Digital transformation and SME internationalisation

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Digital Transformation and SME Internationalisation: Unravelling the Moderated-Mediation Role of Digital Platforms Capabilities and Digital Resilience

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Digital Transformation and SME Internationalisation: Unravelling the Moderated-Mediation Role of Digital Capabilities, Digital Resilience, and Digital Maturity

Purpose. This study has two main objectives. First, to examine the indirect effects of digital platform capability and digital resilience on DT outcomes for small- and medium-sized enterprises (SMEs), and second, to investigate how digital business model maturity influences these indirect effects.

Methods. The study adopts a quantitative design and collects data through a self-reporting survey from individuals in the technological industries. The Partial Least Squares-Structural Equation Modelling (PLS-SEM) and PLS Multi-group analysis examine the measurement and structural models and the significance of differences in indirect paths based on the digital business model maturity level, serving as a moderator.

Originality. This research contributes to the existing literature by focusing on the international outcomes of platform ecosystems in developing markets. It explores how digital platform capability and resilience support the digital transformation of SMEs, considering their vulnerability due to their small size. The study also fills a research gap by investigating the relationship between big data, digital leadership, and the international growth of digital platforms. Lastly, it explores the role of digital maturity in the relationships between antecedents, determinants, and outcomes of digitalisation.

Findings. The findings of this study provide valuable insights into the internationalisation of digital SMEs. They indicate that digital platform capability and resilience fully mediate, connecting digital resources to SME growth. The study also confirms the digital business model maturity's positive and significant moderating effect on these indirect relationships.

Keywords. Digital Platform Capabilities, Digital Resilience, SMEs, International Growth, Customer Involvement, digital business model maturity.

1. Introduction

The new waves of technological disruption labelled "industry 4.0" have transformed existing revenue and business models and the international dimension of firms (Strange and Zucchella, 2017). Against this backdrop, SMEs have especially been necessitated to renew themselves and innovate how they create and capture value across foreign markets. These firms have adopted new digital platform-based business models that considerably reduced the minimum size and scale required for a small digital company to do business outside its original markets to respond quickly to these external challenges and disruptions (Evers *et al.*, 2023). They have successfully removed barriers and considerably reduced the minimum size and scale required for a small digital company to do business outside its original markets (Manyika *et al.*, 2016). While international entrepreneurship (IE) scholars are showing an increased interest in exploring the role of Digitalisation in SME internationalisation (e.g., Jafari-Sadeghi *et al.*, 2021), two gaps remain to be addressed.

Initially, it is imperative to acknowledge that the existing body of literature on IE has only recently begun to capture the international outcomes of Internet-based platforms (Ojala *et al.*, 2018; Liang Chen *et al.*, 2019). Hence, due to its nascency, our understanding of the antecedents and determinants of platform internationalisation remains underdeveloped, ambiguous (Evers et al., 2023), and unsynthesised (Ritter and Pedersen, 2020); thereby, it requires more quantitative evidence (Lee and Falahat, 2019). Also, given that the previous works have predominantly emanated from developing markets (e.g., Sinkovics *et al.*, 2013), the effect of digital platforms from within emerging markets has been subject to limited inquiry (Hervé *et al.*, 2021; Haddoud *et al.*, 2023).

Despite the presence of rigorous empirical evidence elucidating the core elements comprising a digital platform capability (DPC), there is a notable paucity of studies determining its antecedents and outcomes (Annarelli et al., 2021), such as data—in the context of international markets (Ritter and Pedersen, 2020; Evers *et al.*, 2023), digital leadership (DL)—lending deeper insights into the role of the leaders in a successful digital transformation (DT; Ritter and Pedersen, 2020) and their connection with the mentioned capability (Erhan *et al.*, 2022), as well as its consequential impact on international performance (Jean and Kim, 2020; Verhoef *et al.*, 2021). Moreover, despite the well-established impact of e-commerce, previous studies have failed to identify capabilities related to the platform phenomenon, such as DPC and resilience, that mediate the relationships between resources and performance (Cassetta *et al.*, 2020). Particularly, while the resilience capability has been established to contribute to a firm's competitive advantage, how it influences firm performance remains unknown (Gu *et al.*, 2021).

In the second instance, the dynamic and unpredictable nature of the global digital business environment has placed significant pressure on international firms to quickly adapt their business

models to external challenges and disruptions (Evers *et al.*, 2023). However, industry analysis indicates that less than 30% of DT programmes succeed (McKinsey, 2018), suggesting that SMEs struggle to cope with the scale and depth of the required changes (McCarthy *et al.*, 2021). In this respect, the adoption of digital technologies by firms has attracted the attention of researchers interested in understanding how SMEs seek opportunities to expand their businesses in foreign markets (Monaghan *et al.*, 2020; Evers and Andersson, 2021; Calandra *et al.*, 2023), which requires successful and constant re-thinking of existing business models (Child *et al.*, 2017; Bohnsack *et al.*, 2021; Colovic, 2022). To address this concern, digital business model maturity (DBMM) is introduced as a capacity to respond to change appropriately (Robertson *et al.*, 2022).

The prevailing use of the resource-based theory sets the backdrop for the literature on DT(Kraus *et al.*, 2022). Within this domain, a notable research gap arises concerning the achievements of SMEs in their resource innovation and strategic reconfigurations and its relationship with the overall performance and growth of the firm, particularly at heightened levels of DT, i.e., higher levels of DBMM, where industry 4.0 strategies seamlessly integrate into SMEs' operations (Agrawal *et al.*, 2018). In such a context, an unanswered enquiry remains: whether these firms exhibit success in resourceful innovation and strategic adaptability, enabling swift responses to external challenges and disruptions (Evers *et al.*, 2023), and demonstrate more robust performance in the international markets (Bouncken *et al.*, 2021; Vial, 2021). Therefore, exploring the interconnections between resources, capabilities, and performance, along with DBMM, becomes a compelling avenue of inquiry, which is vital for comprehending the significance of business model-related mechanisms in ensuring firms' long-term survival and global prominence (Bhatti *et al.*, 2021; Andreini *et al.*, 2022).

To address the two sets of gaps in the existing scholarly works, this paper first sets out to explore the relationships underpinning the international expansion of platform-based enterprises, generating fresh evidence for the IE literature (Evers et al., 2023) from an emerging economy (Hervé et al., 2021). It also endeavours to provide significant insights into the effects of digital resources and higher-order capabilities on DT outcomes (Jean and Kim, 2020; Verhoef *et al.*, 2021). The first objective is to investigate the indirect (mediating) effects of digital platform capability and digital resilience (DR) on the relationship between digital resources and international performance, which contributes to a deeper understanding of this growing body of literature (Annarelli *et al.*, 2021; Gu *et al.*, 2021). Next, employing a robust partial least square multi-group analysis, this paper compares the paths mentioned above across ventures categorised according to their level of DBMM. By doing so, it provides an insightful exploration of the moderating influence of Digitalisation on both the direct and mediating effects within an international context, which illuminates the outcomes of digital maturity (Bouncken *et al.*, 2021; Vial, 2021).

2. Theory and Hypotheses Development

2.1. SME Digitalisation: Background, Antecedents, and Implications

SMEs are increasingly vital in economies, encompassing both developed and emerging markets, since following the challenges of the pandemic crisis, many are transitioning to a digital economy. According to the IE literature, SMEs adapt their operations to meet foreign market requirements, striving to expand into foreign markets; hence, success in internationalisation now relies on SMEs' innovative technologies and adaptive capabilities (Asemokha *et al.*, 2019). In this context, a digital platform, which is one of the three manifestation forms of digital technologies (Nambisan, 2017), defined as a shared, common interface of services and architecture hosting complementary offerings, plays a central role as it has lowered transaction costs and capacity constraints, facilitated the access to a greater number of international markets (Manyika *et al.*, 2016), and enabled SMEs to coordinate transactions between users in a much larger scope (Nambisan, 2017).

To date, several studies have empirically shown that the internationalisation of digital SMEs differs from product-based and service-based ventures, characterised by online expansion, non-equity entry modes, and international partnerships (Cahen and Borini, 2020). Nonetheless, adopting a digital platform poses challenges for SMEs, particularly in developing countries (Ghobakhloo and Ching, 2019). Despite its economic importance, the research landscape concerning SMEs' digitisation's antecedents, capabilities, and implications remains limited (Eller *et al.*, 2020).

2.2. Digital Platform Capabilities, Digital Resilience, and Platform Internationalisation

In recent years, the resource-based theory and its extension, the organisational capabilities, have served as the conceptual basis for numerous studies investigating the internationalisation of digital SMEs (Abbasi Kamardi *et al.*, 2022). As digital resources alone may not be valuable, firm-specific, rare, non-substitutable, and hard to imitate, we argue that superior international growth (IG) can be generated only when, first, companies cultivate new capabilities, and second, new digital resources and capabilities are embedded within higher order capabilities (Jean and Kim, 2020). These capabilities could help digital platforms overcome the “liability of outsiders,” which refers to their potential lack of appeal to users in foreign markets (Brouthers *et al.*, 2016). Hence, building upon prior research platforms (Ojala *et al.*, 2018; Liang Chen *et al.*, 2019), the authors argue that successful online international expansion depends on the firm's specific higher-order and critical capabilities, including DPC and DR.

