

Digital Transformation of Malaysian Small and Medium-Sized Enterprises: A Review and Research Direction



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Abstract Digital transformation refers to redefining the business process via digital technology. The innovation and digital revolution have remarkable effects on the global economy by affecting organisational relevancy in the marketplace. SMEs are considered as a nation's growth engine and seriously affected due to tech-adaptation challenges that arise at a fast pace such as COVID-19 outbreaks severely affected the SMEs businesses by the drop in demand and scarcity of resources all across the globe, including ASEAN region such as Malaysia, Indonesia, Singapore, Philippine, Thailand etc. Thus, to begin with digital transformation, enterprises must be aware of the factors influencing it as only few countries are lagging in digital transformation in the ASEAN region. This paper aims to highlight the factors influencing the digital transformation of SMEs focusing on internal and external factors. The Innovation and Technology Adoption Theory was selected as the underpinning theory for this research, along with the holistic Technology-Organisation-Environment (TOE) Model as the chosen framework to reflect technology adoption theory. The present study raises some practical implications for policymakers, government and industries. It will help accelerate the rapid adaptation of digital technology for SMEs and directly affect the growth of SMEs. The present study singled out that organisational, technological and environmental factors provide a widespread view of digital transformation of SMEs.

Keywords Digital · Innovation · Technology · Organisation · Environment · SMEs · Transformation

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1 Overview

Digital transformation (DX) plays an essential role in today's business world as the fourth industrial revolution gets in shape speedily and business organisations get familiar with digital technology (Morakanyane et al. 2017) related to products, services, and processes. In this regard, large organisations are more technology mature and prepare to take risks than small and medium-sized enterprises (SMEs) (Deniz 2021; Gioldanowski 2019). SMEs need to ride the waves of digital transformation as today's consumers are more affianced with mobile devices. Social media, cloud computing all across the globe, including the ASEAN region (Peillon and Dubruc 2019). The rapid technological advancement may appear as a primary reason for businesses to unlock the digital economy by providing fast, economical and better services (World Bank 2018). However, digital transformation among SMEs is notably lower, as the majority of the studies pointed out digital transformation in the large organisation focusing on the business model and innovativeness (Hänninen et al. 2017; Kaiser and Stummer 2020; Steiber et al. 2020).

Moreover, how the large organisations drive through the digital transformation, especially in developed countries, identified prevalent factors on digital transformation concerning SMEs in the ASEAN region, especially in Malaysia, is missing. Malaysia lags behind international peers regarding digital adoption by businesses as only 62% subscribe to the internet, and less than 30% have an online presence (World Bank 2018), which shows that SME's digital transformation in Malaysia is equivalent to lower-middle-income country. The reason behind that small and medium-sized businesses lack ample resources and skills; however, the Malaysian government is striving to improve the business performance of SMEs for the overall progress and growth of the country as SME Corp Malaysia (2018) revealed five significant obstacles that SMEs are confronting: cost of doing business, cash flow and payment financing, business financing, human capital, and ICT adoption. Despite numerous government interventions to increase digital adoption among Malaysian SMEs to increase GDP contribution, the results remain below the mark. Past literature revealed various studies on technology adoption, but there has been no comprehensive DX analysis in Malaysia, especially in light of the current unprecedented situation with COVID-19, as DX involves multifaceted services that are not well theorized. Hence, the present study discovers the motivating & limiting factors of Digital Transformation by Malaysian SMEs. Since Malaysia aspires to be the outstanding entrepreneurial nation by 2030, it is critical to understand the factors influencing and limiting Malaysian SMEs' digital transformation.

2 Leading Theories

2.1 Innovation Theory

The majority of the previous research applied the Diffusion of Innovation (DOI) theory. As the models developed based on DOI theory such as the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Technology Readiness Index and Technology Adoption Propensity Index (TAP) (Ajzen and Fishbein 1975; Davis 1989; Karahanna et al. 1999; Parasuraman 2000; Ratchford and Barnhart 2012; Jahanmira et al. 2018). Furthermore, numerous studies revealed that multiple theories or models might be utilised to examine technology adoption from individual to institutional levels (Abdullah et al. 2012; Nahian Riyadh et al. 2009). Table 1 depicts the theoretical models for technology adoption from individual to institutional level.

Previous Literature on technological innovation confirms that most empirical studies refer to the “Diffusion of Innovation” or the DOI theory of Rogers and the TOE framework. Furthermore, most of the researchers recognize DOI as being able to identify “perceived” critical characteristics of technological innovations (Hoti 2015). DOI theory has been applied related to various contexts, which includes organisational studies. Rogers (1995) demonstrated attributes of innovations based on five categories such as (i) relative advantage, (ii) compatibility, (iii) complexity, (iv) trialability, and (v) observability (Askarany 2009). These five variables are influencing factors of innovation. Figure 1 depict the diffusion of Innovation Theory.

Table 2 demonstrates the Extended/Integrated Technology Adoption Model specifically to technology-related subjects. Recent studies pointed that traditional theories need to be integrated to provide more comprehensive constructs, especially when they involved new technologies in specific countries and other factors in determining technology adoption among SMEs.

Previous research demonstrates extensive literature on innovation adoption theory along with the excellent choice of models; however, widely used is TOE Framework. Figure 2 shows the TOE framework developed by Tornatzky and Fleischer (1990). It covered a wide range of innovations and helps in strengthening the DOI theory – specifically in technological and organizational (Hoti 2015; Martins et al. 2018). The framework is used to discover the critical factors that affect the organization’s acceptance of new technology. From the past research, the TOE framework has proven to be reasonably practical and provide insight and showed the highest usage in studies of new technologies (Chen and Chen 2017; Hoti 2015; Hussain et al. 2015).

