How Does Remote Analytics Empowerment Capability Payoff in the Emerging Industrial Revolution?

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Abstract

The world has witnessed a meteoric rise of remote working using digital platforms and technologies due to the COVID-19 pandemic. Since data is at the heart of the digital work environment, analytics empowerment capability can enable employees to link with key customers. However, understanding the foundations of such capability in a remote working setting remains a formidable challenge. Drawing on dynamic capability and empowerment theories, this study fills this gap by exploring the drivers of remote analytics empowerment capability (RAEC) and their holistic effects on customer linking and firm performance. The

findings confirm digital technology & tools, information access, decision making, knowledge & skills, and training & development as the drivers of RAEC, which has a significant effect on outcome constructs. The findings also confirm the mediating role of customer linking between RAEC and firm performance.

Keywords: Analytics empowerment capability, Customer Linking, Service adaptation.

1. Introduction

> *"The COVID-19 crisis emphasizes digitalization's role in resiliency, but it has an important side effect — never before has data and the analytical insights it generates, been so critical to enterprise survival."*
> - *Dr Chris Marshall, Associate Vice President for Data and Analytics, IDC Asia/Pacific, Singapore.*

Echoing similar sentiments, some consulting practitioners define that the "workplace is where the work lives" (Evans-Greenwood, Stockdate, & Patston, 2021 p.2). Remote working is a consequence of the transformative changes in the digital revolution in channeling the workload to where human resources are dwelling (Fitzsimmons, Fitzsimmons, & Bordolai, 2014; Motamarri, 2018; Wirtz & Lovelock, 2021). This transformation is, in essence, a transient evolution of enterprise computing from the initial days of centralized data crunching to the current massive data centers (or cloud), which blurred as well as took away the requirement for the co-location of computing power and its consumers (Kotlarsky, Scarbrough, & Oshri, 2014; Oshri, Kotlarsky, & Willcocks, 2009). These changes, in turn, facilitated the global shift of pushing manufacturing and ICT development and operations to least-cost countries (Alsudairi & Dwivedi, 2010), paving the way for the outsourcing revolution[1]. It is not an exaggeration to say that there is no single enterprise or individual who is not impacted by this outsourcing phenomenon. For example, it is estimated that 70-80% of finished

[1] Based on one of the authors' invited talks on 'IT Outsourcing Overview' delivered at SP Jain School of Global Management, Sydney, 2016 and a business case prepared for IBM Singapore's Data Centre Strategy 2004.

manufacturing products are outsourced, and China is the most popular destination; and the global IT outsourcing market is projected to be US$397.6 Billion by 2025, with IBM being the largest IT outsourcing company in the world (Edgson, 2021). Coming back to remote working, conventionally organizational work or business processes are thought to be a collaborative enterprise of the workforce co-located in a defined physical workspace termed either as the office or the shop floor in case of manufacturing. Futurists have long since envisaged the emergence of *digital infrastructure* that would provide a connected environment that blurs the distance, providing a *virtual collaborative space* to achieve the goal of *working together apart* (Chamakiotis, Panteli, & Davison, 2021; Daniels, Lamond, & Standen, 2001; Dwivedi et al., 2020; Kapoor, Bigdeli, Dwivedi, & Raman, 2021; Nambisan, 2017; Olson & Olson, 2000).

Organizational work, irrespective of its macro nature, is a collective endeavor of all individual employees. It also depends on the continuous and recurrent to-and-fro exchange of information units among actors within teams, intra- or inter-organizational and minute of decisions by individual employees (Felin, Foss, Heimeriks, & Madsen, 2012). Empowerment as a means of enabling the workforce to make decisions and decide on the course of action has been advocated and practiced in the manufacturing and services industry for several decades (Bowen & Lawler, 1992; George & Zakkariya, 2018a). Conceptual works on empowerment emerged in the 1970s (George & Zakkariya, 2018a, 2018b; Maynard, Gilson, & Mathieu, 2012). As a natural progression, both theoreticians, practitioners and senior management recognized the need to implement empowerment programs to derive organizational productivity. The literature has argued for employee empowerment in the wake of the massive transformation of the workplace since the 1990s due to Information and Communication Technology (ICT) and the recent data-driven revolution (Huang & Rust, 2017; Larivière et al., 2017; Ostrom et al., 2021). The COVID-19 pandemic and the associated workplace restrictions have given a massive jolt to the organizations to switch to remote work or close-down their