2.2.1. Digital Platform Capabilities

The increasing importance of digital platforms for entrepreneurial SMEs emphasises the significance of DPC, which represents an SME’s ability to effectively use digital resources as a competitive infrastructure (Cenamor *et al.*, 2019; Jean and Kim, 2020; Al-Matari *et al.*, 2022). DPC, considered a

higher-order capability, encompasses two key components: platform integration and platform reconfiguration capabilities. Platform integration is the ability to enhance internal communication and coordination, and platform reconfiguration stands for the ability to improve relational skills and partner knowledge. Researchers widely acknowledge that these first-order capabilities, as emphasised by Karimi and Walter (2015), are instrumental in achieving competitive advantage through the establishment of standards and rules, integrating and reconfiguring knowledge and resources, leveraging digital networks, and better connecting complementors (Annarelli *et al.*, 2021).

Despite resource constraints SMEs face, engaging in online platforms provides an efficient avenue for exporting, reducing costs associated with spatial distance (Vadana et al., 2021). Drawing on this concept, Jean and Kim (2020) show that platform and web capabilities positively relate to export marketing capabilities and performance. Several other studies have also suggested that an underdeveloped DPC hinders SMEs from entering global markets, making developing a robust DPC a central strategy for internationalisation (Westerlund, 2020). This strategic approach enables SMEs to efficiently leverage their resources for successful international entry and competitive success in international markets (Jin and Hurd, 2018).

2.2.2. Digital Resilience

The concept of resilience, stemming from the engineering discipline, has evolved and expanded to many disciplines, including the digital literature, as Wright (2016, p. 3) postulates that digital data and systems should be "free, accessible, interchangeable, operational, and up-to-date; hence resilient." The growing attention to resilience in a turbulent business environment stems from its positive impact on business performance and growth through sustainable operations (Sarfraz *et al.*, 2022). Research on resilience highlights its role as an organisational capability, enabling the ability to rebound and restore performance levels, coordinate and rebuild during crises, and meet customer needs while improving operational efficiency (Yang and Hsu, 2018). In digital markets, DR helps individuals recognise and manage the risks they encounter online business (Karimi and Walter, 2015; Sukumar *et al.*, 2023).

Digital platforms, in turn, offer effective means for companies to engage in far-reaching markets while maintaining real-time connectivity among virtual teams (Manyika et al., 2016). However, the virtual connection between complementors within digital platforms exposes internationalising firms to uncertainties and risks (Luo, 2022). At this point, resilience gives firms the dynamic capability to take transformative actions when faced with risks threatening the organisation's survival (Lengnick-Hall and Beck, 2016). In a parallel vein, organisational growth and survival are postulated to be highly dependent on the ability to reformulate processes and respond properly to the new environment (Kwak et al., 2018), proactively respond to changing market demand and disruption in the face of their

competitors, which together, supports the proposition that DR has the potential to improve firm's performance and growth in turbulent international markets (Yang and Hsu, 2018; Balakrishnan and Ramanathan, 2021).

2.3. Research Model and Hypotheses

Capabilities, particularly higher-order capabilities, can mediate the relationship between digitalisation, resources, and performance, facilitating SME internationalisation (Lee and Falahat, 2019). In this regard, the dynamic capabilities framework sheds light on the challenges firms face in DT, emphasising the importance of solid platforms and adaptive capabilities like resilience. These capabilities enable firms to seize opportunities, mobilise resources, and undergo organisational transformation (Teece, 2012).

[Insert Figure 1]

2.3.1. Customer as Data Provider

SMEs are transforming significantly, shifting from mass production to customised approaches (Wedel and Kannan, 2016), hinges on data availability and utilisation (Hervé *et al.*, 2021; Verhoef *et al.*, 2021). Consequently, this transformation necessitates a fresh perspective on data management for SMEs, introducing a novel customer-centric approach that highlights the potential for consumers and SMEs to gather big data, enabling them to generate new products and services (Rindfleisch *et al.*, 2017).

Recent studies have demonstrated the valuable role of "customer as data provider (CaDP)" in enhancing technological advancements and fostering competitiveness (Verhoef *et al.*, 2021), accelerating the selection of cost-effective resources and the generation of creative outputs with high returns for SMEs (Cui and Wu, 2017). This customer-centric approach extends its benefits to various domains, such as driving overall SME profitability and growth for firms and their digital platforms (Anning-Dorson, 2018; Tuominen *et al.*, 2022).

However, regarding the data as a digital resource, a firm's ability to deploy resources through capabilities is more crucial than the resources themselves (Yen-Chun Chen *et al.*, 2017). In digital platforms, effectively deploying DPCs becomes crucial for SMEs to leverage customer data and translate it into tangible innovation objectives (Bieńkowska and Tworek, 2021). The integration and reconfiguration capabilities enable knowledge exchange and facilitate design processes based on standardised interfaces and modular systems in the platform and operational frameworks (Cenamor *et al.*, 2019). DPCs provide the necessary standards, connectivity, and rules to mediate the production, search, and delivery of digital content and information goods within digital platform ecosystems, enabling collective knowledge and resource utilisation to adapt to market conditions, enhance new product performance, and drive overall company and platform growth (Karimi and Walter, 2015;

Bieńkowska and Tworek, 2021; Al-Matari *et al.*, 2022). Hence, based on these deliberations, the authors propose the following hypothesis:

H1a: Digital platform capabilities mediate the relationship between the customer as a data provider and international growth.

It is posited that information technology plays a critical role in making SMEs more resilient and responsive (Jafari-Sadeghi *et al.*, 2022). The ability to effectively use digital data is essential for achieving operational and strategic goals, ensuring organisational survival and growth (Al-Matari et al., 2022). While the role of data-enabled capabilities in resilience, an area punctuated by the supply chain literature, is well-established, the linkage between big data, resilience, and its effect on performance lacks empirical research in other fields (Rindfleisch *et al.*, 2017). However, in a data-rich environment where customers are inherently considered data providers, meeting technological requirements and customising offerings to customer needs becomes essential (Zhang and Xiao, 2020). While big data analytics offer opportunities for monitoring market trends and optimising operations, the mere presence of big data is insufficient for meeting customer needs (Strange and Zucchella, 2017). Instead, technical and governance capabilities are needed to analyse and operationalise that data (Constantiou and Kallinikos, 2015) to realise its potential to absorb the complexities in the volatile environment of sudden customer demands. This improves the firm's resilience by leveraging efficiency in resource use (Beuren et al., 2022) and promotes responsiveness (Gu et al., 2021). Resilience then improves performance and growth by encouraging creativity, searching for innovative business solutions, and expanding the behavioural repertoires (Lengnick-Hall and Beck, 2016), thereby indirectly enhancing overall SME growth and performance (Dubey et al., 2021; Bahrami et al., 2022; Beuren et al., 2022). Hence, based on the above review, the authors propose the following hypothesis:

H1b: Digital resilience mediates customer relationships as data providers and international growth.

2.3.2. Digital Leadership

Digital leadership has emerged as an integral approach to support SMEs in implementing a digital business model and thriving in the era of Industry 4.0. Digital leaders combine their leadership abilities with digital technologies, adding value to enterprises and demonstrating digital intelligence (Rudito and Sinaga, 2017). Within the context of DT, digital leaders play a pivotal role in deciding who and what should be involved in the implementation of DT programmes (McCarthy *et al.*, 2021), which aligns with the concept of leadership as the pursuit of actions that lead to the success of the SME (El Sawy *et al.*, 2020). Platform leaders, in particular, ensure the platform ecosystem's growth and survival, fostering change, innovation, and financial outcomes (Khaw *et al.*, 2022).

In the digital age, digital leaders respond to digital disruption by transforming their businesses through holistic approaches incorporating digital technologies, solutions, and capabilities to enhance SME performance (Schiuma *et al.*, 2022). They embed DPCs into their businesses, building core competencies that enable them to excel in the digital landscape. As SMEs embark on digitalisation journeys, digital leaders are encouraged to leverage digital platforms (Bogusz *et al.*, 2019). Located at the frontline of DT, they employ DPCs and integrate digital infrastructure and data by a digital platform to drive consistent performance (Benitez *et al.*, 2022).

