

Advanced Technologies and International Business: A Comprehensive Review of Digital Transformation in Global Operations

Marwa M. Abd Elghany

Associate Professor in Business Information Systems Department
College of Management and Technology
Arab Academy for Science and Technology
marwa.abdelghany@gmail.com, marwam@egypt.aast.edu

Abstract. This study examines the implications of advanced technologies, including big data analytics, blockchain, and the Internet of Things, on international business (IB). Through a comprehensive literature review and interdisciplinary analysis, we explore how these technologies are reshaping global value chains, altering location decisions, and transforming governance structures in multinational enterprises. Our findings reveal that advanced technologies are enabling more distributed and shorter value chains, facilitating real-time decision-making, and enhancing trust in international transactions. However, they also present challenges such as data security risks and potential job displacement. This research contributes to IB theory by proposing a framework for understanding the multifaceted impact of advanced technologies on international business operations and strategy. It also offers practical insights for managers navigating the digital transformation of global business.

Keywords: advanced technologies, international business (IB), management.

1. Introduction

International Business (IB) as an academic field indeed started in the post-war period, and grew most dynamically in the period of international business expansion in the post-war economic growth of the industrialised nations of the West. More than halfway through the 1950s, most of the research done after this first phase of self-consolidation has stuck to the formal economic based reasoning that tries to address a set of important problems only. Such are international trade, foreign direct investments, and, in a way, the very creation, utilization, and, most significantly, the rationale as the MNE as an instrument to international business (Engwall et al., 2018). The vastly different ways that multi-national enterprises (MNEs) should handle crises that arise in the course of their daily business could not be captured by the "traditional dependent variables" of IB research, which are investment, departure, and location. MNEs possess other motives in disengaging or engaging with crises beyond the minimization of risks. Furthermore, MNE activity influences and shapes societal problems rather than being entirely responsible for their creation. These are significant, current occurrences that should be given consideration in the field's study agenda.

That is why the fact that such a field of study as 'Critical Management Studies' (CMS), developed over the last 20 years and which, as noted by Adler et al. (2007), attempts to provide a range of substitutes for mainstream management theory and, therefore, is claimed by many to have changed the practice of management significantly, has not influenced on IB as a phenomenon. However, there appears to have been a visible though progressive increase in the study, theory, and thought that has been steadily been labeled "critical perspectives" in international business.

Computerized advanced technologies, otherwise referred to as advanced technologies are dynamic technologies. Thus, they are impacting on the extent of nearing all sectors with a new way of behavior in the global economy (Alcsacer et al., 2016). Namely, these technologies affecting companies entail building complex arrays, which are their geographically distributed strategic partners, specialized customers and consumers, and international value systems (Kano et al., 2020). Furthermore, it explained that the better access to the modern technologies is linked with the international markets and the increasing concern with the global business prospects (Dillon et al., 2020; Sinkovics et al., 2018). The application of advanced IT solution can help minimize the cost of the transaction, global population distribution and density (Chen, and Kamal, 2016), value chain (Laplume et al., 2016; Hannibal, and Knight, 2018) and facilitate partnership across the border. Rather than the term information and communication technology (ICT) or emerging technology (ET), the term "advanced technology" is used (Fotaki et al., 2020; Hannibal and Knight, 2018). It refers to a number of digital technologies that are becoming more and more prevalent, used by worldwide businesses for diverse value-creating and -capturing objectives.

The majority of international business (IB) research to date concentrated on the internet's role in the internationalization of firms. Examples embrace research on e-commerce cross-border as in Yamin and Sinkovics (2006) and Ahi et al. (2022), and, the impact of digital platforms on IB activities as in Brouthers et al. (2016), and Li et al. (2019), and the use of ICT to link offshore service providers from unfavourable institutional contexts to global value chains. A small number of IB studies have looked at more particular elements of cutting-edge technologies. These studies do not, however, include all of the technologies falling under this category.

For instance, Laplume et al. (2016) and Hannibal and Knight (2018) restrict their attention to the impact of 3D printing on international value chains. The innovative review by Strange and Zuchella (2017) excludes technologies like blockchain, and cloud computing, despite the fact that these have significant consequences for international business actors involved in global value chains for the reason that they have the ability to expand and change the ties between supply chain participants (Ghadge et al., 2020). In consideration of this, and despite the high significance of earlier studies and conceptual works, IB research requires more information about cutting-edge technologies and how they are changing global value chains. The researcher offers a more comprehensive perspective of how various

new technologies might promote IB thinking and research.

In order to achieve this, how these technologies have been applied in the literature on international business is examined and particular attention to pertinent studies is paid that have given greater consideration to cutting-edge technology in the fields of IB through the following detailed outline for the research gap, research questions, and the objectives of the study

Research Gap:

While advanced technologies including AI, blockchain, and IoT are increasingly being applied in international business, there is a lack of sufficient grand theories that would sufficiently capture the means, manner and extent of change in global trade. Present literature varies in the extent to which 'hard' empirical evidence ties these technologies to enhanced competitiveness and strategic innovation. Moreover, there has been application for organizations of different scales and sectors that has not been well addressed.

Research Questions:

1. In what way do the advanced technologies such as AI, blockchain and IoT impact the international business environment?
2. How exactly do these technologies affect the competitiveness of the multinational corporations?
3. How does these enhancements influence on the strategic management processes of international business and trades?
4. What threats and opportunities exist in the technological adoption for the emerging economies?
5. How can firms harness these technologies for the purpose of sustainable growth in the international markets?

In an effort to meet the aforementioned research questions the following research objectives have been developed to guide the study for enriching the knowledge of the relationship between the advanced technologies and the future of the international business:

1. To derive the changes that implement AI, blockchain, and IoT on the business interfaces and processes at the international perspective.
2. To assess the impact of these technologies in improving the competitiveness of multinational enterprises; and in enhancing the strategic positioning of multinational enterprises.
3. To explore the decision-making processes with respect to the potential changes that technological innovations bring about in global commerce.
4. To examine the challenges and opportunities related to adoption of business in the emerging markets.
5. To evaluate the implications of the advanced technologies adoption in international business.

It is therefore significant to study the advanced technologies and their effects on international business as the findings are both theoretically and practically relevant profoundly affecting the worldwide trade and commerce. Here is a detailed exploration of these aspects:

Theoretical Significance

1. Conceptual Development:

The study adds to the conceptual models that examine how new technologies fit into and disrupt existing organisational archetypes. It provides an understanding of how business and buying and selling has changed over time on an international level.

2. Innovation Diffusion:

The study increases the knowledge of innovation dissemination based on the examination of the technologies such as AI, blockchain or IoT in different markets with divergent cultures and regulation systems.

3. Economic Theories:

It extends the conventional models based on the principles of competitive advantage, market form, and supply chain by considering impacts of the advanced technologies.

4. Strategic Management:

The findings provide insight to strategic management theories demonstrating that firms are indeed able to use technology as a source of competitive advantage and mobility into new markets.

Practical Significance

1. Operational Efficiency:

The study shows how different technologies such as AI and IoT can facilitate supply chains, cut costs and improve key business decisions in the context of the international business environment.

2. Market Expansion:

It gives information on how businesses leverage on advanced technologies to gain access to new markets, new ventures through mitigating some of the barriers that include geographical gaps, and regulations.

3. Risk Management:

The study establishes how implementation of Blockchain will promote the increase of transparency and security while conducting international business so as to reduce risks involved in fraud and data leakage.

4. Consumer Interaction:

The study explores how IoT and AI enhance consumer experiences and subsequently help create better marketing pitches to consumers globally enhancing the satisfaction of consumers.

5. Regulatory Implications:

It covers the existing possibilities associated with the implementation of these technologies along with the information on compliance and ethical pitfalls.

The rest of the paper is organised as follows. The research methodology is exemplified in the next section then the utility of advanced technologies in IB is covered in the part after, and a comprehensive review of the applicability of cutting-edge technology in key global value chain constituents is provided. The causes and effects of the use advanced technology by international corporations are illustrated and then the implications of the presented review for upcoming IB research are investigated before concluding the paper.

2. Research Methodology

This research uses a systematic review approach to examine the effects of advanced technology in international business. This approach was followed due to its step-by-step method and ability to provide a synthesis of the literature base in a coherent manner from which the focus of the research can be determined (Tranfield et al., 2003).

Inclusion and Exclusion Criteria

To ensure the relevance and quality of the studies included in the review, specific criteria were established:

Inclusion Criteria:

Journal articles specifically peer reviewed works that were published between 2010 to 2023 to consider the recent innovation in technology.

Publications that are directed at technologies such as Artificial Intelligence Technology, blockchain Technology and big data.

Studies exploring the effects on the international business practices such as supply chain, marketing, and cross-border operations.

English sources only in order to be consistent with the analysis done.

Exclusion Criteria:

Newspapers and magazines, journals that do not go through the peer review process such as, letters of the editor, etc.

Researches that cover only domestic business environments that are not related to the international processes.

Literature review only on technologies which are no more effective and is less relevant to the current

international business scenario.

Synthesis and Analysis:

Therefore, the selected papers' information was analyzed using the thematic analysis method. Categorised themes given in this study have raised key implications of the facet of technology on international business. This involved:

1. Data Extraction: Only the Key findings, Methodologies, and Theoretical frameworks of the various studies were analyzed.

2. Thematic Coding: The data collected were analyzed and categorized in thematic content areas including operation efficiency, new market, and regulatory concern.

3. Comparative Analysis: The similarities, differences, and themes were defined across studies.

The systematic review methodology, while rigorous, has limitations:

Publication Bias: The emphasis on peer-reviewed literature may limit the study to ignore extra information that can be gained from industry reports or other materials that are not scholarly (Rothstein et al., 2005).

Language Bias: Restricting the kind of studies to those in English reduces the chance of coming across cross referenced if any published in other languages (Egger et al., 1997).

Time Constraint: The selected period up to 2023 can be lagged behind the post year innovations or the trends that emerged after this year.

3. Use of Modern ICT Technologies in International Business

IB studies must continue to expand beyond traditional subjects like foreign direct investment (FDI) or the multi-national enterprise (MNE), according to a persistent need. Review articles in important (IB) journals make the argument that the field's work needs to expand and suggest a number of innovative areas for future investigation. These suggestions range from emphasising security concerns and terrorism risks in Henisz et al. (2010) and Griffith et al. (2008) to researching the function of information and communication technology (ICT) and the effects of new technology advancements and on internationalising processes in Engwall et al. (2018) and Aharoni and Brock (2010).

An introduction of nine cutting-edge technologies is presented in this section, including big data analytics, 3D printing, robots, the Internet of Things (IoT), blockchain, cloud computing, simulation, and virtual reality. Industry 4.0 is said by many academics and commentators to have begun with the integration of these technologies (e.g., Rüßmann et al., 2015; Liboni et al., 2019; Strange and Zucchella, 2017; Sony and Naik, 2020). According to He et al. (2020), the framework of this new technology is dependent upon cyber-physical systems that are linked via wireless, standards, and internet-based protocols. Advanced analytics, big data, human-machine interaction, digital-to-physical transfer, and machine-to-machine communication are the essential elements of Industry 4.0 (Brun et al., 2019). The virtual reality, and Internet of Things (IoT) technologies have a high hardware component share and extensive network connectivity. The fundamental idea behind the Internet of Things is that things may be able to sense, recognise, network, and process for connecting with other devices and communicate with them over the internet in order to accomplish a goal (Whitmore et al., 2015). For instance, the technology enables physical components of a supply chain to be digitally linked in order to exchange data and communicate with one another (Birkel and Hartmann, 2019; Ben-Daya et al., 2019). The technology gives businesses a competitive edge since it delivers greater product utilisation, reliability, and capabilities than traditional product boundaries (Porter and Heppelmann, 2014). Virtual reality describes a group of technologies that overlay digital information and visuals on the real world (Porter and Heppelmann, 2017). These connected technologies may alter how businesses interact with customers, develop their workforces, and oversee their global value chains (Porter and Heppelmann, 2017).

Cloud computing, cybersecurity, and blockchain are examples of technologies with low hardware component shares but extensive network connectivity. According to Venters and Whitley (2012),

"Cloud computing is a form of shared-resource computing that is outsourced and involves pooling processing in big external data centres that are accessible via the Internet to a range of users." The allure of the cloud for big businesses is that they can control the costs of the data centres more, while for small businesses, it reduces the obstacles to computing entry, and makes it easier to access big data centres (Venters and Whitley, 2012). The following concept, cybersecurity, describes a collection of technologies that assist businesses in minimising cyber risks, such as cyberattacks, and data breaches, hence lower value chain susceptibility (Ghadge et al., 2020). One of the utmost innovative technologies recently, blockchain, is last in the list. It also goes by the name "distributed ledger technology" and describes a list of chronologically ordered chunks of digital ledger data that is encrypted (Laplume, 2018). Similar to a spreadsheet or database, a ledger enables any network user to verify or keep track of transactions (Zheng et al., 2020). Blockchain can increase the automation and transparency of payments and intellectual property ownership while lowering transaction costs for businesses (Felin and Lakhani, 2018).