businesses (Dwivedi et al., 2020; Lal, Dwivedi, & Haag, 2021; Productivity Commission, 2021). Not every corporation has the adequate digital infrastructure and organizational processes to switch to this 'gear'. There are corporations like IBM that had embarked on remote working for more than two decades, at least for their services workforce whereas the rest of the corporations are not prepared for the *new normal* (Accenture & Qlik, 2020; IBM, 2020).

A recent worldwide survey of 9,000 respondents by Accenture and Qlik revealed some intriguing facts about data collection and usage in remote working (Accenture & Qlik, 2020). The study notes that organizations never analyze 60-73% of their data. Only 32 per cent of executives voiced that they were able to create measurable value from data. The findings also highlight an anomaly of perceptions between top executives and employees. While the executives think that their employees are data-literate, the employees think that their skills are inadequate. The study reveals that organizations are sitting on a gold mine of data, and the biggest roadblocks to value creation are data literacy of the workforce and inaccessibility of the data to the right employees at the right place and time. The emerging new normal, data revolution and the need to empower the workforce to manage the complex and dynamic work environments has motivated us to root our study on the analytics empowerment of employees in remote working. Miller & Davenport (2021) also anticipate that the future of work involves employee collaboration or coworking with AI powered tools which necessitates autonomy and empowerment to employees.

Empowerment as an enabler to dynamic capabilities (DCs) emphasizes the need for organizational job designs that promote adaptive abilities to cope with uncertainties and navigate through '*unknown unknowns*' (Felin & Powell, 2016; Teece & Leih, 2016). As this new normal of work style is emerging, one thing appears to be certain; that the work delivery in the post-pandemic world is not going to be the same as before. The Australian Government's

study on the framework of remote work asserts that before the COVID-19 pandemic, no organization would have experimented on remote delivery of work as only 8% of the workforce performed remotely in 2019. This number dramatically increased to 40% in 2020 and remained at 38% in 2021, while pandemic restrictions were being eased. With these insights, the government agency concludes that remote work is possibly an enduring change, and about 35-40% of all work performed could be done remotely (Productivity Commission, 2021). There is ample anecdotal evidence that the analytics empowerment capability of employees in remote settings helped organizations gain performance advantages (IDC, 2021). For example, Emily Stevens, Managing Editor at Career Foundry, notes that there is an uptake in the job advertisements for remote data scientists (Stevens, 2021). Corporations like Refinitiv that feed financial-market data and provide infrastructure to other corporations report that their analytics insights have helped their customers (D'Auria et al., 2020). Thus, we envisage the integration of empowerment and analytics to enable employees to effectively engage with customers from remote locations, satisfy customer needs and contribute to the long-term sustainability of their corporate mission and goals. We conceive this effective decision making and offering of solutions by leveraging information, knowledge & skills as remote analytics empowerment capability (RAEC). Given the complex workplace evolutions during the COVID-19 pandemic and likely to endure in the post-pandemic world, the authors envisage that the RAEC of employees plays a very significant role in organizational performance. However, there is a paucity of research on the dimensions and effects of RAEC. Concerning this broad theme, this investigation addresses the following two research questions:

RQ1: What are the antecedents of remote analytics empowerment capability?

RQ2: What are the effects of remote analytics empowerment capability?

To address these research questions, we have reviewed the existing literature for suitable constructs to conceptualize RAEC. Bowen & Lawler (1992) first proposed a conceptual model

of employee empowerment consisting of four dimensions, namely power, information, knowledge, and rewards. Until recent extensions, the prevailing empirical works on empowerment are that of Spreitzer (1995; 2008). Spretizer's empowerment model is a second-order construct formed by four sub-dimensions, namely meaning, competence, self-determination, and impact. Motamarri et al. (2020) have recently reconceptualized frontline empowerment to account for the changing workplace, technological, and analytics developments (Bowen, 2016; Kiron, Prentice, & Ferguson, 2014; Larivière et al., 2017; Mariani & Wamba, 2020). Relying on these latest developments, we developed a research model linking RAEC to outcome variables, customer linking and firm performance. The existing literature streams of empowerment, dynamic capabilities, and big data analytics have emphasized the enablement of employees with access to information, but no conceptualization exists that has explicitly treated analytics empowerment of remote workers (Maynard et al., 2012; Motamarri, Akter, & Yanamandram, 2017; Motamarri et al., 2020). This research bridges this significant gap and assesses the impact of RAEC on organizational performance.