Despite this, it is posited that there is a missing link between leadership, DPC and SME international performance. While research exploring the mediating role of DPC is limited, initial evidence suggests that DPC positively mediates the relationship between DL and performance (Benitez *et al.*, 2022). Developing digital capabilities, in general, requires a combination of digital, market, business, and strategic leadership skills, which can enhance business agility and, subsequently, contribute to improved IG and performance (Roberts and Grover, 2012; Jafari-Sadeghi *et al.*, 2023). Taken together, based on the deliberations, the authors propose the following hypothesis:

H2a: Digital platform capabilities mediate the relationship between the customer as a data provider and international growth.

DT necessitates effective organisational change, and continual innovation, in this regard, is seen as essential for survival and growth in the rapidly changing digital landscape (Schiuma *et al.*, 2022), enabling leaders to anticipate trends, solve complex problems, and make informed decisions (Kane *et al.*, 2019). Given the volatile nature of the digital environment (Erhan *et al.*, 2022), El Sawy *et al.* (2020) consider DL as an approach that ensures continuous innovation, strategic sustainability, and growth of the firm in a digital ecosystem. In this context, a digital leader has to define directions, think in different scenarios, realise weaknesses, and practice with ideas; hence, leadership can only influence performance outcomes indirectly.

Stated differently, good transformative leadership establishes growth and survival by inducing satisfaction (Bashir and Gani, 2020), enabling employees to respond promptly to disruptions (Teece, 2012), and anticipating customer needs. They use the platform to steer the firm clear of uncertainties (Bogusz *et al.*, 2019); thereby, these digital-savvy leaders improve the SME's chance of survival and growth by enhancing the resilience capability (Cahen and Borini, 2020; El Sawy *et al.*, 2020). Hence, collectively, the authors propose the following hypothesis:

H2b: Digital resilience mediates customer relationships as a data provider and international growth.

2.3.3. Moderating Role of digital business model maturity

As DT requires SMEs to evolve their business model, entailing significant changes to SMEs' properties and opening up new possibilities for firms to engage with customers through platforms, it calls for new ways of using data and directing business, boosting new capabilities and competitiveness (Schiuma *et al.*, 2022). Therefore, DTs may significantly disrupt platform leaders and their complements, and SMEs' internationalisation would only add to its complexity (Evers *et al.*, 2023). As such, digital maturity, defined as the identification, description, and optimisation of processes concerning digitalisation (North *et al.*, 2020), can be seen as a systematic method for a firm to adapt to compete effectively in a digital environment.

However, despite the benefits presented by DT, many SMEs struggle and fail to achieve the desired results (Nasiri *et al.*, 2022). In stark contrast, the effects of DT on the financial performance of some SMEs with a higher level of digital maturity are quite impressive; hence, it is proposed that the positive effects of digital technologies increase in parallel with the level of digital maturity (Nasiri *et al.*, 2022). When companies reach a higher level of maturity, they will achieve significantly higher levels of revenues and performance (Çallı and Çallı, 2021) and are more successful in internationalisation (Cassetta *et al.*, 2020; Anwar *et al.*, 2022; Reim *et al.*, 2022).

Further, besides the performance construct, studies on the moderating impact of digital maturity are limited. First, regarding the DPC, when new dynamic capabilities are embedded within processes to mobilise digital resources, the performance benefits of these capabilities increase, and the effects of capabilities on international performance would be much higher (Cassetta *et al.*, 2020; Anwar *et al.*, 2022). Second, by digital maturity and adoption of digital tools, resilience is affected, in the supply chain domain, per se (Faruquee *et al.*, 2021), and a smaller set of studies outside the supply chain domain reported the same results (Robertson *et al.*, 2022).

Third, as digital platforms rely on data processing, the maturity of these platforms involves more ease of access to data and more customer involvement in data collection and analytics (Al Halbusi *et al.*, 2022), enabling seamless integration of data and improving their competitive position. Lastly, many digital firms suffer from the leadership gap; while they have digital-savvy leaders in place (McKinsey, 2018), they fail to transform and achieve high growth. This is suggested to be related to the relationship between the roles of digital leaders and the platform's digital maturity level, which is critical to carry and supporting an SME toward a DT journey (Schiuma *et al.*, 2022). The study proposes that DBMM moderates all the hypothesised mediations (H1a–H2b), wherein the relationships are stronger for digitally mature firms. To assess the moderation effect, the hypotheses are:

H3a-d: Digital business model maturity moderates the relationships of CaDP → DPC → IG (H3a); CaDP → DPC → IG (H3b); DL → DPC → IG (H3c); DL → DR → IG (H3d).

In retrospect of the extensive literature review and the scholarly deliberations underpinning the development of hypotheses, the authors first strived to assess the relationships of digital resources (i.e., CaDP and DL) and capabilities (i.e., DPCs and DR) with the IG of digital SMEs. These investigations specifically focused on unravelling the mediating mechanisms employed by DPC and DR within the context of digital SME international growth. Additionally, the authors addressed the research gap regarding the moderating impact of digital maturity on the relationships within digital SME internationalisation. In the next section, the data collection methods within the SME context and the utilisation of the SmartPLS framework for analysis can be seen, ensuring rigour and validity in our study.

3. Research method

We conducted a study targeting entrepreneurial small- and medium-sized enterprises in the Information Technology sector in Iran to test the proposed hypotheses. These firms were selected considering the dynamic nature of their environment, entailing the ability to reconfigure their business models and operations as a requirement for growth in the international markets (Denicolai *et al.*, 2021). Regarding the choice of country, Iran was employed as an empirical research context for two reasons. First, according to the International Telecommunication Union, Iran is among the countries with the highest global growth rate in information technology over three consecutive evaluation periods, showing a significant rise in the industry's contribution to the GDP from 2.7 per cent in 2018 to 4.6 per cent in 2021 (Bakhtiari, 2021). Second, many entrepreneurs turned towards digital businesses as Iran integrated into increasing international competition. However, Iranian scholars seemed to adhere to the traditional entrepreneurship context, yet, they have only recently recognised the potential of digital entrepreneurship research in the country, which justifies the need and opportunity for research in this context.

3.1. Research approach and data collection

The study is based on a quantitative cross-section survey among the active firms in the IT industry (ISIC, Rev. 4; section J, divisions 61-63). The steps taken for conducting the research and analysing the data are presented in Figure 2. To obtain a representative sample, two criteria were applied. First, the selected firms had to meet the European Union definition of SMEs, having less than 250 employees. Second, to ensure the firms were internationally active, they had to have engaged in international activities in the past five years. Based on these criteria, from more than 1500 active firms in the industry, we narrowed our sample to 428 firms. The sampling method included clustering the sample based on the industrial park or zone in which it was located. Firms were asked through email, the official social media of “Iran Blockchain Community,” the largest community of Industry 4.0 in Iran, and through phone calls to fill out an online questionnaire; hence, the voluntary sampling method was

used in this step.

[Insert Figure 2]

A self-administered questionnaire targeting the CEOs of the firms was designed, which are key decision-makers (Reuber, 2018) and have a holistic overview of the company's operations and strategic orientation because they are involved in various activities (Cenamor et al., 2019). The instrument was pre-tested on three academic experts to achieve face and content validity, and minor adjustments were made to questionnaire items. The questionnaire was shared with a cover letter explaining its purpose and the potential benefits of the research and clearly stating that participation is voluntary. Respondents were also assured that their reported data would be confidential and used only for academic purposes. After multiple rounds of reminders through emails and calls, 185 usable responses were received, constituting a satisfying 43.22% response rate. While the sample size inherits the deficiencies related to the research on SMEs (Chidlow *et al.*, 2015), it confirms heterogeneity concerning age and size. As Table, I present, of the sample, nearly 82 per cent had a staff headcount of 10-100, and approximately 52 per cent were 10-25 years old.

[Insert Table I]

3.2. Variables

3.2.1. Dependent variable

When assessing international growth (IG), growth encompasses complete operationalisation, while growth orientation pertains to relative evaluation, an attitudinal concept based on subjective measurement. Previous studies have utilised diverse measurements, ranging from export intensity (Denicolai *et al.*, 2021) to subjective growth. Adopting the measure from Zhou *et al.* (2012) and drawing on pertinent literature, we operationalised IG based on a reflective self-reported perceptual measure. Table II represents the operationalisation of the constructs. The respondents were asked to compare their company's foreign sales growth, foreign profit growth, and foreign market share growth in the past three years with their major competitors on a seven-point Likert scale, ranging from 1 (completely disagree) to 7 (completely agree).

3.2.2. Independent variables

We adopted the *customer as a data provider* (CaDP) from Zhang and Xiao (2020), which was reflectively operationalised based on Rindfleisch *et al.* (2017) and by adjusting two scale items by Cui and Wu (2017) to capture the relevant role of the firm in the subject. Respondents were asked to rate their agreement on three statements related to the role of customers during the new product development process: (I) customers as data providers; (II) customers as data sources; and (III) the project team's involvement in customer data, based on a seven-point Likert scale.