3 What is ICT and Digital Technology

Information and communication technology (ICT) or information technology (IT) refers to technology that provides access to information. It focuses primarily on communication technology, including access to the internet through multiple

Table 1 Theoretical models for individuals/institutions

Theory	Level of analysis	Construct
Diffusion of Innovation (DOI) Theory	Individual	Roger classified individuals based on four categories: Innovator, early adopter, early majority, late majority and laggard
Diffusion of Innovation (DOI) Theory	Individual	Behaviour and determinants of innovation diffusion based on: Relative advantages, compatibility, complexity, observability, Trialability with two additional constructs: image & voluntariness of use
Technology Adoption Model (TAM)	Individual	Perceived Usefulness (PU) and Perceived Ease of Use (PEOU)
TAM II (revised TAM)	Individual	Social influence and cognitive instruments as determinants of Perceived Usefulness (PU), Anchor and adjustments are determinant of PEOU
Extended Technology Adoption Model (TAM)	Individual	Using TAM (perceived usefulness and ease of use) with additional construct, perceived credibility
Unified Theory of Acceptance & Use of Technology (UTAUT) – modified TAM	Individual	Direct determinants of usage and intention: Performance expectancy, Effort expectancy, Social Influence, Facilitating conditions, Mediators (usage intention & behaviour), Gender, Age, Experience & voluntariness of use
Decomposed Theory of Planned Behaviour (DTPB)	Individual	Based on DOI and TPB, attitudinal belief have 3 parts: (1) perceived usefulness, (2) perceived ease of use, (3) compatibility
Theory of Reasoned Action (TRA)	Individual	The most influential theory to explain human behaviour and attitude towards adoption of innovation
The technology-organisation-environment (TOE) framework	Institution	Focusing on three contexts: (1) Technology, (2) Organization, (3) Environment
The technology-organisation-environment (TOE) framework	Institution	Technological context, Organisational context includes resources (capital & human), scope & size, Environment contexts include both the direct and indirect roles of competitors, industry associations and the governments
Institutional Theory	Institution	Pressures for technology adoption: coercive pressure, normative pressure and mimetic pressure

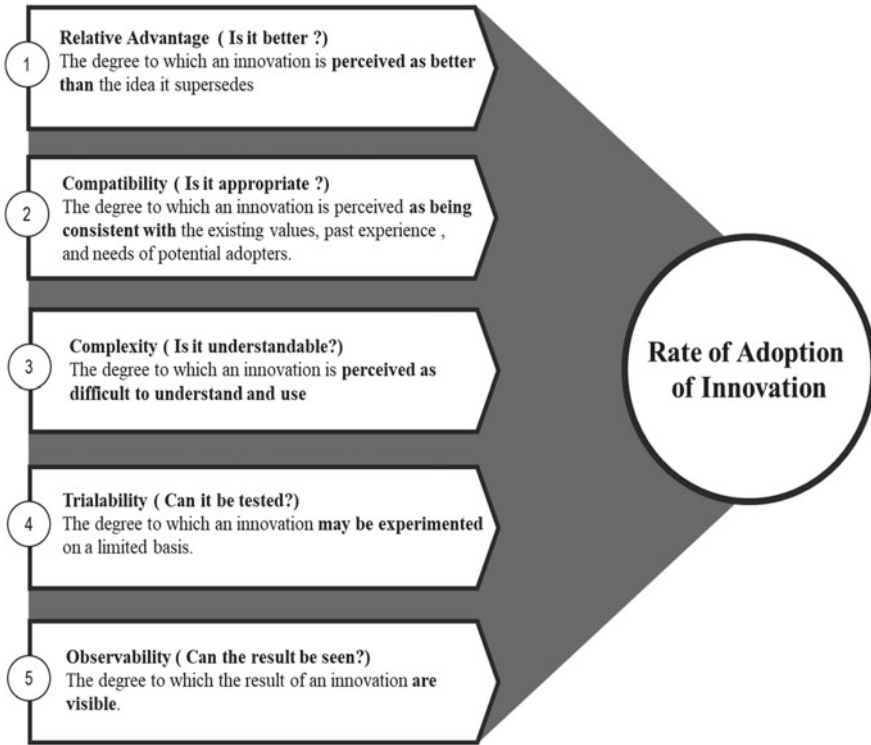


Fig. 1 Diffusion of innovation theory

mediums such as wireless networks and mobile devices (Christensson 2010). Meanwhile, *digital technology* is defined as: “Digitised information is recorded in binary code of combinations of the digits 0 and 1, also called bits, which represent words and images. Digital technology enables immense amounts of information to be compressed on small storage devices that can be easily preserved and transported. Digitization also quickens data transmission speeds. Digital technology has transformed how people communicate, learn, and work” (The Gale Group Inc 2003).

Digital technology is enabled by ICT infrastructures that provide widespread applications to individuals and businesses, creating multiple opportunities for business expansion, new jobs and fast forward modernisations (SME Corp Malaysia 2018). Therefore, it can be concluded that digital technology is a new and emerging technology that encapsulates the process of acquisition, transmission, storage and practical usage of digital data that adds value to individual users and businesses which are enabled by an ICT technology infrastructure. ICT is broadly being used for both analogue and digital technology. Thus, in the new era of digital business, the term digital technology has become more specific as it can be used to refer to current, new and emerging digital and intelligent services.