The rest of the paper is organized as follows. Section 2 reviews relevant theories of empowerment and dynamic capabilities and develops the research model. Section 3 describes the research and data collection method, followed by a PLS-SEM analysis of the model. Section 4 summarizes the findings. Section 5 presents theoretical contributions, managerial implications, limitations of the study, and future directions. Finally, Section 6 concludes the investigation.

2. Literature Review and theory

2.1. Significance of analytics empowerment capability in the remote environment

The idea of remote work has recently received significant importance in practice and academia due to the COVID-19 pandemic (e.g., Adamovic, 2022; Carnevale & Hatak, 2020;

Dwivedi et al., 2022; 2020; Carroll & Conboy, 2020; Lund, Madgavkar, Manyika, & Smit, 2020; Soga, Bolade-Ogunfodun, Mariani, Nasr, & Laker, 2022; Trkman & Černe, 2022; Verma & Gustafsson, 2020). Gartner surveys reveal 82% of the 127 company leaders prefer remote work initiatives (Gartner, 2020). Utilizing employees' analytics empowerment intensely in a remote place may accelerate job performance. Lin (2002) has explicitly stated that empowerment assists employees or managers in dealing with more adverse market changes effectively and efficiently. Furthermore, analytics empowerment can assist employees in mobilizing resources (e.g., data-driven resources) appropriately based on the problem related to customers, suppliers, and firms (Aghina, Handscomb, Ludolph, Rona, & West, 2020). Motamarri et al. (2020) define empowerment in analytics-driven services from front-line employees' perspectives that acknowledge the importance of decision-making ability, discretionary skills, information access, knowledge, technological tools, and training. Akter, Bandara, and Sajib (2021) recognize that analytics empowerment capability (AEC) is vital for emergency operations management that helps to tackle disruptions, uncertainty, and continuing service support. The scholars conceptualize AEC by acknowledging analytics climate, technology, information access, decision making, knowledge, and training. Therefore, in line with previous studies, this study defines remote analytics empowerment capability (RAEC) as an employee's ability to use digital technology, trained to leverage analytics insights, knowledge to solve customer problems and make effective decisions in the provision of solutions to customers.

Firms like Facebook, Microsoft, HP, Amazon, and Intel are allowing employees to work remotely using advanced technology (Lee & Swartz, 2020). Nearly 60,000 Facebook staff are likely to work remotely even after the COVID-19 pandemic (Kaushik, 2021). Mark Zuckerberg, Facebook's founder and CEO, has been quoted to have said that remote work and being out-of-the-office made him "happier and more productive at work," given "more space

for long-term thinking," and empowered him to "spend more time with family" (BBC, 2021). Despite the positive stance now towards remote work, remote work arrangements deem an immense challenge for businesses to quench their endless thirst for productivity (Sinha, 2020). The RAEC may be a solution to tackle such challenges. Despite this apparent identified critical role of RAEC to impact organizational routines and procedures, there is scarce attention on its conceptualization and empirical validation in the extant literature. To bridge this identified gap in the literature, this investigation conceptualizes a RAEC model and attempts to empirically test its real-life effects, founding on dynamic capabilities theory.