Technology is crucial for managing global value chains because today's worldwide business is characterised by intangible data flows, as opposed to the previous century's emphasis on flows of physical commodities and money (Luo, 2021; Nambisan et al., 2019). Businesses need to rely on big data analytics capabilities to extract value from such a large amount of data and to more effectively align relationships within and between organisations. The process of creating a system model describing and analysing its behaviours is known as simulation (Scheidegger et al., 2018). Through the use of simulation technologies, it is possible to observe the behaviour of complex processes in a digital setting without having to conduct often-expensive experiments on a physical replica or the real system (Scheidegger et al., 2018). It is employed, among other things, as the main technique for resolving issues in complicated manufacturing systems (Ferreira et al., 2020).

Advanced technologies like 3D printing and robotics that have a large proportion of hardware components but little connection (Culot et al., 2020). The additive process of 3D printing, also known as "additive manufacturing," involves adding layers of material one at a time to create 3D objects (Laplume et al., 2016). Products can be created at any location using a 3D printer with an initial design that is based on a digital model, hence suppliers, customers, and service providers in the 3D printing sector can be spread out geographically (Laplume et al., 2016; Bouncken and Barwinski, 2020). Last but not least, there are highly automated, adaptable robots that use machine learning and sensor technology to do an increasing range of activities (De Backer et al., 2018). The new varieties of robots are more independent, adaptable, and cooperative than the older forms and are able to handle relatively difficult tasks while collaborating with one another and human operators (De Pace et al., 2020). Modern robots may significantly raise production overall and improve the quality of parts and products (De Backer et al., 2018).

4. Key Insights on IB Research

The articles from IB research are subjected to a theme-based analysis in this section. The main technology investigated before classifying the publications is initially determined. Then the relevant studies after describing the articles' primary themes are cited, and a synopsis of the most important results is discovered.

Even research that expressly discusses some of the most cutting-edge technologies tends to take a more general approach rather than focusing on how a particular technology may affect global trade (Banalieva and Dhanaraj, 2019). Although technologies like 3D printing have gotten increasing attention, big data analytics has less coverage compared to other disciplines.

According to IB researchers, 3D printing has the ability to both shorten global value chains and move the location of production activities (Laplume et al., 2016; Hannibal and Knight, 2018). Steenkamp (2020) makes an effort to explain how the Internet of Things might be used in international marketing. He demonstrated that technology encounters significant consequences for a company's

brand management in foreign markets. Other IB experts investigate the impact of the fourth Industry revolution on backshoring projects, which move the activities of manufacturing back to the place of origin, rather than concentrating on a single technology (Dachs et al., 2019). IB researchers use theories to explain their findings, including the resource-based view, the knowledge-based view, the transaction cost analysis, and the internalisation theory. These theories are logically more suited to the context of global value chains and cross-border corporate operations. For instance, theories like internalisation and transaction cost analysis are more pertinent to describe how advanced technologies are influencing the global value chains' management because they cover topics like controlling or monitoring a partner firm and explain interfirm and intrafirm collaboration and trade.

Some technologies, such simulation, robotics, and virtual reality, are covered in generic Industry 4.0 articles. The majority of research was released recently, emphasising the rapid and recent surge in interest in sophisticated technology from a temporal perspective. Since 2016, there has been a noteworthy rise in publications in the international business field, which highlights the growing importance of these technologies for managing businesses and their global commercial operations. These technologies are becoming more important for managing enterprises and their global business operations.

IB academics have long researched the factors that influence the places that multinational corporations choose for their operations (Dunning, 1980; Rugman and Verbeke, 2004). In order to exploit the value established in global value chains, these businesses look for the utmost favourable geographic configuration of the value chain. To do this, they analyse where activities must be situated and how they must be distributed (Kano et al., 2020). IB scholars have long maintained that businesses select a site to improve productivity and simultaneously cut expenses associated with transportation (Alcacer et al., 2016). The availability of labour, natural resources, and favourable government policies were further benefits that were mentioned (Dunning, 1980). Recent IB studies (Alcacer et al., 2016; Kano et al., 2020) have emphasised the importance of industrial clusters, connectivity, and large cities in selecting a favourable location.

But cutting-edge technologies can also influence living's location. An illustration is modern robotics. Robots are now capable of doing difficult jobs more effectively than ever before because to advancements in their mobility and versatility (Liboni et al., 2019; De Backer et al., 2018). They can now offer the flexibility required to produce customised items at affordable costs thanks to their capacity to interact with one another and operate with people (Rüßmann et al., 2015; Ancarani et al., 2019). The previous characteristics have impacted the economics of where to locate manufacturing activity, in addition to the rising labour costs in emerging markets (De Backer et al., 2018; Strange and Zucchella, 2017). Businesses in developed economies may select to manufacture in-home as a feasible substitute to locating these activities distant from home (Dachs et al., 2019). As a result, several businesses have moved their manufacturing back to their home nation (Dachs et al., 2019). Such backshoring activities lead to lower costs, better quality control, and more responsive customers (Ancarani et al., 2019).

Emerging technologies such as artificial intelligence, and robotics have played a major role in reshoring and nearshoring trends in supply chain management system. A survey provided by the Boston Consulting Group study in 2023 revealed that thirty percent of the companies that had adopted these technologies had been forced to think about sourcing nearer their markets. This change has been attributed to the need to improve supply chain robustness and increase supply lead times with fifty five percent of the firms noting improved production responsiveness as the most important gain (Boston Consulting Group, 2023).

Quantitative data further illustrated this trend that the companies, which applied the advanced technologies experienced a decrease in transportation expenses to the extent of seventy percent and stated about better inventory control with sixty-five percent (Gartner, 2023). These benefits explain why reshoring and nearshoring are growing more popular because firms want to reduce costs, and also to become more flexible.

Additionally, according to Laplume et al. (2016), 3D printing technology possesses the capacity to alter the global value chains' density and its geographic scope. Because all businesses need to design things is a 3D printer, a computer, and the appropriate software, this technology allows businesses to do so from anywhere in the globe. As a result, manufacturing can be done domestically and closer to consumers (Hannibal and Knight, 2018). With reduced international flows of intermediate goods and services and reduced delivery times and transportation costs, the technology's capacity to streamline supply chains may reduce the amount of intermediary goods and services that are transferred internationally (Strange and Zucchella, 2017). Along with neighbourhood and online print shops, as technology spreads, households can as well participate in the activities of manufacturing (Laplume et al., 2016). Therefore, the development of value chains that are more dispersed, and shorter is linked to 3D printing technology (Laplume et al., 2016). Furthermore, the technology expands the economy of scope (i.e., produces a wider range of goods for a given amount of capital), whereas lowering transportation expenses and reducing the carbon footprint of manufacturing processes (Garmulewicz et al., 2018).

An institutional setting that supports economic activity is a governance framework (Williamson, 1979). Multinational corporations aim to efficiently organise their global value chain activities by selecting a certain governance structure. They accomplish this by externalising or internalising actions (Buckley and Strange, 2011; Banalieva and Dhanaraj, 2019). This decision is typically impacted by technological improvements since they make it easier to coordinate cross-border economic operations and gain access to global talent pools (Kano, 2018).

Multinational companies, however, confront a variety of difficulties in managing their worldwide value chains, some of which can be specially addressed by modern technologies. In the lack of perfect trust, monitoring and regulating international partner companies is a huge difficulty (MacDuffie, 2011).

The amount of information shared and processed by international partners can be improved using blockchain technology (Nambisan et al., 2019). Companies can preserve and exchange records of previous behaviour thanks to the technology's creation of an unalterable decentralised public ledger (Cuypers et al., 2021). As a result, it reduces the need for internal control of activities, which lowers transaction costs and increases market efficiency (Catalini and Gans, 2016).

Communication between various value chain participants (such as suppliers, assemblers, service providers, customers, and lead firms) can be difficult when managing global value chain networks. By enhancing supply chain decision-making processes, IoT can help with governance (Strozzi et al., 2017; Zheng et al., 2020). Due to its capacity to deliver real-time information on all phases of the supply chain, from locating raw materials to distributing finished goods, and to afterwards send early alert signals for necessary action, this improvement is made feasible (Ben-Daya et al., 2019). The main company's internal communication and contacts with international partners are improved by this better-informed decision-making process. As a result, businesses can react quickly to alterations to value chain activities (Ben-Daya et al., 2019). Additionally, as the IoT offers trustworthy information about product performance and consumption, it enables manufacturing companies to connect with customers more explicitly and expand their service offerings (Rymaszewska et al., 2017). For example, the multinational company, Siemens AG has successfully incorporated the IoT devices in its supply chain system. Through smart hubs, Siemens has been able to integrate, optimise and transform its manufacturing premises with IoT for real-time monitoring, predictive maintenance and proficiency. It also allowed the company to gather and analyze a significant amount of data regarding machines and logistics which can be now used for making better decisions. Through the implementation of IoT solutions, Siemens has experienced an overall of ten percent decrease in operating expenses as well as twenty percent jump in supply chain effectiveness (Siemens, 2022).

Another important element in the Siemens' IoT approach is the application of digital twins in manufacturing smart environments. This not only helps in the formulation of the best production schedules, but also in the capability to predict the possibility of disruptions. Consequently, the company

has been able to reduce incidences of downtime and enhance its competitive readiness to changes in the market hence enhancing its competitiveness across the globe (Smith, and Jones, 2023).

Moreover, payments between suppliers and purchasers can be facilitated by combining blockchain and the IoT. For instance, the IoT can provide tracking devices that are linked to blockchain at a buyer's warehouse. When the cargo is delivered to the customer, they may verify that it satisfies all of their requirements (such as the cargo's quality and quantity), and then utilise the blockchain's smart contract twelve characteristics to instantly disburse the funds to the provider (Pournader et al., 2020).

Big data analytics can additionally influence how a company is governed. The IoT and big data analytics work together to capture, store, analyse, and share data in real-time, increasing supply chain transparency and enabling quicker, more informed decisions (Aryal et al., 2018). In order to reduce risks and potential disruptions, global value chains must be evaluated and, if required, reshaped as a result of the quick and increased access to pertinent data (Sheng et al., 2021). According to Wang et al. (2016), the forecasting of product demand, factory capacities, transportation costs, and fixed operations expenses at each possible location can all be aided by big data analytics. Moreover, it can enhance the partner selection process by using advanced techniques to analyse the partner's capacity for performing specific core tasks, for instance, multi-criteria decision-making approaches or data mining (Wang et al., 2016; Kano, 2018; Chai and Ngai, 2020).

Another tool to lessen market uncertainty and regulate costs is a carefully structured contract (Cuypers et al., 2021). The availability of vast contract data paired with analytics technology, especially machine learning for data analysis, has made it possible to partially or even completely automate the development, evaluation, and analysis of contracts (Mills, 2016; Betts and Jaep, 2017; Cuypers et al., 2021). Automation shall make market-based transactions less expensive and contract enforcement much more effective. Consequently, businesses may decide to enhance their outsourcing activities (Cuypers et al., 2021). Big data analytics could, however, have a significant impact on adopting processes. The use of technology improves and expands the number of activities and decision-making that are automated in businesses (Jarrahi, 2018; Schneider and Leyer, 2019). As a result, it reduces the necessity for, and expense associated with, monitoring and assessing personnel, as well as the possibility that they may engage in opportunistic conduct (Cuypers et al., 2021).

To sum up, business communication technologies such as video conferencing, and instant messaging platforms have influenced the conduct of international business. These tools have greatly minimized the importance of physical traveling since people are now able to conduct real time cross-border communication and work. For instance, applications such as Zoom and Microsoft Teams which enable virtual meetings enable firms to sustain good working relationships with their clients and partners across the global market (Smith, 2022). This has led to improvement in operation productivity and overall expenses on business travels. Technologies in e-commerce have helped the business world goes global and reach the international markets. With Shopify or Alibaba, organisations can sell their products and services across the globe irrespective of the lack of outlets (Johnson, 2023). It has led to equal distribution of the international business since SMEs have a chance to stand against their bigger counterparts. Also, the use of digital payment systems has made transactions to be faster thereby eliminating instances of delays, thus making the customers to be more satisfied.