To measure *digital leadership* (DL), we adopted measures from Erhan *et al.* (2022), which operationalises perceptions of DL based on the "Informatics Leadership" scale by Ulutaş and Arslan (2017). Six of the 18 items on the scale are related to the orientation dimension, explicitly used to capture DL. Respondents are asked to answer questions related to, and not limited to, raising awareness about the risks and technologies, determining ethical behaviours, and sharing experiences on a seven-point Likert scale.

3.2.3 Mediating variables

The digital resilience (DR) measure was adopted from the DR framework by the UK Counsel for Internet Safety (2020). The instrument is built based on four main domains of influence, including [I] understanding risks in the environment; [II] recognising and differentiating between diverse types of risks; [III] enabling users to assess risk and manage their experience, and [IV] policies that help a widespread understanding of online risks and harms to promote positive use of the Internet. The respondents are asked to answer eight questions on a seven-point Likert scale that reflectively measures how well the domains of influence promote each aspect of DR.

The construct of *digital platform capability* (DPC) was operationalised by adopting a second-order formative construct from Cenamor et al. (2019). DPC is formed by two reflective constructs consisting of four items each: Platform integration and Platform recognition. Platform integration involves questions related to enhancing internal communication and coordination, such as ease of access to data. Platform reconfiguration constitutes indexes related to improving relational skills and partner knowledge, such as adapting to include new partners easily. Participants are asked to answer items on a seven-point Likert scale for both constructs.

3.2.4. Moderating variable

Regarding the *digital business model maturity* (DBMM) construct, multiple frameworks and assessment instruments are available, each with deficiencies, ranging from the lack of a detailed description of the components, introducing a preliminary model, or defining no maturity level. However, the "Maturity and readiness model for Industry 4.0 strategy" developed by Akdil *et al.* (2018) matches the context of this study because, unlike the other frameworks, it does not suffer from the same deficiencies, mainly targets Industry 4.0 strategy, and provides expanded perspective for companies adopting Industry 4.0 strategies. To identify the maturity level, answers to the assessment survey are evaluated regarding four stages: "Absence," "Existence," "Survival," and "Maturity." The instrument comprises 13 associated fields grouped into three dimensions.

3.2.5. Control variables

We controlled for age and size as widely accepted variables that *situate* outside the framework but might have a relationship with the IG of SMEs. Age represents the number of years since the firm's

foundation, and staff headcount refers to the firm's size because older and larger firms are *stated* to typically have more access to resources and experience, on which they expand to international markets.

3.2.6. Addressing survey biases

We applied ex-ante procedural remedies to address the common method variance (CMV) (Chang *et al.*, 2010). The data collection was separated proximally, questionnaire items were shuffled, and items capturing independent and dependent variables were separated. Regarding the *ex-post* remedies, the emerging factor based on Harman's single-factor test explained 23.4% of the variance. To further substantiate this, following (Kock, 2015), the model was tested at the factor level, and no internal variance inflation factors (VIF) more than 3.3 were found, indicating the absence of CMV.

[Insert Table II]

3.3. Measurement model specification

Data were analysed using IBM Statistical Package for Social Sciences (IBM SPSS v.24) and partial least squares structural equation modelling (PLS-SEM) by SmartPLS 3.3.3 (Ringle *et al.*, 2015). Previous studies support this choice by recognising PLS-SEM as a suitable technique to test and validate the model for three reasons. First, PLS-SEM can potentially reveal new causal relationships, especially to uncover the heterogeneity in international business research. Second, it better focuses on predicting the dependent variable in novel predictive models (Hair Jr *et al.*, 2017). Third, PLS-SEM is more suitable for hierarchical component models with different measurement modes (Sarstedt *et al.*, 2016), which applies to this study, as there are two levels of abstraction for the DPC construct.

3.3.1. Assessment of reflective constructs

All the constructs, except for the second-order DPC, were operationalised as reflective. Various tests were conducted to ensure the reliability and validity of the reflective constructs. As Table II shows, Cronbach's alpha (α) serves as the traditional criterion for evaluating internal consistency, providing an estimate of the reliability based on the inter-correlations of the observed indicator variables. As a complementing criterion to Cronbach's α, composite reliability (rho_c) reveals the shared variance amongst a set of observed variables conceptualising a latent construct. α coefficients and rho_c values are within the suitable range for all variables. Concerning convergent validity, the outer loadings (indicator validity) sizes are also within the acceptable range, are statistically significant, and exceed the threshold of 0.708. The average variance extracted (AVE) was used as a criterion for the grand mean values of the squared loadings of all the indicators associated with the constructs. The results show that all constructs have AVE > 0.5, successfully explaining more than 50% of the variance in the constructs.

Regarding the extent to which the constructs are empirically differing from one another and the degree of differences between the overlapping constructs, we tested the Discriminant Validity, measured by the heterotrait-monotrait ratio of correlations (HTMT) $^{0.90}$ criterion (Table III). Different thresholds of 0.85 and 0.90 are suggested for HTMT. In this study, three constructs revealed an HTMT of more than 0.9; however, the upper bounds of the Confidence Intervals for these variables do not exceed one, suggesting that these constructs are empirically distinct.

[Insert Table III]

3.3.2. Assessment of higher-order formative construct

As a reflective-formative (type II) construct, DPC was measured by two first-order constructs: Platform integration and reconfiguration. Accordingly, the measurement modes differed depending on the level of variables. For the reflective measurement model assessment of the first-order variables, we used Mode A and treated the indicators as error-prone manifestations of the underlying construct (Sarstedt *et al.*, 2022). However, regarding the second-order variable (i.e., DPC), we used Mode B (formative) measurement; thereby assuming that the indicators represent different aspects of DPC that jointly define its meaning. The literature supports analysing hierarchical latent variables containing different measurement models (Sarstedt *et al.*, 2019). Hence, a two-stage approach was applied following Hair Jr *et al.* (2017).

[Insert Table IV]

In the first stage, we used a repeated indicator approach to calculate the latent variable scores and ran the PLS algorithm to assess the reflective (Mode A) model. In the second step, we omitted the first-order constructs to compute weight and significance and used the latent variable scores to assess the formative second-order (Mode B) construct. As shown in Table IV, the criterion of the collinearity of the indicators (VIF) and the significance of the indicator weight were calculated to assess the formative measure. The VIF values for the two first-order variables are below the threshold of 3.3 (Hair Jr *et al.*, 2017), indicating that the collinearity is insignificant. To assess the weight's significance, we performed a bootstrap, and the results show that all the weights of platform integration and platform reconfiguration are significant at $p < 0.001$ level.

4. Results

4.1. Structural model

To assess the formative model and test the hypothesis, we ran a two-tailed bias-corrected and accelerated (BCa) bootstrapping of 5000 subsamples with 95% confidence intervals (BCa-CIs) using SmartPLS 3.3.3 (Ringle *et al.*, 2015). This step includes addressing collinearity, evaluating the paths coefficients (β), standard errors (SE), *t*-statistics, confidence intervals, the predictive performance (R^2), the effect sizes (f^2), the standardised root mean square residual (SRMR), Bentler- Bonett normed fit

index (NFI), representing an incremental fit measure (Hair Jr *et al.*, 2017), and the predictive relevance (Q^2) through Blindfolding (Roldán and Sánchez-Franco, 2012).

[Insert Figure 3]

We initially examined the inner (structural) model for collinearity issues. Table IV results indicated that the predictor construct's tolerance values (Inner VIFs) were within the acceptable range. Bootstrapping analysis revealed that six out of eight direct paths were statistically significant. Figure 3 showed significant relationships between DPC and DR with IG. CaDP exhibited significant positive associations with DPC and DR, but its impact on IG was insignificant. Direct paths from DL to DPC and DR were significant, but DL did not significantly influence IG. Age and size were not significantly associated with the dependent variable.

[Insert Table V]

PLS-SEM aims to maximise the quality of the model and the amount of explained variance of each endogenous latent variable. The results revealed a substantial value of R^2 for DPC and moderate values for DR and IG. Next, to evaluate the impact of an exogenous construct, they are omitted in the model to calculate the changes in the R^2. The criterion indicating this impact is f^2 effect size was calculated (Nitzl et al., 2016). Blindfolding computed the Predictive relevance to assessing the cross-validated redundancy index (CV-R Q^2) and cross-validated communality (CV-C Q^2). Q^2 values larger than zero indicate that the exogenous constructs have predictive relevance for the endogenous constructs (Hair Jr *et al.*, 2017). The results support strong predictive relevance for the constructs (Q^2 above 0.5 for all endogenous variables). As a complementary method to predictive relevance, we also calculated the Predictive validity (out-of-sample predictive power). Following Shmueli *et al.* (2019), we ran $PLS_{Predict}$ for multiple repetitions (k = 10). Assuming that the sample size is adequate, the results reveal that the $Q^2_{Predict}$ values for all the indicators are above zero. Also, for all the thirteen indicators of the endogenous variables, SEM_{RMSE} is smaller than LM_{RMSE}, specifying that the model has high predictive power, as shown in Table 6.