Table 2 Extended/integrated technology adoption model in specific technology subject & scope

Extended /integrated theory	Subject	Scope	Constructs/dimensions	Literature
Extended Technology Adoption Model (TAM)	e-banking	Bangladesh	TAM (perceived usefulness and ease of use) with additional construct, perceived credibility	(Nahian Riyadh et al. 2009)
Extended Diffusion Of Innovation Theory (DOI)	e-commerce	Malaysia	DOI (relative advantage, compatibility, complexity, Trialability, observability) with additional construct: Internal culture	(Poorangi et al. 2013)
Extended Diffusion Of Innovation Theory (DOI)	Internet-based ICT	Melaka & Johor, Malaysia	DOI (relative advantage, compatibility, complexity, Trialability, observability) with 3 additional constructs: ICT security, ICT cost, Benefits	(Tan et al. 2009)
Integrating TPB and TAM	IT	General	hybrid model, combining TPB and TAM	(Riemenschneider et al. 2003)
Integrating TAM, TOE and TPB	e-commerce	General	3 adoptions drivers based on TAM with individual constructs from TOE and TPB	(Stiles 2015)
Integrating TOE and DOI	cloud computing	North east of England	Combination of TOE framework and DOI constructs	(Alshamaila et al. 2013)
IMPULS	IR 4.0	Malaysia	strategy & organization, smart factory, vertical and horizontal integration, distribution control, smart product, data driven services & employee	(Hamidi et al. 2018)

4 Digitisation, Digitalisation and Digital Transformation (DX) Concept

The spreading of digital technology to industry, economy, and culture becoming the reason to differentiate between various technologies. Thus, the phenomena that occur

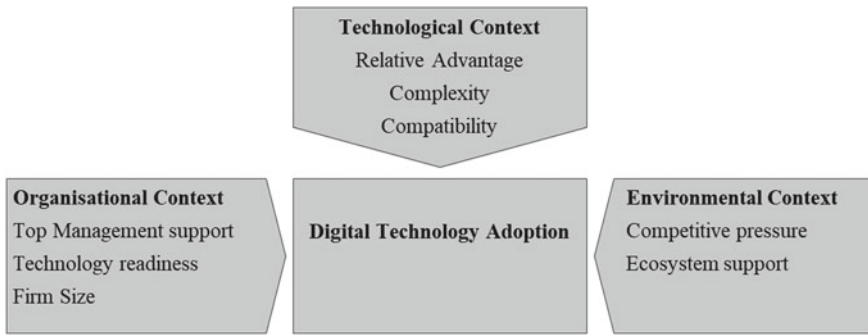


Fig. 2 TOE framework. Source Gutierrez et al. (2015)

when the real and virtual worlds converge to show the need to distinguish between digitisation, digitalisation, and digital transformation and their scale and scope (Kwon and Park 2017; Saarikko et al. 2020). Savi (2019) compiled the definitions of three digital domains demonstrated in Table 3. Digitisation is about converting non-digital to digital format. Digitisation is fundamental because it creates a connection between physical and digital that provide business value because of digital data. Meanwhile, digitalisation refers to enabling or improving processes by leveraging digital technologies or digitised data such as electronic forms connected to supply-chain management to deliver the services to customers. Digitalisation aims to increase productivity and efficiency while at the same time lowering costs by enhancing current systems but does not modify or transform them. Digital transformation involved business transformation enabled by digital technologies.

Table 3 Digitisation, digitalisation, and digital transformation

	Digitisation	Digitalisation	Digital transformation
Focus	Data conversion	Information processing	Knowledge leverage
Goal	Change analog into digital format	Automate existing business operations and processes	Change company’s culture, the way it works and thinks
Activity	Convert paper document, photos, microfilm VHS tapes to digital format	Creation of completely digital work processes	Creation of a new digital company or transformation to a digital one
Tools	Computer and conversion/encoding equipment	IT systems and computer applications	Matrix of new digital technologies
Challenge	Volume (Material)	Price/Financial	Resistance to change—Human factor
Example	Scanning paper	Completely electronic registration process	Everything electronic from registration to content delivery

5 Digital Transformation

Digital transformation can be defined as the processing of digital computers, online sites, mobile operating systems, and social media knowledge. Each digital product and service's value propositions are assessed on customer segmentation dynamics, product quality, and service bundling, and channel owner commissions (Holmstro and Nyle 2015). A detailed analysis of DX definitions was conducted by Morakanyane and Grace (2017) to determine how researchers describe the digital transformation. Similar study was conducted by Joao Carlos et al. (2018). Furthermore, Jurgielewicz (2019) conducted the digital transformation literature review. The findings of DX definitions by these three studies are shown in Table 4.

6 Emerging Technology Under DX

The digital transformation involved the changes that are guided and developed on a technological base. It is characterised within an enterprise as an organisational transition to technologies for big data, analytics, cloud, mobile and social media (Nwankpa 2016). Hence, Digital transformation with the commercial world (Westerman et al. 2012) rise of because of emerging technologies such as IoT, Big Data, Machine Learning, Artificial Intelligence, Smart services, Robotic Process Automation (RPA) and other new technology leveraging on cloud computing and high bandwidth fixed and mobile connectivity infrastructure coverage such fibre optic and 5G. Understanding the digital technologies under DX will give better clarity on their benefits to SMEs. Table 5 depicted emerging technologies enabling DX.

Those technologies are mapped to the vital aspect of business improvement and value creation as DX's benefits to SMEs (Table 6).