It can also be noted that, the use of supply chain management technologies, especially the blockchain and IoT has enhanced logistics and inventory management. Blockchain increases the provision of transparency and traceability thereby minimizing fraud and errors in the international transactions (Williams, 2023). Real time tracking of goods is made possible through IoT devices thereby enhancing inventory and the rate of losses. These technologies have increased supply chain robustness which is essential in sustaining Competitive advantage within global markets. Digital tools such as data analytics and artificial intelligence have revolutionalised how global managers make decisions. According to Brown (2023), big data can be used in order to increase understanding of market trends, customer needs, and environments of competition. The technology in Artificial intelligence analysis

assists in the generation of predictive strategies in demand for products and adaptation of pricing mechanisms. This has boosted strategic management and gain improved returns in the versatile international operations. The following table summarises the above.

Table 1: IB Aspect Affected in accordance to Technology Type; Source: The Researcher

Technology Type	IB Aspect Affected	Key Benefits
Communication	Collaboration & Efficiency	Real-time interaction, and reduced travel costs
E-commerce	Market Access	Global reach, and simplified transactions
Supply Chain Management	Logistics & Inventory	Transparency, and less errors
Data Analytics and Artificial Intelligence	Decision-Making	Market insights, and predictive analytics

The following presents empirical evidence and case studies available in the literature on the above table.

Jabbour et al. (2018) showed that analytics facilitated via the use of AI helped firms to improve supply chain management by making demand forecasts and cutting lots of holding expenses. For instance, IBM used artificial intelligence to enhance the movement of its products then IBM remarks that its annual savings have been pegged at twenty percent after the AI adoption in the enhancement of its logistical network (IBM, 2020).

Alibaba is a good example of how a firm has moved from China and utilized e-commerce, digital payment platforms to penetrate in the new markets of Southeast Asia (Chen et al., 2020). The digital infrastructure created by these advanced technologies made it possible for Alibaba to extend localized services, which improved customers' satisfaction.

IoT can be integrated into company's products to offer better customer experience and to generate additional streams of earnings. A related example can be seen in General Electric where the company implemented the Industrial Internet of Things in its industrial machineries leading to predictive maintenance services as a competitive edge (GE, 2018).

However, with the use of the advanced technologies there are some issues which include; cyber security threats and ethical dilemmas. According to the World Economic Forum (2021), the adoption of new technologies has led to increased cases of cybersecurity threats. This has a notable implication to the issue of security when implementing technological advancement in the companies. Therefore, the previous case evidences suggest how the usage of advanced technologies spur operational improvements, market access and competitive advantages in the international business. Nevertheless, there are obstacles that business entities have to overcome in order to harness these technologies to the full.

5. Merge of Advanced Technologies and International Business

For businesses that control their value chains' organisational structure via digital platform networks, advanced technologies have significant ramifications. In order to support commercial transactions, these platforms are digital systems that promote engagement, communication, and innovation (Constantinides et al., 2018; Cennamo, 2019; Chen et al., 2021). They establish market globally with participants like Online payment service providers, sellers, logistical service providers, and the platform owner (or the orchestrating firm) (Li et al., 2019). Examples of these platforms embrace Apple's iOS, Google's Android, eBay, and Amazon's marketplace.

Cloud computing services can provide ecosystem-specific benefits for the platform owner in the digital market (Li et al., 2019). The corporate agility required to provide instantaneous real-time, digital, and experience-oriented services is improved by cloud services (Luo, 2021). Businesses can access a

seamless package of storage and business software through cloud computing, saving money on establishing information technology (IT) infrastructure (Lund et al., 2019). For instance, Amazon uses cloud services to provide IT capabilities for its online third-party merchants (Li et al., 2019). Additionally, businesses are capable of employing cloud-based services to manage global connections and resources, generate value-add for foreign clients, and deliver it to them (Luo, 2021).

For instance, Amazon improves customer experience by using cloud-based voice services (Li et al., 2019). Blockchain technology possesses ramifications for the governance of digital platforms as well. Instead of a fully centralised infrastructure run by a single entity, platform owners can employ blockchain to construct a semi-decentralized governance system that can balance openness with control (Chen et al., 2021) (e.g., a bank).

Intangible activities that help a company generate, assimilate, and utilise knowledge while gaining access to the specialist knowledge of its international partners are what provide the company with the most value in global marketplaces (Mudambi, 2007; Mudambi, 2008). Internalizing this complicated and tacit knowledge is the key to a multinational modern firm's competitive advantage globally (Tallman, and Chacar, 2011; Banalieva and Dhanaraj, 2019). The difficulty for leading firms is to spread such expertise among geographically separated units by preserving, facilitating, and controlling information and communication flows (Kano, 2018; Banalieva and Dhanaraj, 2019). Several cutting-edge technologies are able to make the process easier.

Cloud services help improve sharing and transferring of knowledge. For instance, private cloud systems can take the form of virtual desktops that allow employees who are spread out geographically to easily access business client analytics (Luo and Bu, 2016). Cloud-based blueprints have the ability to recognise, save, and code pertinent information, which can be quickly recovered by search functions for the transmission of explicit knowledge (Luo and Bu, 2016). Thus, the ability to develop a platform of services for coordinating activities in the regional value chain can be made possible by cloud technology. The IoT also makes it possible to monitor and manage assets by delivering information about equipment, cargo, and delivery trucks. IoT applications include, for instance, tracking shipments from one place to another (Lund et al., 2019). Businesses can then store and retrieve these data using cloud technology, and using analytics tools, they can convert the data into useful knowledge concerning the state of their supply chains. A richer, more contextualised sharing of knowledge is also made possible by sophisticated technologies. For instance, augmented reality can be helpful for comprehending and using a particular digital technology in the transmission of knowledge within and across firms.

Additionally, and more broadly, employing cutting-edge technologies necessitates possessing cutting-edge skills like programming that are frequently resistant to digitalization and can be only shared via socialised communities (Banalieva and Dhanaraj, 2019). People with certain skills such as those who are educated 3D printing, for instance, view themselves as belonging to a unique community (Bouncken and Barwinski, 2020). Even if they work for different companies or are located abroad, they may form a deep connection to the technology and impart to peers their knowledge, excitement, and values (Anthony et al., 2016; Bouncken and Barwinski, 2020). This results in a single digital identity that enables open risky exchanges of tacit and explicit knowledge between businesses (Bouncken and Barwinski, 2020).

In order to transfer knowledge and skills to foreign subsidiaries, human capital has been a crucial element (Banalieva and Dhanaraj, 2019). Multinational corporations must train their worldwide staff in order to maximise their human resources. These businesses may train staff members all over the world by combining augmented reality and virtual reality. For instance, holograms of product prototypes allow geographically separated professionals to cooperate in real-time. This is made possible through augmented reality and virtual reality (Porter and Heppelmann, 2017). Virtual reality can also assist businesses in enhancing staff cross-cultural training. For instance, businesses can utilise virtual reality to put workers in scenarios where they can virtually see how people from a different culture behave and

communicate, learning how to modify their behaviours in the process. By enabling workers to become aware of various cultural contexts without the requirement for physical presence, this learning can reduce misunderstandings in cross-cultural cooperation (Caligiuri et al., 2020).

Simulators and virtual reality also improve classroom instruction that encompasses experiential learning and intercultural competence (Li et al., 2013; Sit et al., 2017). The importance of these two technologies is highlighted by the pandemic (COVID-19), which has rendered virtual international training and collaboration crucial to global human resource management (Caligiuri et al., 2020). It should however be noted that a key factor surrounding the usage of technology adoption in international business is the need for a reskilled workforce. Recent studies pointed out the fact that since new technologies appear on the market virtually every day, it is crucial to provide employees with consistent training in order to close the existing skills gap and ensure optimal use of new instruments (Martinez, and Zhao, 2022).

Furthermore, experts are recommending that large numbers of workers are likely to be displaced from their jobs because of automation and AI technologies since they can solve complex problems that human beings do in a more efficient manner especially jobs that require routine manual work. Additionally, in the developed economies there tends to be high labour costs, thus there is higher incentive for firms to use automation for the purpose of cutting costs and to remain viable and competitive in the market (Brynjolfsson, and McAfee, 2014). This can result in massive loss of employment to put in place re-orientation training for workers. On the other hand, in emergent economies where labour is relatively cheap and easily available the impact could be less so obvious. Nonetheless, with their usage becoming mainstream on these regions, these nations may as well start experiencing changes in their labor market, which may worsen unemployment and social disparities (Autor, 2015). In addition, culture moderates the use of technology since the behavioural pattern of consumers and business models in a certain country may not be appropriate for a specific technology (Chen et al., 2023). Solving these issues is essential for supporting enterprises to use advanced technologies proficiently and sustain market leadership in the global economy.

The monitoring and evaluation of personnel within businesses is significantly impacted by big data analytics (Tambe et al., 2019). Through the analysis of emails, chats, and employee-generated content, managers can anticipate the success of specific people and teams (Sheng et al., 2021). Additionally, many workers now consider working from home to be the new standard due to the COVID-19 pandemic. Consequently, it has become extremely difficult for businesses to manage staff while encouraging social contact (Sheng et al., 2021). Working in these unfamiliar, uncertain situations has caused high levels of stress in a large number of office workers around the world (Caligiuri et al., 2020). To solve this problem, businesses might utilise "people analytics," which applies analytics methods for personnel management, to gather and analyse information on staff needs, workloads, and other stressors in order to make better educated decisions (Leonardi and Contractor, 2018; Sheng et al., 2021). On the plus side, companies can utilise international freelancing talents, for instance, in fields like big data analytics, and artificial intelligence, especially if the company has shortage of competencies in these fields, by having the option of remote labour (Luo, 2021). This strategy enables businesses to access human resources that are more affordable, quicker, more adaptable than in-house talent (Manyika et al., 2016).

International business and adoption of technology issues create much controversy, especially in terms of rate and effects of technology on the markets. The overriding extant literature can be discussed with regard to the concept of the digitalization and its impact on competitive advantage. Researchers claim that on one hand, technology is used as the source of growth and innovation, on the other hand, unequal distribution of technology between developed and developing countries intensifies the gaps that exist (Wang, and Zhou, 2022). For instance, the fact that industrialized countries embrace new advanced manufacturing technologies results in increase in productive efficiency hence creating a competitive gap that the less developed technologically are hard to overcome (Kumar, and Singh, 2021). Besides, the spread of technology across the countries is said to lead to cultural imperialism and or

dilution of local business cultures. Some scholars argue that global giants fully efforts to technology transfer, in most cases put the financial gains ahead of the local technology needs (Thompson, and Reilly, 2023). A study by Patel and Wang in 2023 distinguished that the impact of the advanced technologies differs due to the infrastructural and regulatory conditions of the regions, which means that people should not be rushed to adopt these technologies in the different markets they operate in. In brief, recent research reveal that adoption of advanced technologies in international business is not just about the black-and-white positive of negative impact of advanced technology but manifests itself in nuanced ways given the context within which it operates. Such debate also puts emphasis on the need for appropriate policies that incorporate the globalization aspect together with the localization processes to allow technology improvement in international business processes.

Literature review on technology adoption in international business has offered multiple approaches but contain some limitations. Most papers review the findings with regards to the adoption rate and the economic gains while overlooking the qualitative issues including cultural and organizational readiness (Smith, and Johnson, 2023). For instance, research often measures the extent of technology implementation but rarely examines how culture aspect affects the implementation process of new advanced technologies (Garciam, and Lee, 2022). Also, the prevailing problem is pursuing success from developed economies which could not fit the framework of developing regions because of differences in the infrastructural and socio-economic environment (Patel, and Kim, 2023). Thus, future research should extend cross-sectional research with cross-cultural research and longitudinal research to portray dynamic aspect of technological adoption in miscellaneous international business settings. This would help get a better insight of forces that will encourage the use of technology around the world.

6. Benefits of Advanced Technologies on International Business

IB research has long emphasised the unique benefits of IT for businesses that are expanding internationally, including lower transaction costs, scalability, speed, and user network economies (Singh and Kundu, 2002; Brouthers et al., 2016; Banalieva and Dhanaraj, 2019). Some of the most important benefits of cutting-edge technologies for global businesses that came out of the researcher's investigation are listed below.