Before turning to the mediation analysis, we evaluated the good fitness of the model. SRMR measures the squared discrepancy between the observed and the model-implied correlations (Henseler *et al.*, 2014). This study's SRMR is 0.038, and NFI is 0.905, supporting an acceptable model fitness level.

4.2. Mediation analysis

To assess the mediation significance, a specific mediation test was applied. After establishing the significance of the direct effects, following Nitzl *et al.* (2016), the model was tested for total effects, specific indirect effects, the type of mediation, and the variance accounted for (VAF). The results

reveal significant total effects for CaDP → IG and DL → IG, and also significant specific indirect paths through DPC and DR supporting full (indirect only) mediation for all four hypotheses H1a to H2b.

[Insert table VI]

4.3. Multi-group analysis

To build theory effectively (Reuber *et al.*, 2017) and address potential distortions in aggregate data analysis, namely negative and positive group-specific effects can cancelling each other out due to the heterogeneousness of the data (Hair Jr *et al.*, 2017), we tested the effects of "digital business model maturity" as a categorical moderator on the calculated Paths, specifically the indirect paths through PLS multi-group analysis (PLS-MGA). After applying the calculations posited by Akdil *et al.* (2018), we categorised the data into two groups: mature (frequency: 73) and immature (frequency: 112). Before conducting the PLS-MGA, which evaluates the differences in variations in the path coefficient of two groups (mature vs immature) and does not require any distributional assumptions for the two groups, we ran the PLS algorithm to calculate AVE, CR, and R^2 for the data groups. The results, as shown in Table VII, reveal suitable scores for the indexes, supporting the readiness of the measurement model to test the structural framework.

[Insert table VII]

We then applied the bootstrapping PLS-MGA using 5000 subsamples with BCs-ICs. A significant difference between the groups is inferred from the PLS-MGA p-values ≤ 0.05, as a nonparametric test, and t-statistics of either Parametric or Welch-Satterwait tests that assume equal and unequal variances across groups, respectively. As shown in Table VIII, the PLS-MGA results suggest that there are significant differences in the path coefficients: CaDP → DPC, CaDP → DR, DL → DPC, DL → DR, DR → IG, the total effects CaDP → IG and DL → IG, and the specific indirect paths CaDP → DPC → IG and DL → DR → IG; thereby, supporting H3a and H3d.

[Insert table VIII]

5. Discussion and Implications

5.1. Discussion

This research endeavours to examine two objectives: firstly, to examine the mediating influence of DPC and DR, and secondly, to evaluate the moderating effect of the digital maturity level of SMEs on the associations between their digital resources, capabilities, and IG.

Discussing the direct effects (Figure 3), consistent with previous studies, the relationship between DPC (e.g., Jin and Hurd, 2018) and DR (e.g., Balakrishnan and Ramanathan, 2021) with IG is positive, with DPC having a stronger relationship than DR, in terms of its more significant coefficient and effect size. A possible explanation for this difference might be that DPC facilitates the effectiveness of using digital resources as a competitive infrastructure. At the same time, DR sustains

the capacity for performance and reformulation of processes to face the dynamic nature of global digital markets. Surprisingly, the study was unable to demonstrate a significant positive relationship between CaDP and DL with IG, which disagrees with previous findings (*cf*. Anning-Dorson, 2018; Khaw *et al.*, 2022; Tuominen *et al.*, 2022). While these results should be approached with caution, they indicate that a customer-centric approach and transformative leadership alone might not ensure the international growth of the platform ecosystem (*cf*. El Sawy *et al.*, 2020).

Regarding the direct relationships of CaDP and Dl with DPC and DR, all paths are positive and statistically significant, following previous studies (e.g., Schiuma *et al.*, 2022). The effect of DL on DPC and DR is considerably more significant than that of CaDP due to its larger coefficient and f^2 effect size, which can be explained by the importance of DL compared to the other digital resource and capacity because it is the leader's strong ties with innovation, their cooperation skills, orchestration ability, and creativity that enable SMEs to grow and survive in the digital world (Beresford, 2018). Overall, the framework has satisfactory predictive power regarding the combined effects of the exogenous variable on IG, explaining more than 0.65 of the variance of the endogenous variable.

The mediation analysis (Table VI) supports the mediating relationships examined in the study, aligning with existing literature. Regarding the total effects, DL demonstrates a stronger impact on IG with a larger coefficient. However, a more detailed analysis of the specific indirect paths reveals that DPC exerts a greater influence on the relationship between CaDP and Dl with IG than DR, as evidenced by larger path coefficients and VAFs. These results reflect the theory that international growth through customer involvement is achieved only through integration and reconfiguration capabilities that facilitate the design, production, and exchange of data and knowledge in platform ecosystems (Karimi and Walter, 2015; Xu *et al.*, 2021; Al-Matari *et al.*, 2022). Functioning as the strongest mediator in the relationship between DL and IG model, the results broadly support the notion that only through DPC can digital leaders integrate digital infrastructure and data to drive consistent performance (Benitez *et al.*, 2022).

Regarding DR, the results agree that relying solely on big data is insufficient to ensure corporate success (Strange and Zucchella, 2017). The growth and survival of SMEs depend on effectively utilising digital data to achieve operational and strategic objectives, which are achieved only by supporting resilience (Dubey *et al.*, 2021; Gu *et al.*, 2021; Bahrami *et al.*, 2022). This DR fosters creativity and the pursuit of innovative business solutions while optimising resource utilisation (Beuren *et al.*, 2022). Turning to DL, the indirect only result of DR's mediating role analysis again accords with the extant literature (Cahen and Borini, 2020; El Sawy *et al.*, 2020), explicitly supporting the notion that digital leaders alone cannot guarantee international growth without the ability to anticipate trends, solve

complex problems during turbulent periods, and make intelligent business decisions (Kane *et al.*, 2019), enabling employees to respond promptly to disruptions (Teece, 2012; Li *et al.*, 2016).

Turning to the outcomes of the second objective (Table VIII) that explored the moderating influence of digital maturity on indirect relationships, we posited that digital maturity, specifically DBMM, would moderate all the anticipated mediating relationships. We hypothesised that the impact of exogenous variables on the endogenous variables, particularly the dependent variable, would be amplified when the firm demonstrates a high level of preparedness for Industry 4.0 strategies. The findings revealed that digital maturity significantly moderates the mediation paths: CaDP → DPC → IG and DL → DR → IG. While In contrast to earlier assumptions (cf. Schiuma *et al.*, 2022), the moderating effect of digital maturity on DPC → IG is insignificant. It reinforces the paths of CaDP → DPC and DR, indicating that as the firm's digital performance increases, the positive effect of data as a digital resource becomes stronger, aligning with previous research findings (e.g., Nasiri *et al.*, 2022). Consequently, this leads to significantly higher international growth by bolstering the mediating role of DPC, which aligns with prior research suggesting that companies that attain a certain level of maturity experience significantly higher revenue levels and enhanced performance (Çallı and Çallı, 2021) and greater success in internationalisation (Cassetta *et al.*, 2020; Anwar *et al.*, 2022; Reim *et al.*, 2022).

The results, lastly, offer evidence of the robust moderating influence of digital maturity on various paths: DL → DPC, DL → DR, DL → IG, DR → IG, and the indirect path: DL → DR → IG. These results are in line with previous conjectures that higher levels of digital maturity and the adoption of digital tools, accompanied by digitally proficient leaders (McKinsey, 2018), foster resilience (Faruquee *et al.*, 2021; Robertson *et al.*, 2022) and effectively propel SMEs on their journey toward digital maturity in international markets (Schiuma *et al.*, 2022).

5.2. Theoretical Contribution

This research makes significant theoretical contributions across five areas of literature. Firstly, it contributes to the overall paucity of research regarding the conceptualisations that frame the internationalisation of digital platforms (Brouthers *et al.*, 2016; Ojala *et al.*, 2018; Liang Chen *et al.*, 2019) and its interplay with digital resources and capabilities (Cahen and Borini, 2020; Eller *et al.*, 2020). Additionally, it provides valuable insights into the internationalisation of digital SMEs in a developing country (Sinkovics *et al.*, 2013; Ghobakhloo and Ching, 2019). Second, it supports a robust positive relationship between DPC and IG, aligning with prior studies linking web and digital capabilities to global market expansion (Jean and Kim, 2020; Westerlund, 2020). Moreover, the significant positive path from DR to IG contributes to the literature by highlighting that an SME's ability to withstand digital disruptions can foster growth in international markets (Kwak *et al.*, 2018; Yang

and Hsu, 2018; Balakrishnan and Ramanathan, 2021; Gu *et al.*, 2021).