Those technologies are vital enablers for Industrial Revolution 4.0 (IR 4.0), involving cyber-physical systems (CPS). Industry 4.0 can be seen by using cyber-physical systems to transfer the concepts of the internet of things to industrial applications. Intelligent control, information, and communication devices characterize these systems. They can communicate with other systems and humans and interact autonomously. It reflects the "internet of things" (also the "internet of goods and services") with the support of mobile devices (e.g., smartphone or smartwatch) and new apps for users or consumers; various evolutionary stages are possible (Müller and Hopf 2017). The cyber-physical systems are capable of delivering tailor-made, personalized goods and services in a flexible way and around the world. Digital tools are essential to help SMEs acquire the required facilities, which are imperative for providing information at the right time (Ghobakhloo et al. 2012).

Table 4 Digital transformation definitions

Researcher	Digital technology aspect/usage	Area of improvement or transformation	Impact or value
Morakanyane and Grace (2017)	Integration of digital technologies	Business processes	Process Integration
	Leveraging digital resources	Strategy & Execution	Create differential value
	Fundamentally altering traditional ways of doing business	Redefining business capabilities, processes, and relationship	
	The use of technology to radically improve performance	Business process and market access	Reachability & business performance
	A business model is driven by changes related to the applications of digital technologies	Business Model	All aspects of Human Society
	Use of new digital technologies	Business Improvements	Significant business improvements
	Realignment of technology and business models	Customer engagement at every touchpoint	Customer experience
	Changes induced by digital technologies	Throughout an organisation	Business transformation
	Changes of digital technology	Business model, Products, Organisational structure and automation	Business transformation
Joao Carlos et al. (2018)	Use of new digital technologies; (1) Social Media (2) Mobile (3) Analytics or embedded device	Enhancing customer experience, streamlining operation, and creating a new business model	Major business improvement
	Realignment or new investment in technology and business model	Customer experience	More effectively engage digital customers at every touchpoint
	Usage of ICT	Business automation	Affecting politics, business and social
	Use of technology		Reachability and radically improve business performance
Jurgielewicz (2019)	Go beyond digitisation process	Product & process	Revenue created from revenue assets

(continued)

Table 4 (continued)

Researcher	Digital technology aspect/usage	Area of improvement or transformation	Impact or value
	Complete networking of all sectors	Collect relevant information and turn the information into action	New advantages and opportunities to the business
	Usage of ICT	Creation of new capabilities	People and society's life
	Reinventing a business to digitize operations	Operation and supply chain relationship	Re-energizing business to capture new potentials

Table 5 Technology enablers for DX

Technology	Features	Benefits to business
Digital Platform	Connecting demand (buyer) and supply (seller) using digital platforms	Increase market access, Business Model Innovation & better customer experience
Cloud Computing	Scalable and flexible computing resources	Cost-effective solutions and expedite go-to-market
Internet Of Things (IOT)	Collect the data using sensors that measure behaviour and equipment's health for predictive monitoring and improve response time	Operational efficiencies
Business Analytics & Artificial Intelligent (AI)	In-depth analysis of data and information that provide insight and recommendations to businesses	Better and faster decision-making process with insights
Robotic Process Automation (RPA)	Replace human resources for repetitive activities using the software	Automation of process, reduce human errors and resources
Cybersecurity	Protect network and customer and business data, critical assets for digital business	Protect data and operation from cyber threats that can cause business disruption

Table 6 DX – Technology, key aspects of improvement & value creation (Herbert 2019)

Technology	Internal processes improvement	Customer experience enhancement	Business model innovation	Value creation
Usage of Emerging/new digital technology such as cloud, RPA, digital marketing, IOT, cybersecurity	Way of working that improves operations, analysis and decision making	Engagements, interactions, and transactions with customers	How revenue is generated and how customers are acquired and retained	Business, society, and economy

7 Organisational Aspect

Azhari’s maturity model consists of eight digitisation dimensions: strategy, leadership, products, operations, culture, people, governance, and technology. Five levels of digital maturity are defined, which allow companies to classify themselves. The first level, “unaware”, defines organisations where the digital transformation strategy is not in place. The second level is “conceptual”, selling a few digital products but still lack a digital strategy. The third level is “Defined”, which are the companies that can consolidate pilot experience as part of the implementations. A culture of digital thinking is taking root in the enterprise at this point. The fourth level is “Integrated”, are the companies have a clear digital strategy. After having developed and implemented a digital strategy across all products and business processes, the company can be classified as “transformed” (Leipzig et al. 2017) (Fig. 3).

A more superficial Digital Maturity level was introduced by Korachi and Bounabat (2020). It has three levels; Maturity-level 1 organizations use IT as a tool to support business processes. Maturity-level 2 organizations use IT to improve the business processes; maturity-level three organizations define processes that enable effective and efficient use of IT technology to help the organization achieve its aims and business performance (Fig. 4).

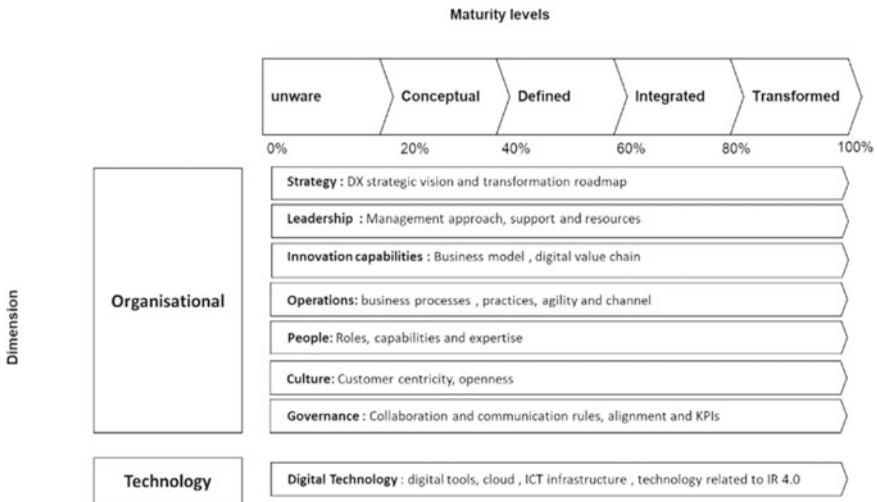


Fig. 3 Digital maturity levels. *Source* Leipzig et al. (2017)

