; Molla and Licker, 2005). Our findings reveal a nuanced landscape in the adoption

Table 3
TOE Factors: Adapted from Tornatzky et al. (1990).

Context	Factors
Technological	- Lack of innovation, knowledge and experience (Digital Inertia) - Improve and willingness to adopt technology (Digital Conversant: AI, chatbots, machine learning) - Customisation (Market segment, promotion, sales)
Organisational	- Attitude towards entrepreneurial mindsets and skills - Limited resources (staff, training skills, finance, awareness) - Strategic Drive: Third party collaboration and engagement by aligning technology with the needs of SMEs.
External Environment	- Covid-19 global pandemic - Lockdown and Social distancing - Closure of Pubs/Restaurants

journey, where restaurant businesses can be distinctly classified into three categories: those that are aware of new technologies but lack the capacity to implement them, those that possess the ability yet remain unaware or unwilling to embrace change, and those that are both capable and eager to adopt innovative solutions.

This adoption process is not a fixed condition; rather, it emerges from the dynamic interplay of individual perceptions, influenced by personal interpretations of knowledge. Various factors come into play, including education, financial resources, tradition, age, and income (Hidalgo et al., 2020), all of which shape these perceptions. Consequently, restaurant owners play a pivotal role in this scenario. Often, it is the early adopters – typically led by visionary and risk-taking individuals – who demonstrate a proactive and optimistic attitude towards new technology, paving the way for innovation within their establishments (Wang and Cheung, 2004; Li and Xie, 2012).

There is limited research on the application of AI technology to achieve enhanced benefits (Dutta et al., 2020; Tortorella et al., 2019). Our findings, for instance, indicate instances of collaboration with third-party companies for customer data analysis and ratings within a competitive market. Such collaborations allow businesses to make informed decisions based on insights derived from advanced technologies. Moreover, studies have underscored the importance of leveraging Industry 4.0 technologies to tackle the challenges organisations face when relying on traditional practices (Moeuf et al., 2018). Additionally, our research highlights individual-level innovation, as restaurant owners adapt their business models by redesigning their websites to better showcase their offerings and attract more customers online.

As previously mentioned, the digital divide presents various challenges, particularly regarding ethnic restaurants' adoption of technology during a global crisis. This situation reveals a complex array of perceptions towards artificial intelligence. Despite the difficulties posed by the crisis, including limitations on delivery staff, some restaurants have highlighted the positive impacts the pandemic has had on their business. Notably, they appreciate platforms such as UberEats and Deliveroo, which have expanded their customer reach significantly.

5.1.3. External environment

In our comprehensive literature review, we have seamlessly woven the environmental context into our study to investigate the myriad influences of external factors, particularly the seismic impact of the global pandemic crisis. This unprecedented event has unveiled a fascinating new pathway for research into the digital divide. The choice to embrace new technology often emerges from the compelling pressures exerted by business partners and competitors. As industries evolve, a ripple effect is witnessed when a growing number of companies begin to adopt innovative technologies, compelling others to follow suit (Grover, 1993; Iacovou et al., 1995; Crook and Kumar, 1998; Kuan and Chau, 2001).

During the initial lockdown, as individuals were confined to their homes, an astounding surge in demand for online takeaway services emerged, driven by the urgent need to satisfy consumer cravings. Our findings illustrate that while a majority of restaurant owners and their employees express a genuine appreciation for technological advancements, a troubling lack of innovation and ambition serves as a significant roadblock. This concern is powerfully reinforced by our results, highlighting the critical need for a renewed focus on creativity and forward-thinking in the sector.

The unprecedented outbreak of a global crisis, such as the COVID-19 pandemic, caught businesses off guard in ways that were difficult to predict. Despite some reservations about machine learning and AI, many enterprises are actively looking to incorporate these technologies. This trend is also evident among restaurant owners in the Middle East, who are increasingly embracing advanced technology to optimise their operations. However, it is important to acknowledge that ethnic restaurants in the UK still face uncertainty regarding the benefits of AI, even in light of the substantial challenges brought on by the pandemic. Our findings suggest that both individual and managerial attitudes towards

AI can play a crucial role in shaping business operations during the crisis and beyond, ultimately impacting support and collaboration within their restaurant workforce.