Thirdly, it establishes a fully mediated relationship between CaDP and IG through DPC and DR. This finding emphasises that having a large amount of data alone does not ensure successful DT in international markets; rather, effectively utilising capabilities is crucial. Thereby, it supports existing research exploring the indirect link between customers as data providers (i.e., big data) and performance through DPC (Yen-Chun Chen *et al.*, 2017; Strange and Zucchella, 2017; Lee and Falahat, 2019; Bieńkowska and Tworek, 2021). Furthermore, this study fills a gap in the literature by investigating the antecedents and determinants of platform internationalisation through DR (Lee and Falahat, 2019; Evers *et al.*, 2023). Consistent with the notion that firms capable of adapting to dynamic business environments are more likely to excel internationally, this study establishes that big data can lead to IG by enabling DR (Dubey *et al.*, 2021; Gu *et al.*, 2021; Al-Matari *et al.*, 2022; Bahrami *et al.*, 2022; Beuren *et al.*, 2022).

The findings of the fourth set of contributions reveal that DL does not significantly impact IG. However, DPC and DR act as full mediators in the relationship between DL and IG. This surprising result sheds new light on the role of DL in adopting digital solutions within the context of Industry 4.0 (Eberl and Drews, 2021). It supports prior studies highlighting how digital leaders respond to disruptions and induce international expansion by developing resilience capabilities (Teece, 2012; Li *et al.*, 2016; Bashir and Gani, 2020) and enabling platform expansion through DPC Weill and Woerner, 2018; Benitez *et al.*, 2022).

Regarding the second objective of the research, the latest findings shed light on the moderating impact of DBMM, addressing the research gap related to the role of heightened levels of SMEs' digital innovation in enhancing their capacity to achieve DPC, resilience, and success in international markets (Bouncken et al., 2021; Vial, 2021). The results underscore the importance of seamlessly integrating Industry 4.0 strategies into SMEs' operations and the effective utilisation and integration of customer-provided data through DPC in digitally-mature SMEs, as it leads to greater IG. This aligns with the notion that a capability-based approach to management, rather than a process-based approach, generates greater organisational value (North et al., 2020). Lastly, the study reveals that with the DBMM bolstering the relationship between DL and capabilities, particularly DR, firms are better equipped to achieve international success by swiftly responding to external challenges and disruptions (Evers et al., 2023). This adds valuable insights to the existing literature on the business model-related mechanisms that contribute to firms' long-term survival and global prominence (Bhatti et al., 2021; Andreini et al., 2022).

5.3. Practical Implications

This research study has significant practical implications for practitioners, managers, and policymakers

aiming to develop effective strategies for platform internationalisation. Next to the characteristics of any leader, a digital platform leader must possess a certain level of skillset (Hensellek, 2020) and play a pivotal role in driving the company towards digital maturity. Foremost, a digital leader must demonstrate a keen awareness of the risks associated with digitalisation to enhance the firm's resilience, produce significant gains in adaptive capacity, and navigate disruptions successfully. Also, to properly reap the benefits of customer data and secure their DT and growth, practitioners must constantly re-think their business model and seek to adopt digital capabilities.

Well-informed managers can make better decisions, facilitating platform growth and resilience even in disruptions or challenges. While big data technologies, as one of the artefacts associated with digitalisation, present certain risks such as cyber-attacks, data loss, and other security issues (Hervé *et al.*, 2021), we suggest that if the capabilities of these digital technologies are well-developed and embedded in the company and if the company has achieved a high digital maturity level, the benefits of this DT will significantly outweigh its risks. This could also benefit SMEs because the failure of DT may be due to the excessive emphasis managers place on the technical aspect of digital technology (Wu *et al.*, 2021).

From a policy perspective, as an imperative consideration, SMEs must focus on establishing a solid foundation that empowers entrepreneurs to synergistically integrate diverse resources and capabilities, encompassing digitalisation, strategic orientations, and internationalisation activities, while formulating their unique digital entrepreneurial internationalisation strategy. Similar to Hervé *et al.* (2021), we emphasise that the expeditious comprehension of the advantages stemming from the adoption of digital technologies, guided by a clear vision, enables the entrepreneurial ecosystem to swiftly cultivate the appropriate mindset necessary to realise their transformative goals and bolster their internationalisation endeavours. Moreover, gaining a deeper understanding of SMEs' digital behaviour provides insights into potentially new dimensions of policy intervention.

6. Conclusions, Limitations and Future Research Directions

The study faces limitations concerning its purpose, context, methodology, data collection quality, level of analysis, and generalizability. First, while as a purpose, a key strength of the study was to connect understudied digital resources and capabilities with the internationalisation theory, drawing causal relationships is constrained due to the cross-sectional nature of the research. Longitudinal or panel data could enhance future studies in this regard. The study's categorisation of internationalising SMEs based solely on digital maturity neglects a crucial aspect of the theory: internationalisation patterns. Future research is thus recommended to incorporate firms' patterns and examine the interconnections between digital resources, capabilities, and internationalisation. The current research predominantly focuses on CaDP, DDPC, and DL. To enrich the understanding of

digitalisation's impact, future investigations could explore other emerging digital technology concepts, such as customer data analysis, artificial intelligence capabilities, and antecedents to effective DL, including employee trust.

Second, the study's context, focused on a developing country market, necessitates cautious interpretation and generalisation. However, globalisation has diminished market barriers, rendering the results applicable to SMEs in more developed markets like Europe. Verification through cross-country studies is recommended to confirm the transferability of concepts and abstractions. The study's contextual issues arise from Iran's unique economic and infrastructural characteristics, including sanctions, shutdowns and limited internet traffic, which hinder the internationalisation pace of digital SMEs. These factors contributed to the small sample size as firms exhibited limited enthusiasm to participate.

Third, regarding the method and data collection, although the sample size meets the minimum requirements in international business research, its relative smallness may hinder comprehensive result extraction and expansion. To address this, future studies can enhance their sample sizes and undertake additional qualitative or quantitative investigations in different regions to validate and enrich the findings. While data and theoretical saturation were reached during data collection, important individuals such as the chief digital officer (CDO) were inadvertently neglected. Future research should examine organisational transformation by collecting data from multiple stakeholders and employees at different hierarchical levels to gain a holistic understanding.

Fourth, the study does not account for within-group differences, highlighting the need for a more detailed exploration and comparison of digital maturity quadrants to gain further insights. Also, using PLS with cross-sectional data has inherent limitations, including spurious results and potential reverse causality. Advanced data-based techniques like Configural Analysis and Supervised Machine Learning can be complementary to address these. Complementary data-based techniques like Configural Analysis and Supervised Machine Learning can be employed to address these limitations effectively. Configural analysis, focusing on combinations of variables leading to outcomes, complements this approach and allows for identifying and analysing emergent patterns and causal effects. Additionally, Supervised Machine Learning is valuable for exploring intricate relationships using deep neural networks between digitalisation and internationalisation research elements. By adopting these complementary techniques, future research can formulate complex or recursive models that better capture the essence of the relationships between digitalisation and internationalisation.

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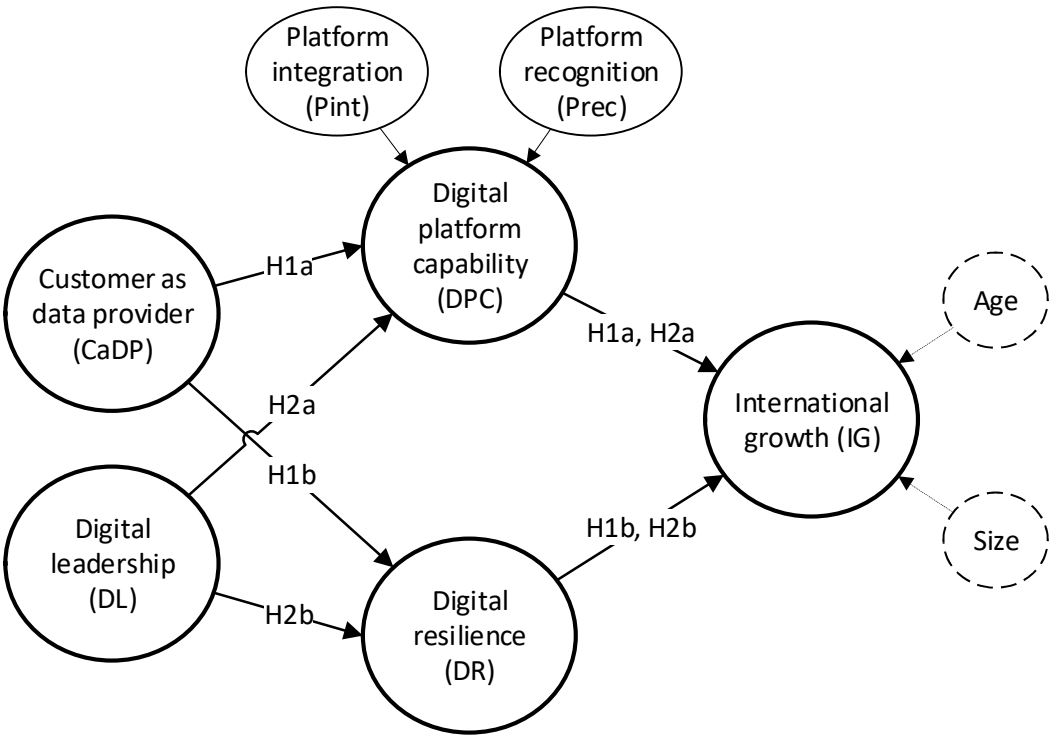