2.2. Dynamic capability

Organizations are facing unprecedented complexity because of the COVID-19 pandemic. Humans have never undergone this scale of disarray and distress as the human economic activity is far more integrated and become dependent on each other now with the advances in air travel and ICT (Olson & Olson, 2000; Vargo & Lusch, 2017). As the work is being pushed to where the worker lives, the remote worker needs to be more adaptable than before. S/he is required to manage both market complexities and vertical organizational process structures (Kanter, 1977). To simultaneously cope with uncertainty and complexity, organizations ought to embark on a *dynamic capabilities framework* to make a strategic choice and sustain competitiveness in the market (Teece, Pisano, & Shuen, 1997). Teece et al. (1997 p.516) define dynamic capabilities as a "firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments". Felin & Foss (2012), expanding the envelope of the foundations of DCs, urge organizations to loosen up the executive hold, and grant autonomy to the employees to dynamically respond to operational contexts. While empowerment determines the decision-making abilities of employees, the DCs, enable organizational procedures and routines to reflect its readiness to absorb market turbulence and make effective decisions in addressing customer needs. Scholars have been

advocating that senior executives need to democratize information by ensuring the right analytics insights are deployed to employees to effectively link with customers, a precursor to achieve superior performance (Accenture & Qlik, 2020; Ransbotham & Kiron, 2017).

Nearly seven decades of research emphasizes that empowerment enhances employee performance and well-being, inculcates positive attitudes, and enables them to work effectively and efficiently (Maynard et al., 2012; Spreitzer, 2008; Wilder, Collier, & Barnes, 2014). Bowen & Lawler (1992) interpret employee empowerment as information access, rewards, knowledge, and decision-making power. For the employees who work in isolation from immediate and extended team's presence, the requirements to seamlessly access information, execute organizational routines, interpret those results, and make decisions becomes much more vital than when operating in an office environment. To facilitate employees operating beyond production line staff, they need to acquire the necessary knowledge & skills, familiarize themselves with the routines, and quickly navigate to the information repositories as they respond to customers in real-time. Orientation of employees through effective training becomes all the more important for the employees (Motamarri et al., 2020). These observations enunciate that RAEC integrates several elements: digital technology & tools, information access, decision making, knowledge & skills and finally, training & development (Motamarri et al., 2020).

Prior research primarily visualized empowerment as a structural and psychological factor that reflects the degree of control to individual autonomy to carry out defined tasks at the individual, team, and organizational levels (Maynard et al., 2012; Motamarri et al., 2020). These conceptualizations also considered the role of technology and information access to determine empowerment. On the other hand, the big data analytics stream has argued for greater access to analytics and associated technologies to all levels of employees to encourage them to make decisions based on data than intuition (Ransbotham & Kiron, 2018; Ransbotham,

Kiron, & Prentice, 2015). These insights also highlight the dearth of conceptual and empirical investigations on empowerment in remote analytics-driven work contexts. Within empowerment conceptualization, an explicit treatment of analytics technology platform, access to analytics insights to facilitate decision making is required (Motamarri et al., 2020). Prior formulations innately treat work contexts as being co-located with other teams who collaboratively take part in the execution of business processes (Maynard et al., 2012). It is also worth noting that with the pandemic imposed on remote work, some of the employee-employee direct exchanges have significantly fallen apart, one of the downsides of remote work (De Smet, Mysore, Reich, & Sternfels, 2021; Productivity Commission, 2021).

Remote work falls under the generic umbrella of Flexible Working Practices (FWP) which also consists of spatiotemporal work, on-demand work and self-directed work (Soga et al., 2022). Soga et al. (2022) in their systematic review of the literature of FWP identified present a contrasting picture of the reality by highlighting the downside of the FWP. These authors caution that organizations shall weigh pitfalls at individual-level, organizational-level, and technology-related. The over-reliance on technology to facilitate FWP exposes both personal and organizational data to the external world leading to privacy and security concerns (Mariani, Styven, & Teulon, 2021). So, while organizations and employees embark on FWP should assess the various downsides, privacy & security risks, and consider delegation like mechanisms to alleviate such complex implications (Soga, Laker, Bolade-Ogunfodun, & Mariani, 2021). Apart from focusing on trust, organizations also need to focus on employee orientation and to enhance the interactions between market orientation and customer-based performance (Babu, Liu, Jayawardhena, & Dey, 2019).