The majority of conventional production techniques are not ecologically friendly since they generate a lot of waste and surplus materials that cannot be used (Strange and Zucchella, 2017). In contrast, waste is generated infrequently or never by technologies like 3D printing, and electronic designs can be maximised to consume a lesser material during manufacture (Strange and Zucchella, 2017). Furthermore, many manufacturing additive techniques may be turned around, converting finished goods into raw materials that can be utilised again (Garmulewicz et al., 2018). Utilizing cutting-edge technologies, businesses can produce goods in areas closer to their final consumers, eliminating the need for long-distance transportation and lowering the carbon footprint of production processes (Garmulewicz et al., 2018). Additionally, the IoT allows for device connectivity, which enables it to deliver accurate information on energy flows. The data can be utilised to develop energy-saving optimisation algorithms by applying analytics (Illa and Padhi, 2018; Zheng et al., 2020). Furthermore, by employing big data analytics to gather sustainability-related data, the orchestrating company in a global value chain can evaluate, forecast, and analyse social, environmental, and economic concerns (Wang et al., 2016). Environmental sustainability is typically favourably correlated with top managerial competencies like knowledge and proficiency with cutting-edge technologies and education that is statistically focused (Akhtar et al., 2018).

Because business actors naturally exhibit opportunistic behaviour, corporations have historically conducted IB in low-trust environments. Partner companies don't always provide all information, give a fair appraisal of possible outcomes, or act cooperatively as a result of these behaviours (Cuypers et al., 2021). As a result, the leading company in a global value chain pays a significant price for tracking overseas partners and creating contracts that reduce interaction risk (Verbeke and Greidanus, 2009). By

providing new trust mechanisms, blockchain technology reduces this low-trust dynamic (Nambisan et al., 2019; Seidel, 2018). Technology now makes it possible to keep track of prior actions in a public digital ledger where they can be searched, which makes it less likely for people to act opportunistically in the future (Cuyppers et al., 2021). Blockchain eliminates the requirement for the time-wasting developing reliability in commercial relationships to gradually build trust (Cuervo-Cazurra et al., 2020). Because through the supply chain, relationships must be built and maintained on trust. Technology addresses a significant issue in managing operations related to the global supply chain (Kwon and Suh, 2005).

Additionally, because blockchain-based contracts provide real-time information, less information asymmetry, and increased assurance, they may help to reduce value chain risks, uncertainty, and transaction costs (Contractor, 2021; Schmidt and Wagner, 2019). Because it can verify identities, blockchain allows supply chain participants to record, authenticate, and trace supply chain transactions, which secures the storage and transmission of signed documents (Mainelli, 2017).

Peer-to-peer validation technology can be used with the technology to help validate information. These characteristics aid companies in choosing international partners with a solid history of inter-firm collaboration. They also have significant consequences for choosing a reliable trade association or joint venture partner in the host market (Brache and Felzensztein, 2019).

To further boost confidence, some other cutting-edge technologies can be used in conjunction with blockchain. The IoT improves auditing and monitoring of operations internally when integrated with blockchain (Nambisan et al., 2019). It permits device-to-device transactions, and blockchain uses cryptography to safeguard these transactions and validates that the sender of the communication is not a third party or malicious software (Pournader et al., 2020). This feature further handles a crucial problem with centralising cloud systems for transaction storage: the vulnerability to disruption from cyberattacks (Pournader et al., 2020). In order to more accurately forecast demand and so lower the risks accompanied with the management global value chains, businesses can utilise big data analytics to incorporate additional data, such as that on the weather, politics, economic cycles, competitor activity, and price levels (Lund et al., 2020). Recently, Martinez and Gomez (2023) pointed out that IoT is becoming more and more a part of international logistics where growth over the past two years was fifty percent. Use of IoT devices in the management of logistics operations has been key in revolutionizing the supply chain management due to real time tracking and occurrence, data analytics and predictive maintenance among others. Such developments have been found to help in effective control of the international distribution networks, increase operational transparency and improve decision-making systems in the global business setting.

With the help of some cutting-edge technologies, manufacturing companies can mass-customize and personalise their product offers, which can increase flexibility and productivity (Fatorachian and Kazemi, 2021; Culot et al., 2020). For instance, robots were employed in manufacturing operations for several decades to carry out repeated tasks that call for strength and fair management (Stadnicka and Antonelli, 2019). However, thanks to technology advancements, factory robots are now more intelligent and secure. Modern robots are capable of mimicking the movement of human being to help out in the production process (Somers and Hollinger, 2016). By developing into sophisticated machines that can carry out challenging jobs throughout the industrial process, these autonomous robots are improving productivity (Stadnicka and Antonelli, 2019).

Analytics techniques in the big data era can significantly boost business performance (Sena et al., 2019). According to Lavallo et al. (2011), the usage of analytics was five times higher in high-performing businesses than in low-performing ones. Additionally, a recent systematic assessment of the literature indicates that using analytics might enhance businesses' supply chain performance (Batistic and van der Laken, 2019). Competencies of individual managers like experience with analytics and familiarity, can improve company success (Akhtar et al., 2018).

In spite of difficulties, augmented reality can increase quality and productivity, as shown by the

results of leading companies using it, such Amazon and General Electric (Porter and Heppelmann, 2017). The time required to build a product can be significantly reduced via augmented reality. For instance, in the shipbuilding sector, technology has made it easier for manufacturers to evaluate ships and identify steel construction elements, which are not included in the finished ships (Porter and Heppelmann, 2017). Training initiatives incorporating augmented reality significantly boost worker productivity compared to those that do not, which tends to boost business performance. Boeing employed the technology to assist students in learning how to assemble aeroplane wings, which resulted in a thirty five percent decrease in time of training and a ninety percent rise in the proportion of inexperienced students performing correctly (Porter and Heppelmann, 2017).

As mentioned in the preceding section, the technology of blockchain increases confidence among supply chain participants because of encryption, which is crucial considering the increased complexity and number of worldwide transactions (Wang et al., 2016). This kind of digital trust not only discourages opportunistic behaviour among value chain partners (Wang et al., 2014), but it also reduces project risks, encourages collaborative decision-making, and enhances the problem-solving skills of all companies participating in a global value chain (Fawcett et al., 2012). These factors contribute to lasting connections, and improved supply chain effectiveness (Nyaga et al., 2010). Johnson and Lee (2022) conducted a detailed analysis of a survey according to which the percentage of large global companies adopting blockchain technology accounts for sixty-five percent as they are keen to make strategic investments in the technology to enhance the reliability of supply chain networks. Therefore, the implementation of the innovative system has helped organizations to improve credibility, transparency, and sustainability of the cross-border transactions to meet the increased need for functional and secure mechanisms of international trade.

According to Smith et al (2023), it was evident that seventy-eight percent of the multinational companies MNC have integrated AI technologies in their activities with the aim of transforming the decision-making mechanisms and enhancing operations. This adoption rate therefore shows a great improvement that was not witnessed in the previous years implying that AI plays a crucial factor that promotes competence and innovation across the globe in business.

AI, blockchain and IoT utilised in the international business environment are leading to significant changes in digital and innovative strategies among the MNCs. While these advanced technologies will remain as a center of gravity for the growth of organizations, they are bound to open new possibilities, manage risks and to optimize efficiency in today's highly connected and competitive global environment.

7. Discussion

The above comprehensive analysis showed how modern technologies have a significant impact on how multinational corporations manage their worldwide value chains. These innovations alter how these businesses select a location, choose specific governance systems, establish digital platform networks, exchange knowledge, and handle their people resources. The cutting-edge technologies can lower transaction costs by digitalizing supply chains by joining systems, actors, and things. This streamlines logistics and transportation and makes it easier to search, monitor, and coordinate transactions (Horvath and Szabo, 2019; Lund et al., 2019). As a result, global value chains are becoming more transparent and dispersed rather than internalising global transactions (Alcacer et al., 2016); in other words, businesses now outsource economic tasks to independent partners more frequently than they did in the past. Advanced technologies, like 3D printing and robotics, automate and digitalize production as well, with ramifications for where value chain activities are located. Additionally, these technologies assist digital platform companies in managing their interactions and transactions with other companies inside the platform network more effectively than in the past. The management of regionally scattered human resources can be made better by the technologies, which can help streamline knowledge exchange within and between firms.

Despite these consequences, the IB literature has only a small amount of study on the use of cutting-edge technologies. For instance, IB research on cybersecurity is in its infancy, despite the fact that risk and security are major issues and are growing more crucial (Pezderka and Sinkovics, 2011; Buckley and Casson, 2021), especially managing global supply chains (Ghadge et al., 2020).

Cybersecurity is crucial for integrating and coordinating businesses' globally distributed operations; it is the main technology improving business intelligence to recognise, control, and reduce the risks associated with adopting new technologies (Luo, 2021). The collective understanding still has a few gaps, though. IB studies, for instance, haven't looked into how cybersecurity technologies may be used to manage connections within and between firms as well as the information flow. Are businesses better equipped to compete in international marketplaces and successfully manage their global value chains if they invest more in this technology? Current research reveals that there is still a menace of cybersecurity since organizations are now heavily depending on the digital structures in their operations; hence, are at risk of experiencing data theft and cyber assault (Smith, and Jones, 2022). However, differences in regulatory environments across the countries present a hurdle to the implementation of technologies since legal structures differ across the countries to implement (Brown, 2023). Coupling of new technologies with already implemented other systems is another problem bringing big challenges in time and resources for compatibility and integration in functionality (Davis and Lee, 2023).

The IB literature hasn't given much attention to simulation. The diverse uses of operations research, for instance, have been highlighted by academics in fields like transportation, energy, healthcare, education, and agri-food (Utomo et al., 2018; Taylor, 2019). In order to create models that optimise decision-making and production system operations as well as boost supply chain resilience, simulation is the important technology (Ferreira et al., 2020; Carvalho et al., 2012). The use of technology may provide multinational corporations an advantage over their controlling subsidiaries, which is crucial because the headquarters must make sure that its international companies share its strategic goals (Kostova et al., 2016). Long-term forecasting and risk management can be facilitated by simulation technology, which can aid the headquarters in controlling its branches more successfully (Stendahl et al., 2021).

Many modern technologies could be helpful. For instance, big data analytics can assist businesses in improving decision-making and strategy (Guenther et al., 2017). Historically, businesses relied on market research to understanding the needs of their customers and getting feedback on their products (Qi et al., 2016). Nevertheless, businesses can use analytics techniques to investigate vast amounts of unstructured data from customer reviews posted online in order to enhance and enrich the quality of their services and, consequently, their competitiveness (Korfiatis et al., 2019). Similar to this, by using these methodologies, businesses can develop creative business models for producing both social and economic value using data from many actors in their global value chain (Guenther et al., 2017). Analytics using big data has the ability to improve management decision-making by bringing logic, facts, and proof to intuition and discursive reasoning (Mortenson et al., 2015). For example, the world's leading retail store, Walmart, applies big data in supply chain management where it determines demand patterns and the right inventory stock level to order (Chen et al., 2021). This predictive capability helps Walmart to minimize on its costs as well as increase customer satisfactions through right stocking. Also, with the help of big data, giant companies such as Amazon make use of the buying trends and preferences to enhance and change the buying experience and advance sales and customer satisfaction (Davenport, and Dyché, 2013).

Additionally, supply chains may be optimised, the IoT can provide real-time data for decision-making in the areas of supply and demand matching, demand forecasting, transportation planning, and last-minute delivery (Sheng et al., 2021). Finally, as was already said, simulation technology can assist managers in making more educated choices regarding their global value chain activities.

Although digitalization can change how corporations manage their assets (such as technology and people), it may cause businesses to substitute technology for human capital, which can exacerbate

unemployment and income inequality (Banalieva and Dhanaraj, 2019). For instance, as consumers shift to online buying, brick-and-mortar stores are rapidly closing their physical locations (Banalieva and Dhanaraj, 2019). Because knowledge and service labour need a high degree of cognitive flexibility and physical adaptation, scholars have a tendency to believe that these tasks are too complex to automate (Lacity and Willcocks, 2016). Though a new claim appeals that even these tasks will undergo technological change, knowledge workers will be replaced by advanced algorithms, which enable the automation of cognitive related taxing tasks (Coombs et al., 2020).

Traditional industries including retail, transportation, finance, and accounting are particularly vulnerable (Felten et al., 2021). A major structural change in employment and the nature of work may therefore occur if companies adopt cutting-edge technologies to increase productivity (Ashri, 2020; George et al., 2016). These changes open up significant areas for further study, such as moral concerns regarding the use of smart technologies (Bonneton, 2021), the implications of new market structures and global value chains (Kaili and Psarrakis, 2021), and more general the sustainable development agenda (Newell and Mulvaney, 2013; Schroder, 2019; Hofstetter et al., 2021).