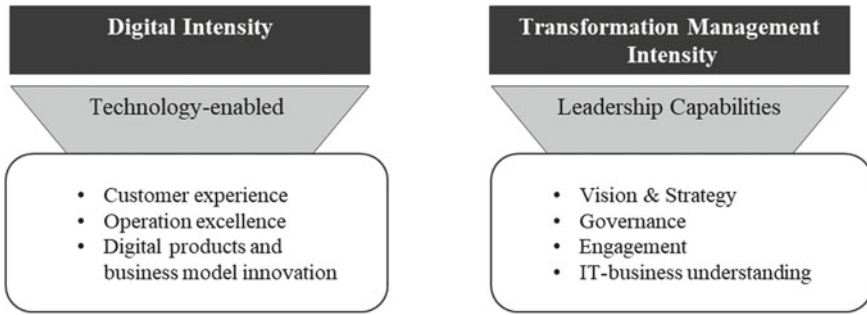
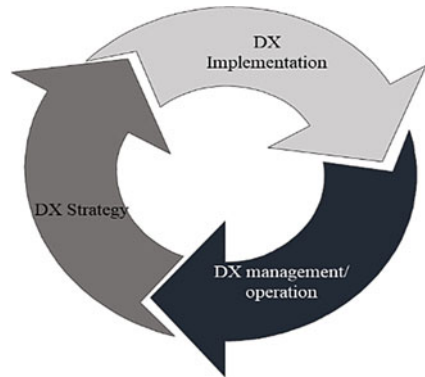


Fig. 4 Areas transformed. *Source* Westerman et al. (2012)

Fig. 5 Areas transformed. *Source* Korachi and Bounabat (2020)



8 Digital Strategy and Implementation

DX starts with the leadership, who formulates the strategy and supports the implementation. For SMEs to keep up with the new digital world and face digital transformation challenges, businesses need a digital transformation strategy to be established and implemented that covers the implications of digital transformation and drive operational excellence (Korachi and Bounabat 2020). DX phases are shown in Fig. 5.

8.1 Organisational Leadership: Mindset, Managerial Capabilities and Support

Based on the earlier segment, strategy is essential in digital transformation, which lies to SMEs’ owner or management. Macro factors such as culture and the digital divide were seen to influence the behaviour of individuals. Many owner-managers of SMEs

implied that resource limitation caused them not to adopt new technology; even if they had the resources, they might not be inclined to adopt more technologies. The culture or mindset of SMEs may determine whether they want to adopt new technology.

In Malaysia, based on Hanifah et al. (2017), most Bumiputera entrepreneurs' failure is due to a lack of management competencies. Poor decision-making caused less effective performance management. Lack of creativity and knowledge coupled with limited skilled workers contributed to low productivity. This explains the lower number of Bumiputera SMEs adopting new technology in their business processes and activities.

When comparing SMEs in other countries (Ghobakhloo et al. 2012), it is found that perceived benefits, government support, and management support are the main determinants that influence IT adoption among SMEs in Brunei. This suggestion is backed up by evidence (Doe et al. 2017), through which the author concludes that the use of mobile technology has challenged the usual trend of adoption in Ghana. Factors of personal level should contribute directly to company-level adoption. The company's workers are expected to embrace and use the technologies in the business.

In Taiwan, Junaidah Hashim (2007) identifies the factors influencing digital adoption: the company's size, characteristics and perception of CEOs towards ICT in terms of compatibility, relative advantage and complexity. The right mindset of SME leaders, along with the proper knowledge and understanding of digital technology, is a crucial ingredient to drive digital adoption in their company. Strong belief to innovate and go beyond business is an essential internal factor for the decision-maker to embrace a new way of running a business. As far back as 2007, the findings showed that the low adoption of ICT by SME owners in Malaysia was primarily because they felt that ICT adoption was difficult (Hashim 2007).

8.2 Organisational Knowledge, Skills and Motivations

Nadkarni and Prügl (2020) research indicates that additional and refined skills for leaders and organisations are needed to achieve digital transformation. The main reason for this is that digital technology creates challenges for innovation that are highly complex. Many businesses struggled to meet these challenges then have suffered enormous consequences. Companies looking to evolve with digital technology to their product and service offerings need well-versed managers in digital technology's fundamental nature (Holmstro and Nyle 2015). Resource-Based View (RBV) is a unified theory for an organisation's internal capabilities action for digital transformation. The resource-based view has been used widely to describe how businesses can achieve strategic advantage and superior efficiency in the IS literature. The heart of the theory is that superior business success is due to resources and abilities that competing companies are firm-specific, rare, and difficult to replicate (Nwankpa 2016). The RBV takes an 'inside-out' view or company-specific viewpoint on whether companies in the marketplace excel or fail (Madhani 2010).