Figure 1. The proposed framework/conceptual model (source: created by the authors)

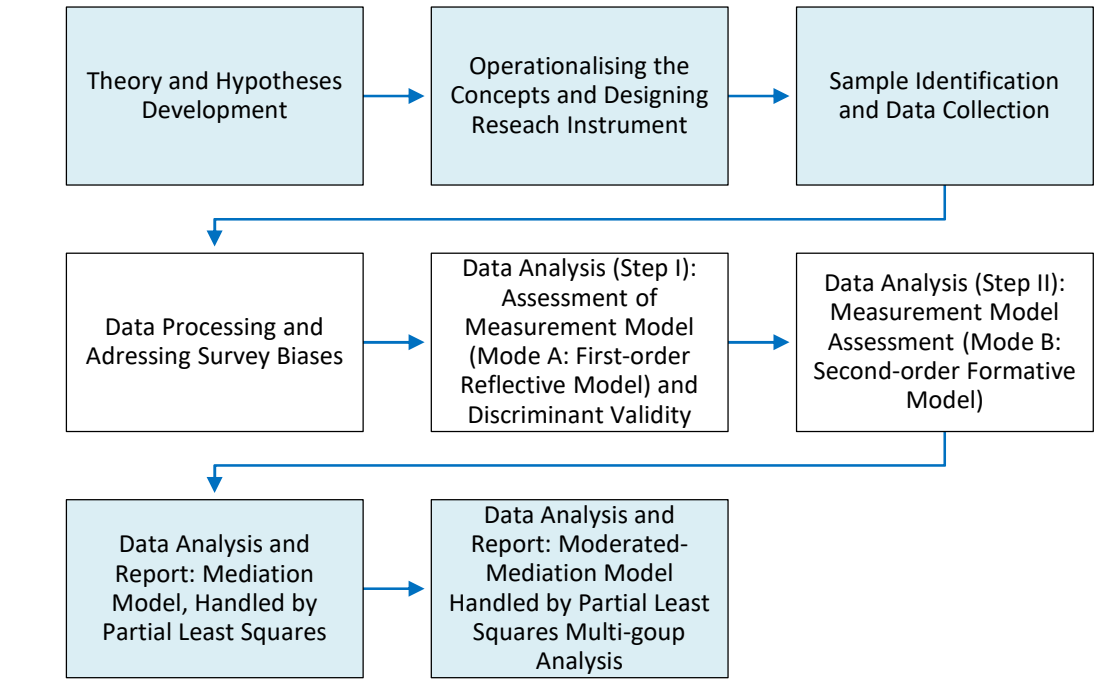

Figure 2. The Research Framework (source: created by the authors)

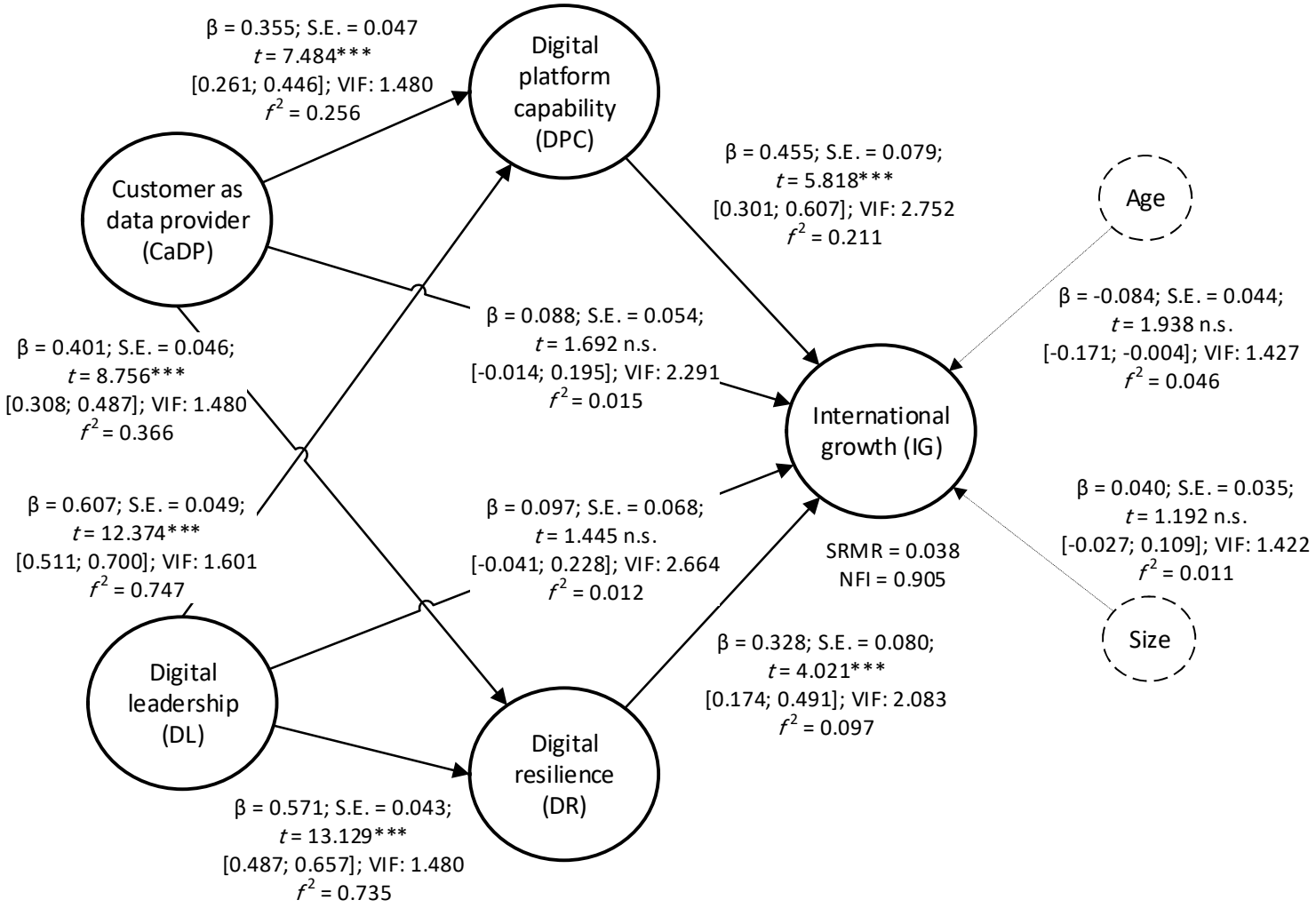

Figure 3. Assessment of the structural model (Direct paths). Note: *p < 0.05; **p < 0.01; ***p < 0.001, n.s.: not significant; BCa Bootstrapping based on n=5000 subsamples, two-tailed, and 95% Confidence intervals. f^2 effect size thresholds: small: 0.02, medium: 0.15, and large: 0.35 (source: created by the authors)

Table I. Sample characteristics (source: created by the authors)

Variable	Frequency (%)	Mean	STDEV
Firm Size (Employees)		59.63	34.18
1–9	5 (2.70)		
10–49	81 (43.78)		
50–99	71 (38.38)		
100–150	28 (15.14)		
Firm Age (yrs.)		11.25	6.24
Below 5	39 (21.08)		
6 – 10	47 (25.4)		
10 - 25	96 (51.89)		
More than 25	3 (1.63)		
Industrial class (ISIC Section J, division code)			
Telecommunications (61)	73 (39.46)		
Computer programming (62)	67 (36.21)		
Information service (63)	45 (24.33)		

Table II. Operationalisation of the variables and measurement model results for first-order constructs (Mode A) (Step I) (source: created by the authors)