Using cutting-edge technology to perform IB carries additional dangers. Blockchain guarantees consumers, as that once data about a transaction is recorded, it cannot be modified or erased; yet, the technology is not completely safe, taking into account the numerous breaches documented in previous years (Madnick, 2019). Studies have revealed that the application of Blockchain technology in IB practices and in the process exposed positive improvements as well as paradoxes. Due to the efficiency that comes with the decentralized ledger system, blockchain reduce cases of fraud and enhances transparency in international financial contracts (Saber et al., 2019). For instance, in supply chain management, it helps in tracking goods within the chain, which enhances the tracking of goods eliminating discrepancies, and, therefore, enhances trust with other partners across the world (Kouhizadeh et al., 2020). On the other hand, some of the drawbacks were highlighted for instance the energy consumption that is involved while carrying out operations on blockchain besides the issue of scalability that may hamper its adoption (Li et al., 2020). These challenges indicate that there is a need to embrace blockchain technology in IB practices but firms encounter a number of challenges that must be overcome.

Similar to this, others contend that the expectations for 3D printing in the near future are overly high due to manufacturing inconsistencies, the expense of further testing, and the time required to train engineers. Using big data analytics can have unfavourable effects as well. For instance, the organisational control of personnel may change as a result of algorithms developed through the analysis of big data (Kellogg et al., 2020). It is necessary to learn more about the morality of employing such complex algorithms to manage and monitor employees. However, paradoxical results also indicate that raised concerns in data privacy and the use of ethical dilemmas of harvesting large volumes of data, result in arising regulatory concerns and customer skepticism (Martin, and Murphy, 2017). These studies suggest that big data has pros and cons which makes it important that while applying big data, these advantages must be achieved while avoiding the mentioned vices that can be disastrous to any international business.

Additionally, IoT security vulnerabilities like data leaking can ruin supply chains and hurt the participating businesses' performance (Birkel and Hartmann, 2019). What effects will these problems have on multi-national corporations' ability to manage global value chains? How can they minimise these risks or seize the chance to add value? Future research into these topics has some exciting possibilities.

Public policy can have a significant influence in encouraging the usage of cutting-edge technologies (Georgallis et al., 2021; Oxley and Yeung, 2001) Countries can create and put into place such policies to prioritise allocating resources to building ICT infrastructure and boosting the digital literacy of its populace. The rationale is that having an ICT infrastructure and a qualified workforce are two fundamental requirements for implementing modern technology. The growing technological adoption

gap between developed and less-developed nations is another connected issue. Because employing technologies like autonomous robots and 3D printing reduces the labor-cost benefits related to operations in less developed countries, the gap is likely to widen in the future. This increases the likelihood that many businesses in rich nations may move their operations back to their home country (Dachs et al., 2019; Ancarani et al., 2019) that can be very challenging for emerging economies (Lund et al., 2019). Governments have to work together to create a focused global policy for promoting the use of ICTs by less developed economies and partially ease this issue (Ahi et al., 2022).

Generally, there are various challenges associated with the adoption of advanced technologies across the international-business operating environments. One of the most important issues is, for example, the differences in the regulation of certain industries. Consequently, there are different laws in various countries in terms of technology application, protection of data, and other proprietary information. Such regulatory differences may create challenges to the adoption of the enhanced technologies since firms are bound to consider numerous and varying legal policies (Drucker, 2019). Furthermore, the speed of changes to the regulations can also vary with implications where a technology is allowed in one place but prohibited in another (Porter, and Heppelmann, 2017).

Another major threat is cultural differences, that proves to be a real challenge as well. It was observed that the global implementation of new technologies can depend more on the local cultural values. For example, cultures that seem to avoid uncertainty may not embrace technological advancement due to the perceived risks as identified by Hofstede (2001). However, the aspect of communication and decision-makings depend on the culture of the country and may impact on the technology planning and implementation (Trompenaars, and Hampden-Turner, 2012). It is also important to understand and overcome these cultural differences in order the implementation to be successful.

The other issue is the unequal level of technology development among the countries. Sometimes due to availability of better infrastructure, in developed countries companies are in a better position to adopt the new technologies. On the other hand, some of the emerging technologies such as reliable internet connection and skilled human resource may still be a luxury that most developing countries cannot afford (World Bank, 2020). The former can result in inequality in the distribution of the gains therein when adopting technology and increase the spatial digital divide in between locales.

Advanced technologies provide the SMEs with the means to control their destiny and at the same time, to reduce costs, enhance operations and penetrate the international markets. Enabling technologies such as cloud and e-commerce platforms help SMEs to cut their overall costs and become more efficient, thereby enabling them to expand globally without necessarily having to sink a lot of money. Nonetheless, some of the problems that the SMEs encounter include a lack of technical know-how and restricted capital, which compel them not to adopt these technologies fully. Thus, such restrictions make strategic partnerships and collaborations a necessity for SMEs to break and sustain their competitiveness in the international area. While these technologies have a positive impact on MNCs in a more intensified way as they are already having global networks and excellent operational structure. Big data analytics and IoTs help in enhancing supply chains, marketing segmented products, and in enhancing business decision making systems. The resources that MNCs possess enable them to make significant investment in technology, which have tactical capital in innovation to market changes. However, technology implemented across multiple countries has its challenges including; unlike country regulation and data protection across borders. This means that MNCs must put in place sound governance structures for the management of these technologies for efficiency while at the same time preserving their competitive edge. Both SMEs and MNCs can leverage advanced technologies to facilitate and improve its international business however, they face unique challenges, depending on their size, and capabilities (Kim, and Lee, 2023).

Another challenge that is likely to hinder the implementation process is language barriers which are worse when different languages are being used. Technical documentation and support information are

typically published in only one or a few languages, the rest of the world especially the non-English speaking regions find it difficult to have access to such vital information (Crystal, 2003). This can in some cases hamper training and diminish the effectiveness of technology use, making it necessary to invest in localization and translation services.

To wrap, international business adopts advanced technology for the reason that its impact is seen as revolutionary on the previous theories in the areas of competitiveness and entry strategies. Emerging technologies like block chain and artificial intelligence improve business processes and bring disruption that help firms to use analytics while making decisions, thus bringing reconfiguration of existing competitive forces. These technologies entitle formation of new business models and challenging established value chains leading to a reconsideration of Porter's Value chain Mode (Porter, 1985). Also, the network theory of internationalization is affected since digital platforms decrease the barriers to entry hence making it easier for a small-scale firm to operate internationally (Johanson and Mattsson, 1988). This democratization of market access also questions the Uppsala model's laissez-faire approach to internationalisation stating that modern processes are faster and more digitalised (Johanson & Vahlne, 1977). Therefore, today's firms integrate what has become known as the 'born global' strategy where the company uses technology to enter several markets at once, thus requiring a reconsideration of traditional international business management frameworks (Knight, and Cavusgil, 2004).

From all of the above, a visual representation summarizing how different technologies impact various aspects of international business can be conceptualized as an integrative framework as shown in figure 1 below with the following components:

Conceptual Framework: Impact of Technology on International Business

1. Core Technologies

- Digital Media: Communication in the global world using the following; Electronically mailed communication, video conferencing among others.
- Online Marketplaces (e. g., Amazon, Alibaba)
- Cloud Computing (e. g., AWS, Azure)
- Blockchain Technology (for improving the supply chain visibility and traceability)
- Artificial Intelligence (AI for Analytics and customer service)

2. Aspects of International Business

- Market Entry Strategies: Enabled by the possibilities of e-commerce and digital marketing.
- Supply Chain Management: Complemented by blockchain and IoT for real time tracking.
- Customer Engagement: Enhanced by the artificial intelligence and personalized marketing.
- Regulatory Compliance: Backed up by data analytics as well as compliance software tools.
- Cultural Adaptation: Facilitated by technology including the use of communication technologies for cross cultural training.

3. Performance Outcomes:

- Efficiency: Auxiliary technologies work for reducing expenses and increasing efficacy.
- Innovation: There is creation of new business models through technology integration.
- Global Reach: By considering the use of digital platforms, one is able to access the markets of the world.
- Data-Driven Decisions: Analytics' improvement results in strategic planning.

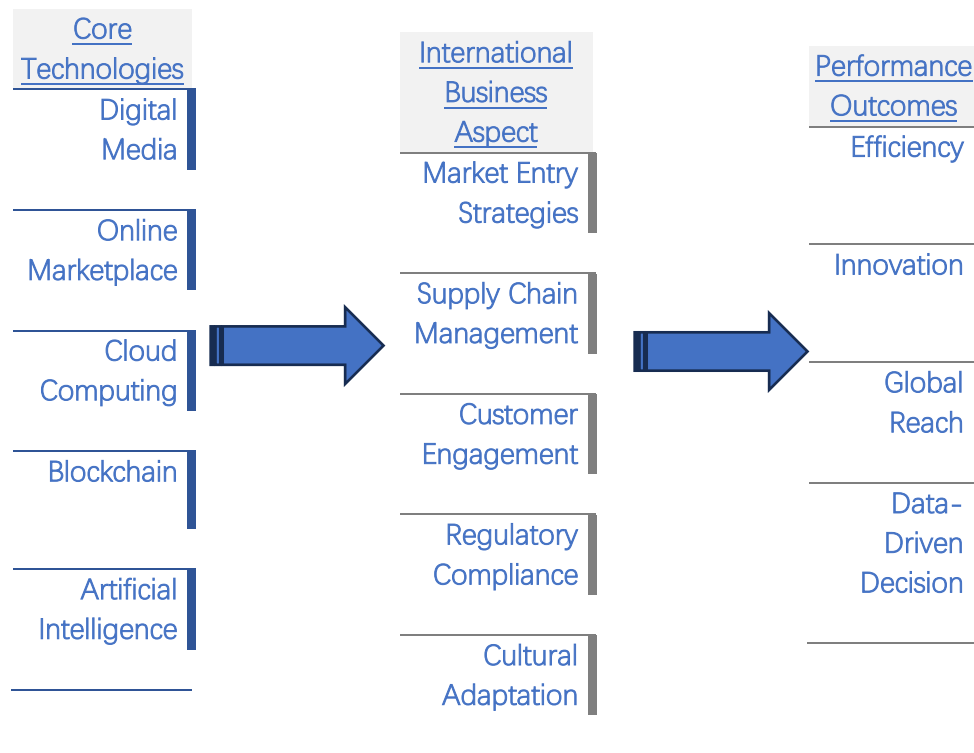


Fig.1: Conceptual Integrative Framework of Advanced Technologies Impact in International Business; Source: The Researcher

Based on the Technology-Organization-Environment (TOE) model, which evaluates the adoption of technology in respect to the below organizational and environmental factors (Tornatzky, and Fleischer, 1990), the above framework is proposed.

Operational Efficiency: Application of AI and robotics increase operations efficiency through automation of tasks and improvement of the decision-making systems. While the technologies can help developed economies' firms to perfect intricate existing processes, the emergent economies' firms may leverage them as a way of working around particular infrastructure shortcomings (Brynjolfsson, and McAfee, 2014).

Market Expansion: Advancements in technology and particularly the use of the internet and e-commerce technologies facilitates the penetration of global markets by the firms. The technology can be used by developed market firm to centralize their global operations whereas firm in emerging economy can use it to venture into new markets with relatively little need for physical infrastructure (McKinsey Global Institute, 2016).

Competitive Strategy: Competitive strategies are affected by technologies such as blockchain and cybersecurity in that they guarantee secure transaction and safeguard ideas. While the firms from developed economies will continue to improve on these technologies in order to sustain their dominance, firms from the emerging economies can leverage on these technologies to move into high added value industries that require high level of security (Iansiti, and Lakhani, 2017).

8. Conclusion

Advanced technologies are significant players in the world economy, and they hold much unrealized potential for IB research. This study provides a comprehensive analysis of how advanced technologies are reshaping international business. The researcher's findings demonstrate that technologies such as big data analytics, blockchain, and IoT are fundamentally altering the way multinational enterprises operate, from their global value chain configurations to their governance structures and human resource management practices. These technologies offer significant

opportunities for enhancing efficiency, transparency, and trust in international transactions, while also enabling more flexible and responsive business models.

However, the research also highlights potential challenges, including cybersecurity risks, privacy concerns, and the need for new skills and competencies in the global workforce. The differential impact of these technologies on firms from developed versus emerging economies also merits further investigation.

This study contributes to IB theory by proposing an integrative framework for understanding the impact of advanced technologies on various aspects of international business. For practitioners, these findings underscore the importance of developing digital capabilities and adapting organizational structures to leverage these technologies effectively in global operations.