From strategic and operational objectives, an organisation can be shaped and accomplished through technology management. *Technology management* is a process that includes planning, directing, control and coordinating the development and implementation of technological capabilities (Liao 2005). Therefore knowledge and skills are essential to address several barriers to IT adoption. Limited resources such as skills, financial and competencies are other factors that caused the low adoption of ICT. Malaysia's serious efforts are to drive technology usage through training and skills development, including initiatives to drive and entice SMEs to adopt the internet as the new way and a more efficient approach to doing business. However, it remains to be seen whether the initiatives can reduce the digital gap. The same situation occurs in Taiwan, where the study shows that ICT skill is one of the ICT adoption determinants (Hashim 2007). In another study focusing on the manufacturing sector Terziovski (2010) explained that SMEs in the manufacturing sector develop competitive advantage through their staffs' creative potential to develop differentiated products for niche markets" (Terziovski 2010). Lack of resources hinders many small and medium enterprises from using or adopting IT compared to larger businesses (Sarosa and Zowghi 2003). Lack of resources is not the only barrier for SMEs to embrace new technology. It is also due to several internal and external factors. Technical competencies and computing skills directly influence how small and medium enterprises evaluate the information system. Innovativeness is critical in determining ICT use among women entrepreneurs in Malaysia (Carlos et al. 2018).

Strategic technology management is crucial for businesses in the current situation characterized by accelerated development of technology and stiff technology-based competition. To achieve sustainable growth, businesses must develop and maintain their technological capabilities to generate external and internal impacts within a volatile socioeconomic context (Sahlman 2010). Business growth and business sustainability relate to technological innovation that creates economic value (Katila and Chen 2008). Meanwhile, technology management is being used to create business transformations to adapt to the fast-changing environment (Unsal and Cetindamar 2015). In any organisation, motivation is the critical ingredient for success. Organisations can have all the world's technical skills, but they will not succeed if they can not motivate their team. Employees are naturally forced to respond to technology's ever-evolving requirements. Every day, new technology advances face workers in the workplace. Some workers welcome the improvements that technology brings. They are looking for new applications for the innovation, while others are resistant and defensive. Employees today want to share what they generate with the financial rewards, and they want to be compensated for the value they deliver, not the hours they spend (Afzal et al. 2013). Thus, digital knowledge, skillset and motivations are the critical components of SMEs' success in leveraging digital technology and reaping digital transformation benefits. Appropriate skills are needed for SMEs to start harnessing the technology that involves front-end and back-end systems. With the right skill, raw data captured by digital technology can be utilised as valuable and actionable insights that provide an extra advantage for SMEs to stay ahead of their competition, effectively expand their market reach and provide better services to their customers. Therefore, it can be concluded from the previous studies that DX strategy, managerial capabilities, managerial supports, technical capabilities and staff

Fig. 6 DX’s organisational aspects



motivations are the identified organisational factors that affect DX in the companies, as shown in Fig. 6.

P1: In the context of SMEs, a digitally transformed SME can be determined based on the level of organisational transformation and the level of technology utilisation. Hence, a successful digitally transformed SME can be compared to a less successful one by measuring the level of organisational transformation and the level of digital technology utilisation.

9 Environmental Aspects

Digital transformation is a dynamic process that impacts all aspects of organizations’ business, management, and internal and external environments (Stoianova et al. 2020). The context of digital transformation in SMEs can be understood by studying leadership, organization, technology, and process; it includes the industry’s environmental aspects (Hausberg et al. 2019; Kwon and Park 2017). An entrepreneurial ecosystem analysis is essential to deep dive further into the environmental aspect from a macro perspective. There exists a considerable body of literature on the entrepreneurial ecosystem. One of the most frequently used is Isenberg’s Model. Figure 7 presents the entrepreneurship ecosystem model adapted from the Isenberg framework.

The entrepreneurship ecosystem recommended by the Isenberg framework cover six key dimensions, (i) Policy (leadership & government), (ii) Finance (financial capital), (iii) Culture (societal norms and success stories), (iv) Support (infrastructure, support professionals such as legal, accounting, technical experts and community support) (v) Human Capital (skilled and unskilled labour, entrepreneur training) (vi) Market (market access and marketing support). Some authors have also suggested a few ecosystems related to SME technology adoptions; Bockstedt and Kauffman (2005) introduced a technology ecosystem that covers two dimensions by the Isenberg framework. Figure 8 shows the three dimensions of the technology ecosystem.

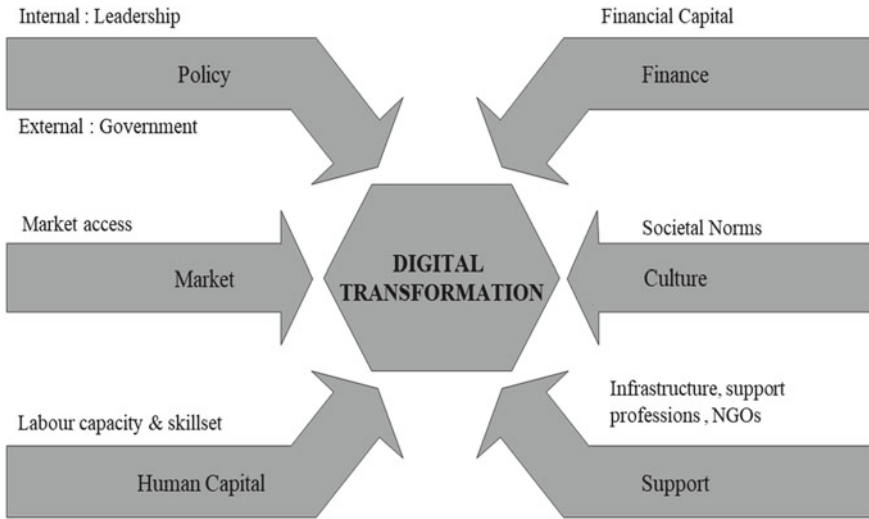


Fig. 7 Entrepreneurship ecosystem. Source Al-Abri et al. (2018)