Items and Constructs	Loading	t-value
Customers as Data Providers (CaDP) (Zhang & Xiao, 2020) [α = 0.843; ρ_A = 0.844; CR = 0.805; AVE = 0.761]		
During the new product development process, customers were our main data providers	0.882	62.997
… customers were our key data sources	0.872	50.484
… the project team actively searched, analysed, and acted on customer data	0.862	51.562
Digital Leadership (DL) (Erhan *et al.*, 2022) [α = 0.838; ρ_A = 0.880; CR = 0.853; AVE = 0.802]		
A digital leader raises employees' awareness about the risks of information technologies	0.898	73.131
… raises employees' awareness about the technologies that can be used to improve the organisational processes	0.887	62.613
… determines required ethical behaviours for information implementations with all the stakeholders	0.908	78.330
… plays an informative role in reducing the resistance towards innovations brought by information technologies	0.890	66.915
… shares own experiences about technological opportunities that will increase the contributions to the colleagues for the structure of the learning organisation	0.895	61.621
Platform integration (PInt) (Cenamor *et al.*, 2019) [α = 0.870; ρ_A = 0.871; CR = 0.881; AVE = 0.719]		
Our platform easily accesses data from our partners' IT systems	0.919	110.321
… provides a seamless connection between our partners' IT systems	0.921	114.200
… can exchange real-time information with our partners	0.920	105.880
… easily aggregates relevant information from our partners' databases	0.891	88.198
Platform Reconfiguration (PRec) (Cenamor *et al.*, 2019) [α = 0.893; ρ_A = 0.933; CR = 0.852; AVE = 0.833]		
… is easily adapted to include new partners	0.915	99.261
… can be easily extended to accommodate new IT applications or functions	0.923	124.823
… employs standards that most current and potential partners accept	0.906	57.505
… consists of modular software components, most of which can be reused in other business applications	0.920	109.525
Digital Resilience (DR) (UKCIS, 2020) [α = 0.876; ρ_A = 0.936; CR = 0.854; AVE = 0.839]		
People are given appropriate access to online services	0.719	14.954
… encouraged to recognise the risk	0.764	17.470
… encouraged to differentiate between varying types of risk	0.714	11.518
… encouraged to report harm	0.756	16.087
… encouraged to use varying reporting mechanisms	0.716	9.582
… encouraged and supported to adapt behaviours and, where possible, to reduce future harm	0.763	14.737
… encouraged to seek recovery services	0.740	12.866
… provided opportunities and encouraged them to inform/review/co-create the system to reduce risk or improve opportunities for others	0.759	18.333
International Growth (IG) (Zhou *et al.*, 2012) [α = 0.871; ρ_A = 0.872; CR = 0.893; AVE = 0.795]		
Our Foreign profit growth is much better than our main competitors	0.882	66.919
Our Foreign sales growth is much better than our main competitors	0.899	83.176
Our Foreign market share growth is much better than our main competitors	0.895	74.577

Note: α = Cronbach's Alpha (CA): 0.70≤ α ≤1; Composite Reliability (CR/ rho_c): 0.70≤ ρc ≤1.00; Convergent validity (AVE): 0.50 ≤ ρve ≤ 1.00. Outer loadings (indicator validity) size range: 0.714 – 0.923. All the AVE, CR, Cronbach's alpha, and ρA (rho_a) values are significant at p< 0.001.

Table III. Descriptive statistics and HTMT for discriminant validity (Step I) (source: created by the authors)

Contracts	Mean	STDEV	[1]	[2]	[3]	[4]	[5]	[6]	[7]
[1] CaDP	4.210	1.832							
[2] DL	4.244	1.811	0.641						
[3] Pint	4.224	1.838	0.874†	0.596					
[4] PRec	4.240	1.796	0.894††	0.649	0.879†††				
[5] DR	4.199	1.863	0.462	0.784	0.486	0.507			
[6] IG	4.073	1.833	0.764	0.630	0.751	0.753	0.513		
[7] Size	59.632	34.181	0.034	0.099	0.020	0.029	0.084	0.058	
[8] Age	11.259	6.243	0.056	0.052	0.087	0.009	0.050	0.113	0.499

Notes: HTMT < 0.85; HTMT confidence intervals (5%, 95%): † [0.929; 0.985]; †† [0.945; 0.996]; ††† [0.940; 0.988].

Table IV. Measurement model results for second-order constructs (Mode B) (Step II) (source: created by the authors)

Higher and Lower order Constructs	Weights	VIF	t-Value	95% BCa-CIs
Digital Platform Capability (DPC)				
[1] Platform integration	0.512	2.294	9.571***	[0.851; 0.881]
[2] Platform reconfiguration	0.521	2.294	9.706***	[0.854; 0.881]

Note: ***p < 0.001; VIF (Variance Inflation Factor): $0.20 \leq VIF \leq 3.00$.

Table V. The effect size of the endogenous variable (source: created by the authors)

Constructs	R^2	CV-C Q^2	CV-R Q^2
Digital Platform Capability	0.812	0.655	0.798
Digital Resilience	0.510	0.615	0.611
International Growth	0.650	0.560	0.696

Notes: CV-C Q^2 = Cross-validated Communality, CV-R Q^2 = Cross-validated Redundancy; R^2 value range: substantial: ≥ 0.75, moderate: ≥ 0.50, weak: ≤ 0.25.

Table VI. The mediation analysis (source: created by the authors)

Total effects				Specific Indirect Paths	Mediating effects				Mediation type (VAF)
Paths	β	SE	t-statistics		β	SE	t-statistics	95% BCa-CIs	
CaDP → IG	0.293	0.041	7.036***	H1a: CaDP → DPC → IG	0.161	0.034	4.765***	[0.175; 0.384]	Indirect only (0.549)
				H1b: CaDP → DR → IG	0.132	0.036	3.623***	[0.067; 0.206]	Indirect only (0.450)
DL → IG	0.464	0.063	10.611***	H2a: DL → DPC → IG	0.277	0.054	5.114***	[0.104; 0.239]	Indirect only (0.596)
				H2b: DL → DR → IG	0.187	0.048	3.791***	[0.093; 0.280]	Indirect only (0.403)

Note: *p < 0.05; **p < 0.01; ***p < 0.001, n.s.: not significant; BCa Bootstrapping based on n=5000 subsamples, two-tailed, and 95% Confidence intervals.

Table VII. Measurement model quality criteria for data groups based on business model maturity (source: created by the authors)

Constructs	AVE		CR		R^2	
	Immature	Mature	Immature	Mature	Immature	Mature
CaDP	0.518	0.811	0.768	0.928	n.a.	n.a.
DL	0.577	0.814	0.819	0.956	n.a.	n.a.
Pint	0.550	0.795	0.772	0.939	n.a.	n.a.
PRec	0.650	0.829	0.778	0.951	n.a.	n.a.
DPC	n.a.	n.a.	n.a.	n.a.	0.555	0.121
DR	0.509	0.586	0.786	0.918	0.672	0.468
IG	0.538	0.503	0.776	0.736	0.583	0.328

Note: n.a.: not applicable; Composite Reliability (CR): $0.70 \leq \rho c \leq 1.00$; Convergent validity (AVE): $0.50 \leq \rho ve \leq 1$.

Table VIII. PLS-MGA results for direct relationships of mature vs immature levels of Digital Business Model Maturity (source: created by the authors)

Parameters	Path coefficient (β)			Multi-group analysis	Parametric test	Welch-Satterwait test	Remark
	Mature (M)	Immature (I)	Diff.	p-value M vs I	t-value M vs I	t-value M vs I	
Direct effects							
CaDP → DPC	0.400	-0.340	0.740	0.025	3.368**	1.854 n.s.	Supported
CaDP → DR	0.467	-0.409	0.876	0.036	3.733***	1.092 n.s.	Supported
CaDP → IG	0.494	0.064	0.429	0.396	1.822 n.s.	0.992 n.s.	Not supported
DL → DPC	0.156	0.615	-0.459	0.024	2.422*	1.470 n.s.	Supported
DL → DR	0.235	0.607	-0.372	0.000	2.287*	2.323*	Supported
DL → IG	0.406	-0.114	0.520	0.183	2.089*	1.340 n.s.	Not supported
DPC → IG	0.514	0.466	0.048	0.911	0.181 n.s.	0.120 n.s.	Not supported
DR → IG	0.563	-0.350	0.912	0.043	3.102**	1.910 n.s.	Supported
Total effects							
CaDP → IG	0.318	-0.285	0.603	0.031	3.757***	2.258*	Supported
DL → IG	0.286	-0.497	0.782	0.009	3.940***	2.747*	Supported
Specific indirect effects							
H3a: CaDP → DPC → IG	0.205	-0.158	0.364	0.042	3.248**	2.140*	Supported
H3a: CaDP → DR → IG	0.221	-0.136	0.357	0.152	2.342*	1.355 n.s.	Not supported
H3c: DL → DPC → IG	0.080	0.287	-0.206	0.182	1.338 n.s.	1.280 n.s.	Not supported
H3d: DL → DR → IG	0.366	-0.210	0.576	0.045	3.147**	2.973**	Supported

Notes: *p < 0.05; **p < 0.01; ***p < 0.001; n.s. not supported; PLS-MGA test (two-tailed); n = 5,000 subsamples; 95% confidence intervals.