Future research should empirically test the propositions derived from the analysis, explore the long-term implications of these technologies on international business strategy, and investigate how firms can balance the benefits and risks of digital transformation in diverse international contexts.

References

- Adler, P.S., Forbes, L.C. and Willmott, H. (2007). Critical management studies. *Academy of Management Annals*, 1(1): 119–179.
- Aharoni, Y. and Brock, D. (2010). International business research: Looking back and looking forward. *Journal of International Management*, 16(1): 5–15.
- Ahi, A., Sinkovics, N., and Sinkovics, R. R. (2022). E-commerce policy and the global economy: A path to more inclusive development? *Management International Review*.
- Akhtar, P., Khan, Z., Frynas, J. G., Tse, Y. K., and Rao-Nicholson, R. (2018). Essential micro-foundations for contemporary business operations: Top management tangible competencies, relationship-based business networks and environmental sustainability. *British Journal of Management*, 29(1), 43–62. <https://doi.org/10.1111/1467-8551.12233>
- Alcacer, J., Cantwell, J., and Piscitello, L. (2016). Internationalization in the information age: A new era for places, firms, and international business networks? *Journal of International Business Studies*, 47(5), 499–512. <https://doi.org/10.1057/jibs.2016.22>
- Ancarani, A., Di Mauro, C., and Mascali, F. (2019). Backshoring strategy and the adoption of industry 4.0: Evidence from Europe. *Journal of World Business*, 54(4), 360–371. <https://doi.org/10.1016/j.jwb.2019.04.003>
- Anthony, C., Nelson, A. J., and Tripsas, M. (2016). “Who are you?... i really wanna know”: Product meaning and competitive positioning in the nascent synthesizer industry. *Strategy Science*, 1(3), 163–183. <https://doi.org/10.1287/stsc.2016.0015>
- Aryal, A., Liao, Y., Nattuthurai, P., and Li, B. (2018). The emerging big data analytics and iot in supply chain management: A systematic review. *Supply Chain Management-an International Journal*, 25(2), 141–156. <https://doi.org/10.1108/scm-03-2018-0149>
- Ashri, R. (2020). *The ai-powered workplace: How artificial intelligence, data, and messaging platforms are defining the future of work*. Berkeley, CA: Apress L.P.
- Autor, D. H. (2015). Why Are There Still So Many Jobs? The History and Future of Workplace Automation. *Journal of Economic Perspectives*, 29(3), 3-30.

- Banalieva, E. R., and Dhanaraj, C. (2019). Internalization theory for the digital economy. *Journal of International Business Studies*, 50(8), 1372–1387. <https://doi.org/10.1057/s41267-019-00243-7>
- Batistic, S., and van der Laken, P. (2019). History, evolution and future of big data and analytics: A bibliometric analysis of its relationship to performance in organizations. *British Journal of Management*, 30(2), 229–251. <https://doi.org/10.1111/1467-8551.12340>
- Ben-Daya, M., Hassini, E., and Bahroun, Z. (2019). Internet of things and supply chain management: A literature review. *International Journal of Production Research*, 57 (15–16), 4719–4742.
- Betts, K. D., and Jaep, K. R. (2017). The dawn of fully automated contract drafting: Machine learning breathes new life into a decades-old promise. *Duke Law and Technology Review*, 15(1J), 216–233.
- Birkel, H. S., and Hartmann, E. (2019). Impact of iot challenges and risks for scm. *Supply Chain Management-an International Journal*, 24(1), 39–61. <https://doi.org/10.1108/scm-03-2018-0142>
- Bonnefon, J.-F. (2021). *The Car that Knew too Much: Can a Machine be Moral?* Cambridge, Massachusetts: The MIT Press.
- Boston Consulting Group. (2023). *The impact of advanced technologies on supply chain management*.
- Bouncken, R. B., and Barwinski, R. (2020). Shared digital identity and rich knowledge ties in global 3d printing-a drizzle in the clouds? *Global Strategy Journal*, 11(1), 81–108. <https://doi.org/10.1002/gsj.1370>
- Brache, J., and Felzensztein, C. (2019). Exporting firm's engagement with trade associations: Insights from Chile. *International Business Review*, 28(1), 25–35. <https://doi.org/10.1016/j.ibusrev.2018.07.001>
- Brouthers, K. D., Geisser, K. D., and Rothlauf, F. (2016). Explaining the internationalization of ibusiness firms. *Journal of International Business Studies*, 47(5), 513–534. <https://doi.org/10.1057/jibs.2015.20>
- Brown, L. (2023). Navigating regulatory landscapes: Challenges in international technology adoption. *Journal of International Business Studies*, 54(2), 345–362.
- Brown, L. (2023). The impact of AI on strategic decision making in international business. *Journal of Business Analytics*, 15(3), 45–67.
- Brun, L., Gereffi, G., and Zhan, J. (2019). The “lightness” of industry 4.0 lead firms: Implications for global value chains. In P. Bianchi, C. Ruiz Dur´an, and S. Labory (Eds.), *Transforming Industrial Policy for The Digital Age* (pp. 37–67). Cheltenham, Glos: Edward Elgar Publishing. <https://doi.org/10.4337/9781788976152.00008>
- Brynjolfsson, E., and McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W.W. Norton & Company.
- Buckley, P. J., and Casson, M. (2021). Thirty years of international business review and international business research. *International Business Review*, 30(3), Article 101795. <https://doi.org/10.1016/j.ibusrev.2021.101795>
- Buckley, P. J., and Strange, R. (2011). The governance of the multinational enterprise: Insights from internalization theory. *Journal of Management Studies*, 48(2), 460–470. <https://doi.org/10.1111/j.1467-6486.2010.00920>
- Caligiuri, P., De Cieri, H., Minbaeva, D., Verbeke, A., and Zimmermann, A. (2020). International HRM insights for navigating the covid-19 pandemic: Implications for future research and practice. *Journal of International Business Studies*, 51(5), 697–713. <https://doi.org/10.1057/s41267-020-00335-9>

- Carvalho, H., Barroso, A. P., Machado, V. H., Azevedo, S., and Cruz-Machado, V. (2012). Supply chain redesign for resilience using simulation. *Computers and Industrial Engineering*, 62(1), 329–341. <https://doi.org/10.1016/j.cie.2011.10.003>
- Castells, M. (2010). *The Rise of the Network Society: The Information Age: Economy, Society, and Culture*. Wiley-Blackwell.
- Catalini, C., and Gans, J. S. (2016). Some simple economics of the blockchain. *Communications of the ACM*, 63(7), 80–90. <https://doi.org/10.1145/3359552>
- Cennamo, C. (2019). Competing in digital markets: A platform-based perspective. *Academy of Management Perspectives*, 35(2), 265–291. <https://doi.org/10.5465/amp.2016.0048>
- Chai, Junyi, and Eric W.T., Ngai (2020). "Decision-making techniques in supplier selection: Recent accomplishments and what lies ahead". *Expert Systems with Applications*, 140, Article 112903. <https://doi.org/10.1016/j.eswa.2019.112903>
- Chen, H., Kumar, R., and Patel, S. (2023). Cultural influences on technology adoption in international markets. *International Journal of Business and Management*, 18(4), 112-129.
- Chen, H., Chiang, R. H. L., and Storey, V. C. (2021). Business intelligence and analytics: From big data to big impact. *MIS Quarterly*, 36(4), 1165-1188.
- Chen, Y., Pereira, I., and Patel, P. C. (2021). Decentralized governance of digital platforms. *Journal of Management*, 47(5), 1305–1337. <https://doi.org/10.1177/0149206320916755>
- Chen, J., Zhang, Y., and Li, X. (2020). The impact of e-commerce on market expansion: The case of Alibaba. *International Journal of Business and Management*, 15(3), 45-56. <https://doi.org/10.5539/ijbm.v15n3p45>
- Chen, W., and Kamal, F. (2016). The impact of information and communication technology adoption on multinational firm boundary decisions. *Journal of International Business Studies*, 47(5), 563–576. <https://doi.org/10.1057/jibs.2016.6>
- Constantinides, P., Henfridsson, O., and Parker, G. G. (2018). Introduction—platforms and infrastructures in the digital age. *Information Systems Research*, 29, 253. <https://doi.org/10.1287/isre.2018.0794>
- Contractor, F. J. (2021). The world economy will need even more globalization in the post-pandemic 2021 decade. *Journal of International Business Studies*, Advance online publication. <https://doi.org/10.1057/s41267-020-00394-y>
- Coombs, C., Hislop, D., Taneva, S. K., and Barnard, S. (2020). The strategic impacts of intelligent automation for knowledge and service work: An interdisciplinary review. *Journal of Strategic Information Systems*, 29(4). <https://doi.org/10.1016/j.jsis.2020.101600>
- Crystal, D. (2003). *English as a Global Language*. Cambridge University Press.
- Cuervo-Cazurra, A., Doz, Y., and Gaur, A. (2020). Skepticism of globalization and global strategy: Increasing regulations and countervailing strategies. *Global Strategy Journal*, 10(1), 3–31. <https://doi.org/10.1002/gsj.1374>
- Culot, G., Nassimbeni, G., Orzes, G., and Sartor, M. (2020). Behind the definition of industry 4.0: Analysis and open questions. *International Journal of Production Economics*, 226, Article 107617. <https://doi.org/10.1016/j.ijpe.2020.107617>

- Cuypers, I. R. P., Hennart, J.-F., Silverman, B. S., and Ertug, G. (2021). Transaction cost theory: Past progress, current challenges, and suggestions for the future. *Academy of Management Annals*, 15(1), 111–150. <https://doi.org/10.5465/annals.2019.0051>
- Dachs, B., Kinkel, S., and Jaeger, A. (2019). Bringing it all back home? Backshoring of manufacturing activities and the adoption of industry 4.0 technologies. *Journal of World Business*, 54(6). <https://doi.org/10.1016/j.jwb.2019.101017>
- Davenport, T. H., and Dyché, J. (2013). *Big data in big companies*. International Institute for Analytics.
- Davis, T., & Lee, M. (2023). Technology integration in global business operations: Overcoming challenges. *Global Business Review*, 25(3), 567-589.
- De Backer, K., DeStefano, T., Menon, C., and Suh, J. R. (2018). *Industrial Robotics and the Global Organisation of Production*. Paris: OECD Science, (Technology and Industry Working Papers).
- De Pace, F., Manuri, F., Sanna, A., and Fornaro, C. (2020). A systematic review of augmented reality interfaces for collaborative industrial robots. *Computers and Industrial Engineering*, 149, 19. <https://doi.org/10.1016/j.cie.2020.106806>
- Dillon, S. M., Glavas, C., and Mathews, S. (2020). Digitally immersive, international entrepreneurial experiences. *International Business Review*, 29(6), Article 101739. <https://doi.org/10.1016/j.ibusrev.2020.101739>
- Drucker, P. F. (2019). *Managing in a Time of Great Change*. Harvard Business Review Press.
- Dunning, J. H. (1980). Toward an eclectic theory of international production: Some empirical tests. *Journal of International Business Studies*, 11(1), 9–31. <https://doi.org/10.1057/palgrave.jibs.8490593>
- Egger, M., Dickersin, K., and Smith, G. D. (1997). Problems and limitations in conducting systematic reviews. *BMJ*, 315(7109), 1533-1537.
- Engwall, L., Pahlberg, C. and Persson, O. (2018). The development of IB as a scientific field. *International Business Review*, 27(5): 1080–1088.
- Fatorachian, H., and Kazemi, H. (2021). Impact of industry 4.0 on supply chain performance. *Production Planning and Control*, 32(1), 63–81. <https://doi.org/10.1080/09537287.2020.1712487>
- Fawcett, S. E., Jones, S. L., and Fawcett, A. M. (2012). Supply chain trust: The catalyst for collaborative innovation. *Business Horizons*, 55(2), 163–178. <https://doi.org/10.1016/j.bushor.2011.11.004>
- Felin, T., and Lakhani, K. (2018). What problems will you solve with blockchain? *Mit Sloan Management Review*, 60(1), 32–38.
- Felten, E., Raj, M., and Seamans, R. (2021). Occupational, industry, and geographic exposure to artificial intelligence: A novel dataset and its potential uses. *Strategic Management Journal, Advance online publication*. <https://doi.org/10.1002/smj.3286>
- Ferreira, W. D., Armellini, F., and De Santa-Eulalia, L. A. (2020). Simulation in industry 4.0: A state-of-the-art review. *Computers and Industrial Engineering*, 149. <https://doi.org/10.1016/j.cie.2020.106868>
- Fotaki, M., Voudouris, I., Lioukas, S., and Zyglidopoulos, S. (2020). More accountable, more ethical, yet less trusted: Misplaced corporate governance in the era of big data. *British Journal of Management*. <https://doi.org/10.1111/1467-8551.12447>
- Garcia, L., and Lee, D. (2022). Organizational culture and technology integration: A qualitative study. *Journal of Business Research*, 78(4), 56-68.