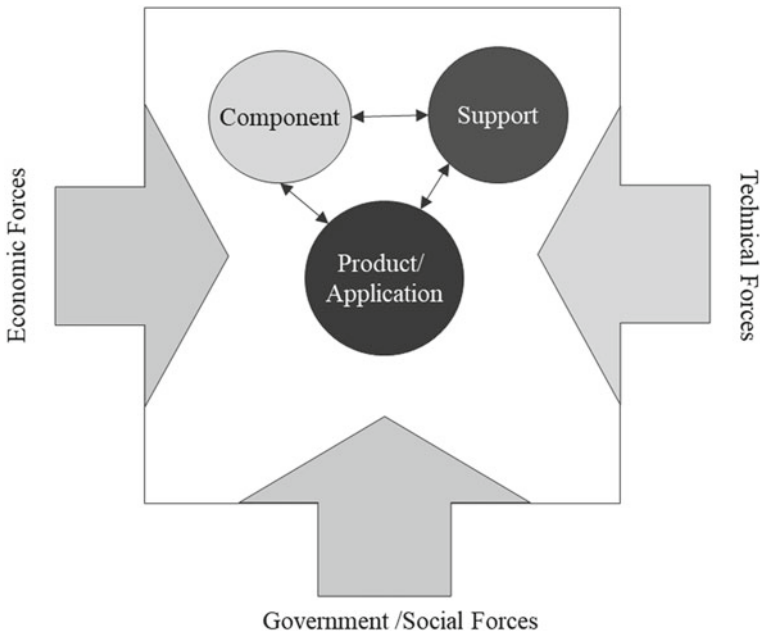


Fig. 8 Dimensions of technology ecosystem. Source Bockstedt and Kauffman (2005)

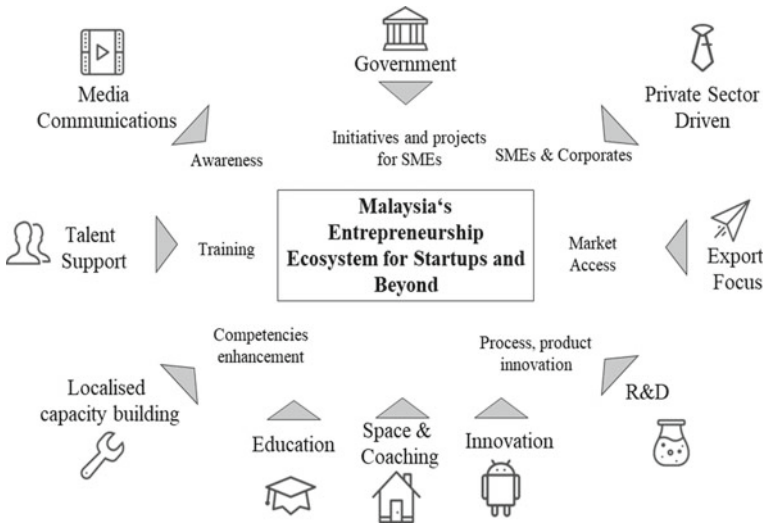


Fig. 9 Malaysia’s entrepreneurship ecosystem. *Source* Xavier (2016)

Xavier (2016) explored the SME ecosystem in Malaysia’s. The study focuses more on start-ups in Malaysia and includes Government and private sectors as part of the ecosystem, as illustrated in Fig. 9.

Based on the entrepreneurship ecosystem studies, it can be concluded that government and Industry players’ supports are essential to driving digital transformation. The supports are required from multiple aspects such as policy, market access, financing facilities, digital tools, capacity and capability building. A sound and well-functioning entrepreneurial ecosystem are essential for countries to nurture SMEs’ involvement in the digital economy. Institutional and regulatory settings can help provide conditions for SMEs to access markets and skill up their resources to scale up their capabilities to capture the business growth potential enabled by digital technology (OECD 2018). The literature review shows that an ICT-friendly policy is essential for SMEs to provide related technology training to enhance their employees’ capabilities in the Malaysian context. It is also essential for government agencies to fund the training programmes through various skills development centres in the country (Tan et al. 2009).

10 Market Factor: Covid-19 Disruptions

In 2020, the world faced an unprecedented situation when the spread of infectious disease COVID-19 became a global pandemic crisis. Most governments took drastic measures by implementing lockdown or Movement Control Order (MCO) to flatten

the COVID-19 incidents (Whitelaw et al. 2020). Social distancing, online classes, contact tracing, virtual meetings and work-from-home (WFH) have become the new norms. The COVID-19 coronavirus pandemic has had a tremendous impact on businesses, especially the worldwide tourism industry. Quarantines and transport closures have contributed to a 22% drop in international visitor arrivals in Q1 2020 relative to 2019 and likely 60–80% over the whole year. With an unprecedented 50 million global jobs at risk because of the pandemic, businesses are in a fight for survival (Lau 2020).

The pandemic has forced more companies to turn to digital applications to allow work from anywhere and mitigate risk in day-to-day operations. The needs of the best infrastructure networks provide communications and allow intelligent connectivity through artificial intelligence (AI), cloud, big data, Internet of Things (IoT) and other platforms. These digital technologies have enabled facial recognition, allowing the hotel industry to transform its check-in and payment process digitally and securely (Lau 2020). It led a variety of companies to implement “contactless” solutions. Whether big or small, shopping centres are anticipated to use robotics to ensure social distancing and reduce workers who have to come to work physically. Work-From-Home (WFH) has increased the usage of virtual meetings, video conferencing and online platforms, which drive the gig economy. The pandemic looks like a catalyst that pushes the industry to be more technologically advanced. People and organisations have had to adapt to new ways of work and life (Deniz 2021; Lau 2020).