5.2. Theoretical contributions

Our theoretical contribution is firmly anchored in the rich empirical insights we've previously explored. As highlighted in the existing literature (Hwang and Nam, 2017; Van Deursen and Van Dijk, 2019), the journey of digital transformation often demands a significant investment of time from management to implement sweeping changes, reflect upon past experiences, and adapt iteratively to new challenges. Yet, the unprecedented upheaval caused by the COVID-19 pandemic forced organisations, particularly SMEs, to undergo digital transformation in a rapid and sometimes chaotic manner, allowing scant time or flexibility for contemplation and adjustment. Investigating how these small and medium-sized enterprises manoeuvred through the tumult of digital transformation during this crisis deepens our understanding of the intricate dynamics and interactions that existed between the fast-evolving external environment and the adaptive strategies employed by management.

We argue that digital technologies, particularly artificial intelligence, can be powerful instruments for growth and efficiency, but only when they are seamlessly integrated with an organisation's existing capabilities and aligned thoughtfully with practical solutions to the challenges posed by shifting external conditions. AI, in isolation, is no silver bullet; it possesses the dual-edged potential to either magnify existing issues or provide vital solutions, depending heavily on how well it is matched with organisational resources and capabilities.

Our second contribution takes a more comprehensive view of the restaurant industry as a whole. The turmoil unleashed by the COVID-19 pandemic has laid bare numerous complexities and systemic inequalities that permeate our society (Hidalgo et al., 2020). Our findings reveal an additional layer of disparity, manifesting as a digital divide within the UK restaurant sector. While existing literature on the digital divide (Van Dijk, 2006; Hwang and Nam, 2017) traditionally focuses on the global chasm between those who have access to digital resources and those who do not, the pandemic has spotlighted a significant digital divide right here in the Western world.

Moreover, we unveil the insight that this digital divide is not solely dictated by access to technology or financial resources. Factors such as eagerness to adopt, skill sets, knowledge levels, and overall comprehension of digital tools play critical roles in bridging or widening this gap. We contend that while effective digital transformation has the potential to lessen this divide, a lacklustre or complacent approach to transformation can leave an organisation vulnerable and at a marked disadvantage.

6. Conclusion

This research focused to examine how digital transformation can enable SMEs to overcome COVID-19 challenges and how it widens the digital divide. The aim was to develop a better understanding of the appropriate and inclusive digital transformation of SMEs that will reduce the digital divide by inculcating digital technology driven innovation in various SMEs. Hence, our research developed a conceptual model that identified and analysed the interrelationships between innovative technologies, SMEs and their external environment (COVID-19 pandemic). Our study confirms the key technological (digital inertia, digital literacy and customisation and personalisation of technology etc.), organisational (attitudes and perception of innovative technologies, lack/access of resources, collaboration and engagement etc.) and the external environmental (COVID-19 pandemic, national lockdown, social distancing and closure of businesses etc.) factors that lead to digital transformation or digital divide among SMEs in the extraordinary times of a pandemic.

6.1. Implication to theory and practice

This paper makes the following theoretical contributions.