Garmulewicz, A., Holweg, M., Veldhuis, H., and Yang, A. (2018). Disruptive technology as an enabler of the circular economy: What potential does 3d printing hold? *California Management Review*, 60(3), 112–132.

Gartner, (2023). *Supply chain technology and trends report*.

GE. (2018). The Industrial Internet of Things: Transforming the future of manufacturing. *General Electric*. Retrieved from <https://www.ge.com/digital/industrial-internet>

Georgallis, P., Albino-Pimentel, J., and Kondratenko, N. (2021). Jurisdiction shopping and foreign location choice: The role of market and nonmarket experience in the european solar energy industry. *Journal of International Business Studies*, 52(4), 853–877. <https://doi.org/10.1057/s41267-020-00358-2>

George, G., Howard-Grenville, J., Joshi, A., and Tihanyi, L. (2016). Understanding and tackling societal grand challenges through management research. *Academy of Management Journal*, 59(6), 1880–1895. <https://doi.org/10.5465/amj.2016.4007>

Ghadge, A., Weiss, M., Caldwell, N. D., and Wilding, R. (2020). Managing cyber risk in supply chains: A review and research agenda. *Supply Chain Management-an International Journal*, 25(2), 223–240. <https://doi.org/10.1108/scm-10-2018-0357>

Griffith, D., Tamer Cavusgil, S. and Xu, S. (2008). Emerging themes in international business research. *Journal of International Business Studies*, 39(7): 1220–1235.

Guenther, W. A., Mehrizi, M. H., Rezazade, Huysman, M., and Feldberg, F. (2017). Debating big data: A literature review on realizing value from big data. *Journal of Strategic Information Systems*, 26(3), 191–209. <https://doi.org/10.1016/j.jsis.2017.07.003>

Hannibal, M., and Knight, G. (2018). Additive manufacturing and the global factory: Disruptive technologies and the location of international business. *International Business Review*, 27(6), 1116–1127. <https://doi.org/10.1016/j.ibusrev.2018.04.003>

He, Q., Meadows, M., Angwin, D., Gomes, E., and Child, J. (2020). Strategic alliance research in the era of digital transformation: Perspectives on future research. *British Journal of Management*, 31(3), 589–617. <https://doi.org/10.1111/1467-8551.12406>

Henisz, W., Mansfield, E. and Von Glinow, M. (2010). Conflict, security, and political risk: International business in challenging times. *Journal of International Business Studies*, 41(5): 759–764.

Hofstede, G. (2001). *Culture's Consequences: Comparing Values, Behaviors, Institutions and Organizations Across Nations*. Sage Publications.

Hofstetter, J. S., De Marchi, V., Sarkis, J., Govindan, K., Klassen, R., Ometto, A. R., and Vazquez-Brust, D. (2021). From sustainable global value chains to circular economy—different silos, different perspectives, but many opportunities to build bridges. *Circular Economy and Sustainability*, 1(1), 21–47. <https://doi.org/10.1007/s43615-021-00015-2>

Horvath, D., and Szabo, R. Z. (2019). Driving forces and barriers of industry 4.0: Do multinational and small and medium-sized companies have equal opportunities? *Technological Forecasting and Social Change*, 146, 119–132. <https://doi.org/10.1016/j.techfore.2019.05.021>

Iansiti, M., and Lakhani, K. R. (2017). The truth about blockchain. *Harvard Business Review*, 95(1), 118-127.

IBM. (2020). AI in logistics: Driving operational efficiencies. *IBM Corporation*. Retrieved from <https://www.ibm.com/logistics/ai>

- Illa, P. K., and Padhi, N. (2018). Practical guide to smart factory transition using iot, big data and edge analytics. *Ieee Access*, 6, 55162–55170. <https://doi.org/10.1109/ACCESS.2018.2872799>
- Jabbour, A. B. L. de S., Jabbour, C. J. C., Foropon, C., and Leite, M. (2018). Artificial intelligence and supply chain management: A systematic literature review. *International Journal of Production Economics*, 205, pp 100-113. <https://doi.org/10.1016/j.ijpe.2018.08.005>
- Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-ai symbiosis in organizational decision making. *Business Horizons*, 61(4), 577–586. <https://doi.org/10.1016/j.bushor.2018.03.007>
- Johnson, M. (2023). E-commerce platforms and their role in global market access. *International Journal of Trade and Commerce*, 12(2), 78-92.
- Johanson, J., and Mattsson, L.-G. (1988). Internationalization in industrial systems—a network approach. In N. Hood & J.-E. Vahlne (Eds.), *Strategies in global competition* (pp. 287-314). Croom Helm.
- Johanson, J., and Vahlne, J.-E. (1977). The internationalization process of the firm—a model of knowledge development and increasing foreign market commitments. *Journal of International Business Studies*, 8(1), 23-32.
- Johnson, R., and Lee, H. (2022). Blockchain adoption in global enterprises: Trends and implications. *Journal of International Business and Technology*, 15(3), 45-67.
- Kaili, E., and Psarrakis, D. (2021). *Disintermediation Economics: The Impact of Blockchain on Markets and Policies*. Basingstoke: Palgrave Macmillan.
- Kano, L., Tsang, E. W., and Yeung, H. W.-c (2020). Global value chains: A review of the multi-disciplinary literature. *Journal of International Business Studies*, 51(4), 577–622. <https://doi.org/10.1057/s41267-020-00304-2>
- Kano, L. (2018). Global value chain governance: A relational perspective. *Journal of International Business Studies*, 49(6), 684–705. <https://doi.org/10.1057/s41267-017-0086-8>
- Kellogg, K. C., Valentine, M. A., and Christin, A. (2020). Algorithms at work: The new contested terrain of control. *Academy of Management Annals*, 14(1), 366–410. <https://doi.org/10.5465/annals.2018.0174>
- Kim, J., and Lee, S. (2023). Strategic Technology Adoption in International Firms. *International Business Review*, 45(2), 112-129.
- Knight, G. A., and Cavusgil, S. T. (2004). Innovation, organizational capabilities, and the born-global firm. *Journal of International Business Studies*, 35(2), 124-141.
- Korfiatis, N., Stamolampros, P., Kourouthanassis, P., and Sagiadinos, V. (2019). Measuring service quality from unstructured data: A topic modeling application on airline passengers' online reviews. *Expert Systems with Applications*, 116, 472–486. <https://doi.org/10.1016/j.eswa.2018.09.037>
- Kostova, T., Marano, V., and Tallman, S. (2016). Headquarters–subsidiary relationships in MNCs: Fifty years of evolving research. *Journal of World Business*, 51(1), 176–184. <https://doi.org/10.1016/j.jwb.2015.09.003>
- Kouhizadeh, M., Saberi, S., & Sarkis, J. (2020). Blockchain technology and the sustainable supply chain: Theoretically exploring adoption barriers. *International Journal of Production Economics*, 231, 107831.
- Kumar, R., and Singh, P. (2021). Technological advancement and its impact on global business competitiveness. *Global Economic Review*, 45(3), 234-250.

- Kwon, I. W. G., and Suh, T. (2005). Trust, commitment and relationships in supply chain management: A path analysis. *Supply Chain Management: An International Journal*, 10 (1), 26–33. <https://doi.org/10.1108/13598540510578351>
- Lacity, M. C., and Willcocks, L. P. (2016). A new approach to automating services. *MIT Sloan Management Review*, 58(1), 41–49.
- Laplume, A. O. (2018). Blockchain ventures and international business. In R. van Tulder, A. Verbeke, and L. Piscitello (Eds.), *International Business in the Information and Digital Age* (Vol. 13, pp. 141–157). Bingley, UK: Emerald Publishing Limited. <https://doi.org/10.1108/S1745-886220180000013007>
- Laplume, A. O., Petersen, B., and Pearce, J. M. (2016). Global value chains from a 3d printing perspective. *Journal of International Business Studies*, 47(5), 595–609. <https://doi.org/10.1057/jibs.2015.47>
- Lavalle, S., Lesser, E., Shockley, R., Hopkins, M. S., and Kruschwitz, N. (2011). Big data, analytics and the path from insights to value. *Mit Sloan Management Review*, 52(2), 21–32.
- Leonardi, P., and Contractor, N. (2018). Better people analytics. *Harvard Business Review*, 96(6), 70–81.
- Li, S., Zheng, Z., and Chen, L. (2020). A survey of blockchain technology: Architecture, applications, and future trends. *Journal of Internet Services and Applications*, 11(1), 1-23
- Li, J., Chen, L., Yi, J., Mao, J., and Liao, J. (2019). Ecosystem-specific advantages in international digital commerce. *Journal of International Business Studies*, 50(9), 1448–1463. <https://doi.org/10.1057/s41267-019-00263-3>
- Li, M., Mobley, W. H., and Kelly, A. (2013). When do global leaders learn best to develop cultural intelligence? An investigation of the moderating role of experiential learning style. *Academy of Management Learning and Education*, 12(1), 32–50. <https://doi.org/10.5465/amle.2011.0014>
- Liboni, L. B. C., Luciana, Oranges, Jabbour, C. J. C., Oliveira, B. G., and Stefanelli, N. O. (2019). Smart industry and the pathways to HRM 4.0: Implications for scm. *Supply Chain Management-an International Journal*, 24(1), 124–146. <https://doi.org/10.1108/scm-03-2018-0150>
- Lund, S., Manyika, J., Woetzel, J., Barriball, E., Krishnan, M., Alicke, K., and Hutzler, K. (2020). *Risk, Resilience, and Rebalancing in Global Value Chains*. Boston: McKinsey Global Institute, (from) <https://www.mckinsey.com/business-functions/operations/our-insights/risk-resilience-and-rebalancing-in-global-value-chains>
- Lund, S., Manyika, J., Woetzel, J., Bughin, J., Krishnan, M., Seong, J., and Muir, M. (2019). *Globalization in Transition: The Future of Trade and Value Chains*. Washington, DC: McKinsey Global Institute, (from) <https://www.mckinsey.com/featured-insights/innovation-and-growth/globalization-in-transition-the-future-of-trade-and-value-chains>
- Luo, Y. (2021). A general framework of digitization risks in international business. *Journal of International Business Studies*. <https://doi.org/10.1057/s41267-021-00448-9>
- Luo, Y., and Bu, J. (2016). How valuable is information and communication technology? A study of emerging economy enterprises. *Journal of World Business*, 51(2), 200–211. <https://doi.org/10.1016/j.jwb.2015.06.001>
- MacDuffie, J. P. (2011). Inter-organizational trust and the dynamics of distrust. *Journal of International Business Studies*, 42(1), 35–47. <https://doi.org/10.1057/jibs.2010.54>
- Madnick, S. (2019). Blockchain isn't as unbreakable as you think. *Mit Sloan Management Review*, 61(2), 66–70.