3. Conceptual model and hypotheses development

Employees' empowerment capabilities through remote analytics will likely be able to support customers' inherent problems remotely. This study assumes that RAEC functions

through digital technology & tools (Delen & Demirkan, 2013; Soga et al., 2021; Teece, 2007), decision making (Kiron et al., 2014; Melhem, 2004; Wilder et al., 2014), information access (Melhem, 2004), knowledge & skills (Melhem, 2004; Spreitzer, 1995), and training & development (Bowen, 2016; Miller & Davenport, 2021; Voegtlin, Boehm, & Bruch, 2015). Relevant technologies & tools empower employees to perform a particular job (Bowen & Lawler, 1992). Employees can accurately craft solutions utilizing analytics tools and other similar advanced technologies (Delen & Demirkan, 2013). They require data or information for appropriately using the advanced technology (Mikalef, Boura, Lekakos, & Krogstie, 2019). Thus, in the realm of big data-oriented businesses, information access is one of the top priorities (Akter et al., 2021). Employees can access customer feedback information and assess what a customer is looking for from the offering (Motamarri et al., 2020). Furthermore, today's digital information is stored by semiconductors, Magnetic and optical systems on various forms of digital media (Mariani et al., 2021). Analytics application detects the best possible action plans from the information and empower employees to make the most accurate decision (Akter et al., 2021). Overall, employees can have good control over how to solve a problem (Kiron et al., 2014; Wilder et al., 2014). Another key aspect of RAEC is employees' knowledge & skills; as earlier studies suggest, it is crucial for employee empowerment (Spreitzer, 1995). Knowledge & skills are essential to interpreting the entire analytics-driven process (Akter et al., 2021; Motamarri et al., 2020). The study also highlights training & development as an important antecedent of RAEC. To make an appropriate decision, training & development is critically important, empowering an individual to make analytics-driven decisions to fulfil a job (Miller & Davenport, 2021; Voegtlin et al., 2015). Employees also need to perceive their manager’s support in terms of appropriate delegation (Soga et al., 2021).

In line with the extant literature presented above, this study introduces a higher-order RAEC model and tests its impact on outcome variables. RAEC consists of five first-order

antecedents, which addresses research question one, as shown in Figure 1. We examine the impact of RAEC on customer linking and firm performance (FPER) as a means to address research question two. Thus, the research model fills the identified research gaps by addressing the two research questions. Firstly, it presents the antecedents of analytics empowerment capability in the context of remote work. Secondly, it represents the direct and indirect effects of RAEC on FPER and the mediating role of customer linking between RAEC and FPER (Figure 1).

Insert Fig. 1 here

3.1. The impact of remote analytics empowerment capability (RAEC) on customer linking and firm performance

Remote work is an emerging workplace transformation where employees can work from anywhere other than the traditional office workspace. The capacity to utilize data-driven insights empowers employees to be customer-centric and provide adaptable solutions to customers (Motamarri et al., 2020). Appropriate information analysis using analytics drives the employees more responsively towards customers. Ultimately, employees get the empowerment in understanding the customers' experience effectively and efficiently (Akter et al., 2021; Fang, Chang, Ou, & Chou, 2014; Lings & Greenley, 2005). A large scale of relevant market information, including customer preference data at an employee's fingertip, can assist in delivering an acceptable solution and facilitate a strong bonding between employees and customers (Hossain, Akter, & Yanamandram, 2021; Rahman, Hossain, & Fattah, 2021). The job performance and engagement ability of high-performing employees may decline in the remote work environment due to a lack of knowledge, and training & development (Larson, Vroman, & Makarius, 2020). Thus, attaining RAEC has been considered crucial in this study to progress customer linking. Extant studies established the proposition of analytics capability with customer engaging or linking. For example, Hossain, Akter, and Yanamandram (2020)

proposed customer analytics capability to engage with customers. Hossain et al. (2021) established the connection between analytics-driven value creation capability and customer linking. Motamarri et al. (2020) found the connection between employee information empowerment and customer linking in analytics-driven contexts. However, there is a lack of empirical evidence in the literature to establish the relation between RAEC and customer linking despite its importance during pandemic kind of situations. Despite the fact, practically, RAEC's importance exists to connect customers. For example, AWS is Amazon's cloud-based platform for business customers; employees of Amazon work remotely and get the empowerment to use analytics in the right way to solve customers' queries by listening to their desires and offering relevant solutions (McKinnon, 2020). Based on the above arguments, we propose the following hypothesis.

H1: Remote analytics empowerment capability positively impacts customer linking.