- **First**, the paper extends the technology adoption and adaptation literature in the context of extraordinary times and disruption caused by a heartless pandemic crisis. This paper offers deep insight on the digital transformation and digital divide among SMEs in the context pandemic global crisis. In so doing, this paper develops a theoretical model based on the TOE theory to assess technology adoption and adaptation.
- **Second**, this is the first paper, to the best of our knowledge, which highlights the context of a pandemic in innovative technology adoption and adaptation for SMEs vis a vis internal organisational and external environmental factors. Our paper unearths the key technological, organisational and external environmental factors facilitation or impeding innovative technology adoption and adaptation by SMEs in the extraordinary times (context of COVID-19). Our paper reveals that it is not only the external environment (COVID-19 pandemic, national lockdown, social distancing and closure of businesses etc.) but also the technological (digital inertia, digital literacy and customisation and personalisation of technology etc.) and organisational (attitudes and perception of innovative technologies, lack/access of resources, collaboration and engagement etc.) factors that lead to innovative technology adoption and adaptation among SMEs.
- **Third**, our proposed model exhibits the most significant relationships among the factors to provide a deeper understanding of the digital transformation or a digital divide in SMEs during a pandemic. It provides insight into the most apposite underlying factors in determining the coping and adaptation factors during disruptions and interruptions. It offers a strong conceptual underpinning for assessing the disruptively interruptive pandemic. Our model is propounded for SMEs in the hospitality industry, but its implications can be for SMEs in other industries.
- **Fourth**, our paper advances technology adoption and adaptation literature in the fast-track digital transformation context, wherein the adoption of innovative technology is having negative impact on the distribution of adoption and adaption of innovative technologies. In normal circumstances, the adoption and coping of technologies for SMEs would have been different but the disruption and interruption caused by the pandemic led to a huge digital divide and digital inertia. This is the most significant and key finding of this research which has huge implications for both theory and practice. In addition, this paper unearths the underlying contextual factors that can provide innovative solutions to SMEs for digital transformation and potentially reset their business models in response to the pandemic and survive in extraordinary times.
- **Finally**, our paper is that our research model provides solutions for digital transformation of MSEs during a pandemic and the measurement of digital divide and digital inertia. It has implications for practice for policy making and making digital transformation for SMEs and strategies to avoid digital divide.

Ethnic restaurants, often run by migrant entrepreneurs or family-owned businesses, face unique cultural influences that shape their attitudes towards digitalisation. Cultural backgrounds significantly impact entrepreneurial decision-making and risk tolerance, which in turn affect technology adoption. Ethnic businesses from individualistic cultures (e.g., North American, Northern European) may be more inclined to experiment with digital tools as a means of enhancing efficiency and fostering innovation. For instance, Lee et al. (2013) study on the impact of cultural differences on technology adoption between the US and South Korea highlights that in individualistic culture, people tend to seek information on their own from direct and formal sources, whereas in collectivist cultures, people rely more on subjective evaluation of an

innovation with conveyance from other-like-minded individuals who were early adopters of technology. Future research can further explore the impact of cultural factors on SME digital adoption by expanding theoretical models such as TOE to include cultural dimensions. Additionally, conducting comparative studies across different ethnic SME groups and investigating how digital training and policy interventions can enhance accessibility for ethnic SMEs would provide valuable insights.

6.2. Limitations and future research recommendations

This study has some limitations, which offer valuable opportunities for future research. Firstly, the data collection was limited to SMEs located in London. Although this regional focus provided depth within a specific urban context, future studies could enhance the generalisability of the findings by incorporating a broader geographical scope, extending data collection across different regions or even at a national or international level. Secondly, the sample was drawn exclusively from ethnic minority-owned restaurants within the SME sector. While this focus offered unique insights into a specific sub-sector of the service industry, future research could explore a wider range of service-based enterprises, as well as firms in the manufacturing sector. This would allow for a more comprehensive understanding of the digital transformation and innovation challenges across diverse industries. Thirdly, the study encountered notable difficulty in securing participation from ethnic minority-owned restaurants. While the reasons for this reluctance were not entirely clear, it highlights an important methodological constraint. Future research should explore the underlying factors contributing to such reluctance and develop strategies to enhance engagement and accessibility among SMEs led by ethnic minority entrepreneurs. Additionally, the conceptual model developed in this research was framed within the specific global crisis context. While this provides important temporal relevance, future studies could test and extend the model beyond crisis settings, including more stable environments and across a variety of organisational sizes, such as large enterprises. Lastly, this paper concentrated on digital transformation and the digital divide within SMEs. Future research may benefit from extending the current model to examine other dimensions of digital innovation, as well as applying it in cross-cultural contexts to better understand how cultural, institutional, and socio-economic factors influence digital adoption and resilience.

CRedit authorship contribution statement

Syed Sardar Muhammad: Writing – original draft, Investigation, Conceptualization. **Bidit Lal Dey:** Writing – original draft, Validation, Formal analysis, Conceptualization. **Muhammad Mustafa Kamal:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Lalnunpuia Samuel:** Writing – original draft, Investigation, Formal analysis, Conceptualization. **Ebtesam Abdullah Alzeiby:** Writing – review & editing.

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Data availability

Data will be made available on request.

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