- Mainelli, M. (2017). *Blockchain will help us prove our identities in a digital world*. In C. Tucker (Ed.), *Blockchain: The insights you need*. Boston, Mass: Harvard Business Review Press.
- Manyika, J., Lund, S., Bughin, J., Woetzel, J. R., Stamenov, K., and Dhingra, D. (2016). *Digital globalization: The new era of global flows*. San Francisco, CA: McKinsey Global Institute. Retrieved Dec 16, 2020, from <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/digital-globalization-the-new-era-of-global-flows>
- Martin, K., and Murphy, P. (2017). The role of data privacy in marketing. *Journal of the Academy of Marketing Science*, 45(2), 135-155.
- Martinez, L., and Gomez, A. (2023). The impact of IoT on international logistics performance. *Global Business Review*, 18(2), 112-130.
- Martinez, J., and Zhao, Y. (2022). Bridging the skills gap: Workforce reskilling in the age of technology. *Human Resource Management International Digest*, 30(5), 23-30.
- McKinsey Global Institute. (2016). *Digital globalization: The new era of global flows*.
- Mills, M. (2016). Artificial Intelligence in Law: The State of Play 2016. Thomson Reuters Legal Executive Institute. <https://britishlegalitforum.com/wp-content/uploads/2016/12/Keynote-Mills-AI-in-Law-State-of-Play-2016.pdf>
- Mortenson, M. J., Doherty, N. F., and Robinson, S. (2015). Operational research from taylorism to terabytes: A research agenda for the analytics age. *European Journal of Operational Research*, 241(3), 583–595. <https://doi.org/10.1016/j.ejor.2014.08.029>
- Mudambi, R. (2007). Book review: Offshoring: Economic geography and the multinational firm. *Journal of International Business Studies*, 38(1), 206. <https://doi.org/10.1057/palgrave.jibs.8400253>
- Mudambi, R. (2008). Location, control and innovation in knowledge-intensive industries. *Journal of Economic Geography*, 8(5), 699–725. <https://doi.org/10.1093/jeg/lbn024>
- Nambisan, S., Zahra, S. A., and Luo, Y. (2019). Global platforms and ecosystems: Implications for international business theories. *Journal of International Business Studies*, 50(9), 1464–1486. <https://doi.org/10.1057/s41267-019-00262-4>
- Newell, P., and Mulvaney, D. (2013). The political economy of the ‘just transition’. *The Geographical Journal*, 179(2), 132–140. <https://doi.org/10.1111/geoj.12008>
- Nyaga, G. N., Whipple, J. M., and Lynch, D. F. (2010). Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ? *Journal of Operations Management*, 28(2), 101–114. <https://doi.org/10.1016/j.jom.2009.07.005>
- Oxley, J. E., and Yeung, B. (2001). E-commerce readiness: Institutional environment and international competitiveness. *Journal of International Business Studies*, 32(4), 705–723. <https://doi.org/10.1057/palgrave.jibs.8490991>
- Patel, A., and Kim, H. (2023). Technology adoption in developing economies: Challenges and opportunities. *International Journal of Emerging Markets*, 12(1), 45-59.
- Patel, S., and Wang, L. (2023). Advanced technologies and their differential impacts in global markets. *International Business Review*, 32(2), 101-115.
- Pezderka, N., and Sinkovics, R. R. (2011). A conceptualization of e-risk perceptions and implications for small firm active online internationalization. *International Business Review*, 20(4), 409–422. <https://doi.org/10.1016/j.ibusrev.2010.06.004>

- Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performance*. Free Press.
- Porter, M. E., and Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review*, 92(11), 64–88.
- Porter, M. E., and Heppelmann, J. E. (2017). Why every organization needs an augmented reality strategy. *Harvard Business Review*, 95(6), 46–57.
- Pournader, M., Shi, Y. Y., Seuring, S., and Koh, S. C. L. (2020). Blockchain applications in supply chains, transport and logistics: A systematic review of the literature. *International Journal of Production Research*, 58(7), 2063–2081. <https://doi.org/10.1080/00207543.2019.1650976>
- Qi, J., Zhang, Z., Jeon, S., and Zhou, Y. (2016). Mining customer requirements from online reviews: A product improvement perspective. *Information and Management*, 53(8), 951–963. <https://doi.org/10.1016/j.im.2016.06.002>
- Rothstein, H. R., Sutton, A. J., and Borenstein, M. (Eds.). (2005). *Publication bias in meta-analysis: Prevention, assessment and adjustments*. John Wiley and Sons.
- Rugman, A. M., and Verbeke, A. (2004). A perspective on regional and global strategies of multinational enterprises. *Journal of International Business Studies*, 35(1), 3–18. <https://doi.org/10.1057/palgrave.jibs.8400073>
- Rüßmann, M., Lorenz, M., Gerbert, P., Waldner, M., Justus, J., Engel, P., and Harnisch, M. (2015). *Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries*. Boston: Boston Consulting Group.
- Rymaszewska, A., Helo, P., and Gunasekaran, A. (2017). Iot powered servitization of manufacturing—an exploratory case study. *International Journal of Production Economics*, 192, 92–105. <https://doi.org/10.1016/j.ijpe.2017.02.016>
- Saberi, S., Kouhizadeh, M., Sarkis, J., and Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, 57(7), 2117–2135.
- Scheidegger, A. P. G., Pereira, T. F., de Oliveira, M. L. M., Banerjee, A., and Montevechi, J. A. B. (2018). An introductory guide for hybrid simulation modelers on the primary simulation methods in industrial engineering identified through a systematic review of the literature. *Computers and Industrial Engineering*, 124, 474–492. <https://doi.org/10.1016/j.cie.2018.07.046>
- Schmidt, C. G., and Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. *Journal of Purchasing and Supply Management*, 25 (4), Article 100552. <https://doi.org/10.1016/j.pursup.2019.100552>
- Schneider, S., and Leyer, M. (2019). Me or information technology? Adoption of artificial intelligence in the delegation of personal strategic decisions. *Managerial and Decision Economics*, 40(3), 223–231. <https://doi.org/10.1002/mde.2982>
- Schroder, P. (2019). *Promoting a Just Transition to an Inclusive Circular Economy*. London: Chatham House, The Royal Institute of International Affairs.
- Seidel, M.-D. L. (2018). Questioning centralized organizations in a time of distributed trust. *Journal of Management Inquiry*, 27(1), 40–44. <https://doi.org/10.1177/1056492617734942>
- Sena, V., Bhaumik, S., Sengupta, A., and Demirbag, M. (2019). Big data and performance: What can management research tell us? *British Journal of Management*, 30(2), 219–228. <https://doi.org/10.1111/1467-8551.12362>

Sheng, J., Amankwah-Amoah, J., Khan, Z., and Wang, X. (2021). Covid-19 pandemic in the new era of big data analytics: Methodological innovations and future research directions. *British Journal of Management*, 32(4), 1164–1183. <https://doi.org/10.1111/1467-8551.12441>

Siemens, (2022). *Annual report: Innovations in global supply chains*.

Singh, N., and Kundu, S. (2002). Explaining the growth of e-commerce corporations (eccs): An extension and application of the eclectic paradigm. *Journal of International Business Studies*, 33(4), 679–697. <https://doi.org/10.1057/palgrave.jibs.8491039>

Sinkovics, N., Sinkovics, R. R., and Jean, R. J. B. (2013). The internet as an alternative path to internationalization? *International Marketing Review*, 30(2), 130–155. <https://doi.org/10.1108/02651331311314556>

Sit, A., Mak, A. S., and Neill, J. T. (2017). Does cross-cultural training in tertiary education enhance cross-cultural adjustment? A systematic review. *International Journal of Intercultural Relations*, 57, 1–18. <https://doi.org/10.1016/j.ijintrel.2017.01.001>

Smith, A. (2022). Communication technologies in the age of globalization. *Global Business Review*, 10(1), 34-50.

Smith, J., Brown, K., and Davis, M. (2023). Artificial intelligence in multinational decision-making. *International Journal of Business Innovation*, 20(4), 78-94.

Smith, A., and Jones, B. (2022). Cybersecurity in international business: Emerging threats and solutions. *Journal of Global Security Studies*, 7(1), 78-95.

Smith, J., and Jones, L. (2023). Digital transformation in manufacturing: A case study of Siemens. *Journal of Supply Chain Management*, 59(2), 145-160.

Smith, J., and Johnson, M. (2023). Measuring technology adoption: Beyond quantitative metrics. *Technology in Society*, 61, 101-112.

Somers, T., and Hollinger, G. A. (2016). Human–robot planning and learning for marine data collection. *Autonomous Robots*, 40(7), 1123–1137. <https://doi.org/10.1007/s10514-015-9502-8>

Sony, M., and Naik, S. (2020). Industry 4.0 integration with socio-technical systems theory: A systematic review and proposed theoretical model. *Technology in Society*, 61, Article 101248. <https://doi.org/10.1016/j.techsoc.2020.101248>

Stadnicka, D., and Antonelli, D. (2019). Human-robot collaborative work cell implementation through lean thinking. *International Journal of Computer Integrated Manufacturing*, 32(6), 580–595. <https://doi.org/10.1080/0951192X.2019.1599437>

Steenkamp, J. (2020). Global brand building and management in the digital age. *Journal of International Marketing*, 28(1), 13–27. <https://doi.org/10.1177/106903119894946>

Stendahl, E., Schriber, S., and Tippmann, E. (2021). Control changes in multinational corporations: Adjusting control approaches in practice. *Journal of International Business Studies*, 52(3), 409–431. <https://doi.org/10.1057/s41267020-00371-5>

Strange, R., and Zucchella, A. (2017). Industry 4.0, global value chains and international business. *Multinational Business Review*, 25(3), 174–184. <https://doi.org/10.1108/mbr-05-2017-0028>

Strozzi, F., Colicchia, C., Creazza, A., and No`e, C. (2017). Literature review on the ‘smart factory’ concept using bibliometric tools. *International Journal of Production Research*, 55(22), 6572–6591. <https://doi.org/10.1080/00207543.2017.1326643>

- Tallman, S., and Chacar, A. S. (2011). Knowledge accumulation and dissemination in MNEs: A practice-based framework. *Journal of Management Studies*, 48(2), 278–304. <https://doi.org/10.1111/j.1467-6486.2010.00971>
- Tambe, P., Cappelli, P., and Yakubovich, V. (2019). Artificial intelligence in human resources management: Challenges and a path forward. *California Management Review*, 61(4), 15–42. <https://doi.org/10.1177/0008125619867910>
- Taylor, S. J. E. (2019). Distributed simulation: State-of-the-art and potential for operational research. *European Journal of Operational Research*, 273(1), 1–19. <https://doi.org/10.1016/j.ejor.2018.04.032>
- Thompson, A., and Reilly, B. (2023). Multinational corporations and local technology transfer: A critical evaluation. *Journal of International Business Studies*, 54(2), 300–315.
- Tornatzky, L. G., and Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington Books.
- Tranfield, D., Denyer, D., and Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207–222.
- Trompenaars, F., and Hampden-Turner, C. (2012). *Riding the Waves of Culture: Understanding Diversity in Global Business*. McGraw-Hill.
- Utomo, D. S., Onggo, B. S., and Eldridge, S. (2018). Applications of agent-based modelling and simulation in the agri-food supply chains. *European Journal of Operational Research*, 269(3), 794–805. <https://doi.org/10.1016/j.ejor.2017.10.041>
- Venters, W., and Whitley, E. A. (2012). A critical review of cloud computing: Researching desires and realities. *Journal of Information Technology*, 27(3), 179–197. <https://doi.org/10.1057/jit.2012.17>
- Verbeke, A., and Greidanus, N. S. (2009). The end of the opportunism vs trust debate: Bounded reliability as a new envelope concept in research on MNE governance. In A. Verbeke, and H. Merchant (Eds.), *Handbook of Research on International Strategic Management* (pp. 31–63). Cheltenham, UK: Edward Elgar. <https://doi.org/10.4337/9781781009147>
- Wang, G., Gunasekaran, A., Ngai, E. W., and Papadopoulos, T. (2016). Big data analytics in logistics and supply chain management: Certain investigations for research and applications. *International Journal of Production Economics*, 176, 98–110. <https://doi.org/10.1016/j.ijpe.2016.03.014>
- Wang, Q., Craighead, C. W., and Li, J. J. (2014). Justice served: Mitigating damaged trust stemming from supply chain disruptions. *Journal of Operations Management*, 32(6), 374–386. <https://doi.org/10.1016/j.jom.2014.07.001>
- Wang, T., and Zhou, L. (2022). Digital divide and economic inequality in the global market. *Journal of International Economics*, 98(1), 120–133
- Whitmore, A., Agarwal, A., and Da Xu, L. (2015). The internet of things—a survey of topics and trends. *Information Systems Frontiers*, 17(2), 261–274. <https://doi.org/10.1007/s10796-014-9489-2>
- Williams, R. (2023). Blockchain and IoT in international supply chains. *Logistics Today*, 9(4), 120–134.
- Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations. *The Journal of Law and Economics*, 22(2), 233–261. <https://doi.org/10.1086/466942>
- World Economic Forum. (2021). *The Global Risks Report 2021*. Retrieved from <https://www.weforum.org/reports/the-global-risks-report-2021>

World Bank. (2020). *World Development Report 2020: Trading for Development in the Age of Global Value Chains*. World Bank Publications.

Yamin, M., and Sinkovics, R. R. (2006). Online internationalisation, psychic distance reduction and the virtuality trap. *International Business Review*, 15(4), 339–360. <https://doi.org/10.1016/j.ibusrev.2006.03.002>

Zheng, T., Ardolino, M., Bacchetti, A., and Perona, M. (2020). The applications of industry 4.0 technologies in manufacturing context: A systematic literature review. *International Journal of Production Research*, 59(6), 1922–1954. <https://doi.org/10.1080/00207543.2020.1824085>