A firm's performance generally depends on several parameters, like the return a firm generates from its investment, the number of customers a firm retains, the growth rate of sales, and overall profitability (Hossain et al., 2021; Wamba et al., 2017). Firm performance in the analytics spectrum has been researched vastly. Extant studies investigated the impact of big data analytics capability on firm competitiveness, innovation, or performance (Akter, Wamba, Gunasekaran, Dubey, & Childe, 2016; Babu, Rahman, Alam, & Dey, 2021; Mikalef, Krogstie, Pappas, & Pavlou, 2019; Wamba et al., 2017), business analytics capability on firm performance (Cosic, Shanks, & Maynard, 2015), and marketing analytics capability of a firm's marketing performance (Babu et al., 2019; Rahman et al., 2021). By 2025, there is evidence that 70% of employees may work remotely for at least five days a month (Castrillon, 2020). There is adequate empirical evidence that employee orientation indeed moderates the relationship between the market orientation of firm and organizational outcomes (Babu et al., 2019). Soga et al. (2021) argue that managers must embrace delegation to overcome the

physical, operational, and affinity distance barriers experienced by remote workers. Thus, remote work in an analytical environment may become essential for accelerating firm performance. Due to the emerging trend of remote work, it is crucial to analyze whether an employee's analytics empowerment capability from a remote location can impact FPER. We assume employees equipped with RAEC are likely to accelerate FPER in a competitive business environment by effectively supporting customers. In practice, it has been observed that firms are advancing their business performance using such remote analytics and employee's empowerment. For example, Shopify is a Canadian-based fast-growing company that offers an e-commerce platform for online stores. Shopify closed all their offices in the pandemic; employees were working remotely empowered through analytics. The firm's sales with a gross merchandise volume exceeded $41.1 billion and gained a net profit of $319.5 million in 2020 (Clark, 2021; Kelly, 2020). Overall, employees' remote work continues to be beneficial to the enterprise. In San Francisco, for example, Twitter has informed employees that they can work from home indefinitely. Similarly, Square passed a similar policy at about the same time, allowing employees to work from home indefinitely, even after the office reopened (Castrillon, 2020). Despite such evidence, academic literature lacks empirical work on the relationship between RAEC and FPER. Therefore, we propose the following hypothesis for further empirical investigation.

H2: Remote analytics empowerment capability positively affects firm performance.

3.2. The impact of customer linking on firm performance

Customer linking or engaging is vital for firms to enhance their long-term sustainability (Hossain et al., 2021). The concept of customer linking has generated momentum in recent years among practitioners and academics (Haumann, Güntürkün, Schons, & Wieseke, 2015; Hollebeek, 2019; Motamarri et al., 2020). The market environment is changing rapidly as a consequence of the technological revolution (Hollebeek et al., 2019). Customers want real-

time solutions and expect a constant connection with a firm due to such advancements (Hossain et al., 2020). Ultimately, a firm that maintains a good connection with customers improves the customer retention rate and enhances its performance (Rahman, Hossain, Fattah, & Akter, 2020). Prior studies have investigated such relationships. For instance, Wang and Kim (2017) investigated customer engagement and FPER. Stone and Woodcock (2013) acknowledged that customer engagement improved business performance. Hossain et al. (2021) found customer linking impacts a firm's sustained competitive advantage. Babu et al. (2019) have empirically ascertained the direct effects of organizational initiatives of customer orientation, competitor orientation and inter-functional orientation on customer-based performance. Thus, by considering the importance of customer linking, this study, in line with previous research, proposes the following hypothesis H3.

H3: Customer linking positively impacts firm performance.