Today, customers no longer expect businesses to respond to their expressed demands but implicitly expect companies to anticipate and meet their future needs before they realise them. This digital-way approach is the most reliable catalyst for consumer satisfaction and competitive advantage in this digital era (Leipzig et al. 2017). IT competencies are essential to accelerate SME owners’ efforts and their employees to leverage technology and remain relevant in today’s knowledge-based economy (Hashim 2007). There is substantial evidence from multiple reports (Deloitte. 2017; SME Corp Malaysia 2018; World Bank 2018), studies and surveys that show that technology savvy enterprises are much more likely to grow than SMEs which utilise less technology. In June 2018, Huawei Technologies and SME Corporation Malaysia conducted a study of 2,033 SMEs covering services, manufacturing, construction, and agriculture to explore the level of ICT adoption and understand the drivers and barriers of digital transformation of SMEs in Malaysia. The results show the computerisation trap that Malaysian SMEs have faced and that there are several approaches to help SMEs adopt digital technology and leverage the technology to empower their business with the support of private and Government agencies (SME Corp Malaysia 2018). The survey discovered that to ensure accelerated adoption and usage of the digital environment, three areas need to be prioritised:

- Having access to digital technology tools (including affordability and experience)
- Having competency or literacy and know-how to use the technology; and
- Being able to participate in or test-drive the digital applications and create the necessary digital environment with available technology.

Table 7 Comparison of relevant DX framework for business

Conceptual framework	What to transform	How to transform
Six Keys to Success	Business Model	By linking technology trends to market needs
Digitisation Piano	Business Model, Organisational structure, Human Resources, International processes, IT capabilities, Products/Services and stakeholders	The process of digitalisation should lead to organisational change and the development of digital business agility
Digital Orchestra	Go-To-Market, Customers, Partners, Workforces, Process, IT capabilities, Incentive, Culture	Organisation leadership and value creation
Digital Re-invention	New Expertise, New Focus, New Ways of Work	Bottom-up re-invention of strategy
Digital Innovation Strategy	Product, Environment and Organisation	Focused exclusively on products/services
Digital Transformation Framework by Corver & Elkhuizen	Customer, Product, Organisation, Process, System	Understanding of customers before moving to other areas
Combination of DOI & TOE (Chen and Chen 2017; Hoti 2015; Hussain et al. 2015)	Use of digital technology to improve customer experience, operational excellence & business model innovation	Individual aspects strengthen by comprehensive business perimeters (Technological aspects, Organisational aspects & Environmental aspects)

In his journal titled “Review and Comparison of Conceptual Frameworks on Digital Business Transformation”, Fortune facilitated comparisons between different frameworks in the following table. It is worth noting that an overwhelming number of conceptual frameworks on digitalisation root in industry and academia (Nwaiwu 2018) (Table 7).

- P2: Under normal circumstances, organisational factors are expected to have a greater influence compared to environmental factors in SMEs’ digital transformation.
- P3: Due to Covid-19, environmental factors may have a greater influence in accelerating digital transformation in SMEs.

11 Conclusion and Future Research Directions

A large number of existing studies in the broader literature have examined digital transformation. The major gap in these studies is that they made fewer attempts to dive deeper into multiple digital technologies that drive DX. Most researchers

focused on a single technology and did not cover the recent global changes due to the unprecedented COVID-19 pandemic situation. This unprecedented crisis required new research on SMEs' digital technology competencies with different challenges, skills, capacities, and behaviours to embrace new technologies. Previous studies were less focused on strategy and motivation factors. To develop the field of DX, it is imperative that future research consider the analysis of emerging and new technology trends and megatrends which include more sophisticated applications or advanced enterprise solutions relevant to SMEs.

New stimulus packages by government and industry and different levels of competition and collaboration have been seen in the market. It is crucial to analyse these changes for SMEs, not just from an academic perspective but also from a managerial perspective, to unlock their potentials in addressing the current difficult economic situation. While there are many researchers who are able to describe DX, nonetheless, it is not yet well-theorised. A serious drawback of all the models is that they are not linked to SMEs' different segment behaviours and business priorities based on the different nature of business and challenges. A considerable body of literature on the environmental contexts explains the environments that influence the internal and external factors that affect digital technology adoption among SMEs.

Further, the TOE Framework lacks the depth required to understand individual characteristics because SME segments are shaped and transformed by DX, especially for personal acceptance of new technology. Hence, TOE as theoretical frameworks may require further extensions and modifications to make the structure more robust for DX's study. Meanwhile, when the increase of relative advantage, compatibility, trialability, and observability of the latest technology, improves the acceptance rate of the new technology for DOI. Among these innovation attributes, observability and trialability are not commonly applied in IT adoption studies. Therefore, improving the models will integrate and extend the TOE model, DOI and RBV as described in the conceptual framework. The understanding can help accelerate rapid digital technology transformation for Malaysian SMEs, which directly impacts the growth of the nation's digital economy.

The COVID-19 pandemic has produced an unusual situation. The environmental aspect is becoming increasingly important in the adoption of new technologies. Work from home, virtual events, temperature checking, contact tracing, digital vaccination certificates as a license to dine-in or travel, and other changes have been intensified as a result of the COVID-19 outbreaks and lockdowns. This scenario demands further studies into environmental variables since the changes are considerable, affecting both the demand and supply sides, driving business automation powered by technology that SMEs required to deal with challenges and exploit new possibilities.

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