3.3. Mediating effect of customer linking

Employees' efforts are essential in implementing corporate strategy and improving the firm's performance (Babu et al., 2019; Richard, 2000). Academics argue that the employee's approach is crucial for firms to establish market frontage and succeed based on customer-firm relationships (Grinstein, 2008; Lings & Greenley, 2009). Such orientation fosters a bond between employees, customers, firms and promotes a sense of belonging to a large family of a firm working to meet and exceed market demands and anticipations (Babu et al., 2019; Grinstein, 2008). The previous sections show that employees' remote analytics empowerment capability impacts firm performance and customer linking. Customer linking again impacts firm performance. These hypotheses indicate that remote analytics empowerment capability and firm performance may have a direct and indirect relationship through customer linking. Generally, during service encounters, employees' ability to generate analytics insights empowers them to build a meaningful connection with a valued customer by fulfilling

customers' desired needs (Akter et al., 2021; Motamarri et al., 2020). Such customer linking generates a sustainable firm performance (Hossain et al., 2021). Employee empowerment equips them to play a dual role of mitigating 'voice of the firm' and 'voice of the customer' to ensure an effective relationship with valued customers (Griffin & Hauser, 1993; Heskett, Sasser, & Schlesinger, 2003). Although importance is stressed on the acceptance of digital platforms for remote working, especially in the COVID-19 pandemic (Mariani & Castaldo, 2020), how employees will attain the analytics empowerment capability in a remote environment and how they will link with customers to enhance the firm performance has never been addressed in academic literature. Extant studies observed the direct relationship between a firm's capabilities and customer linking or engagement (e.g., Hossain et al., 2020; Marcos-Cuevas, Nätti, Palo, & Baumann, 2016) and engaging lead, to firm performance (e.g., Ho, Lu, & Lucianetti, 2021; Sashi, 2012). Few studies (e.g., Hossain et al., 2021) investigated customer linking as a mediator between analytics and firm performance. However, there is no single study that has modelled it in the context of the remote analytics domain. Thus, to address this research gap in the current pandemic business environment, we propose the following hypothesis.

H4: Customer linking mediates the relationship between remote analytics empowerment capability and firm performance.

4. Research method and data analysis

4.1. Measurement scales

Measurement scales on RAEC were adapted from past studies. For example, the subdimensions of RAEC were adapted reflecting the study context of remote analytics empowerment as follows: digital tools & technologies (Aguinis & Kraiger, 2009; Bowen, 2016; Bowen & Lawler, 1992; Teece, 2007), information access (Aguinis & Kraiger, 2009; Bowen, 2016; Melhem, 2004; Motamarri et al., 2020), decision-making ability (Motamarri et al., 2020;

Wilder et al., 2014), knowledge & skills, and training & development (Melhem, 2004; Motamarri et al., 2020; Spreitzer, 1995). In addition, customer linking was adapted from Fang et al. (2014), and firm performance was adapted from Akter et al. (2017). All these constructs were measured using a 7-point Likert scale. The study assessed three control variables (i.e., firm size, firm type, and experience) using a single item.

4.2. Survey data

Using a professional market research firm in Australia, we approached a panel of 923 respondents and finally collected data from 287 samples who have at least 1 years' analytics experience as remote workers. After removing spurious responses (e.g., missing values, straight liners, and speeders), we obtained 250 valid responses. It is noteworthy that the study conducted a pre-test (n=51) before the main survey to check scale items, scale structure, sentence structure, layout, order, and format. Table 1 shows the demographic profile of respondents which shows that the respondents were drawn from diverse backgrounds. For example, out of all the respondents, 55% were female, 47% have more than three but less than five years' experience, 33% represent the ICT industry and 60% of them are between 18-35 years old.

Insert Table 1 here

4.3. Common method variance (CMV)

If CMV is not accounted for, the relationship between measures may be overstated, and the shared variance between constructs may be overinflated (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). As such, we followed Podsakoff et al.'s (2012) priori and post-hoc strategies to tackle CMV, which might have a detrimental effect on the empirical validity of the results due to its systematic non-substantive effects on observed responses (Bagozzi & Yi, 1990). For example, as a priori procedure, we ensured the quality of the questionnaire by removing it from all types of biases, including common scale format, social desirability, and confusing items. As

a post-doc procedure, the marker variable analysis (Lindell & Whitney, 2001), produced non-significant correlations (P>0.05) between marker variables and the outcome variables (CULI and FPER), where r = -0.067 to 0.091.

4.4. Data analysis

Using the Partial Least Squares (PLS)-Structural Equation Modelling (SEM), the study estimated the measurement and structural model. Since the RAEC construct is a second-order model, we used the measurement items of the first-order constructs repeatedly to estimate the score for the second-order construct following the guidelines of (Akter, Wamba, & Dewan, 2017). Due to the inherent advantages of robust prediction of non-normal distribution, factor identification and factor determinacy, we applied PLS-SEM to estimate the hierarchical model Becker, Klein, and Wetzels (2012) and Wetzels, Odekerken-Schröder, and Van Oppen (2009). In addition, the composite based PLS-SEM is suitable for both prediction and explanation of theoretical relationships and understanding the complex nuances in the model (Hair Jr et al. 2021). Following the nonparametric bootstrapping with 5,000 replications and a path weighting scheme for the inside approximation, we analyzed the data using SmartPLS 3.3 (Ringle, Wende, & Becker, 2015).

4.5. Measurement model

Table 2 shows the assessed measurement properties of all the first order RAEC constructs, which includes digital tools & technologies (DTT), Information access (INA), Decision making (DMA), Knowledge & skills (KNS), and Training & Development (TRD). In addition, the study assessed measurement properties of the two outcome constructs: customer linking (CULI) and firm performance (FPER). All the item loadings exceeded 0.70, which indicate a higher degree of convergence among items in assessing the respective constructs. To measure

the reliability of each scale, the study measured the composite reliability (CR) of each construct, which is greater than 0.80, indicating the internal consistency of the items. Similarly, the average variance extracted (AVE) was measured as a reliability indicator, which reflects a large amount of variance among the items captured by each construct (>0.50) against measurement error. Due to the formative nature of the control variables, the study reports the variance inflation factor (VIF), confirming minimum collinearity as the values range between 1.055 to 1.216 (≤5). To confirm discriminant validity, the study estimates the square root of the AVEs in the diagonals in Table 3, which indicates that the diagonal values are higher than inter-correlation coefficients in their respective rows in the correlation Table 3. In a similar spirit, the Heterotrait-Monotrait (HTMT) value was calculated, which confirmed adequate discriminant validity as it was significantly less than 0.90.

Following Becker et al. (2012), we estimated the second order RAEC construct (Type-B, reflective-formative) by repeatedly using all the items of its first-order constructs (4*4=16 items). The measurement performance of the higher-order RAEC construct was assessed using redundancy analysis, collinearity index and significance of the path coefficients (i.e., weights in this case) (Sarstedt et al. 2019). First, we conducted redundancy analysis between the higher-order RAEC construct and an alternative RAEC construct with a single global item, and the path coefficient exceeds the threshold of 0.70. Second, we checked the collinearity index among the lower-order constructs using variance inflation factors (VIF) and all the values are less than 3. Finally, we assessed the significance of associations between RAEC and lower-order constructs by the path coefficients between DTT-RAEC (β=0.300), INA-RAEC (β=0.162), DMS-RAEC (β=0.194), KNS-RAEC (β=0.235) and TRD-RAEC (β=0.263) were significant at p<0.001. As such, RAEC was proven as a robust second-order construct.

Insert Table 2 here

Insert Table 3 here

4.6. Structural model

Table 4 shows the results of the structural model and its hypothesized relationships using path-coefficients (β) and the coefficient of determination (R^2). The findings show that the relationship between RAEC-CULI (β=0.731), RAEC-FPER (β=0.558) and CULI-FPER (β=0.206) are significant at p<0.001. Thus, we support H1, H2, and H3. The R^2 shows that RAEC explains 53% of the variance of CULI and 52 % of the variance of FPER (see Figure 2). According to Cohen (1988), the findings show medium (0.150 to 0.350) effect sizes (f^2) of the hypothesized relationships (H1-H4). We also estimated the mediating effect of CULI between RAEC and FPER, which was proven significant as a partial mediator (β=0.150) (Hayes, Preacher, & Myers, 2011; Preacher & Hayes, 2008). The CULI explains 20% of the overall variance as a partial mediator VAF (Variance Accounted For) (Akter, D'Ambra, & Ray, 2011). The findings on control variables (i.e., firm size, firm type, experience), showed an insignificant impact on FPER.

We also estimated the predictive validity of the research model using PLSpredict. Following Shmueli et al. (2019), the total sample (n=250) was divided into a training sample (n=225) and a holdout sample (n=25). The findings showed the robust prediction power of the RAEC construct on FPER as it showed lower prediction errors for all the indicators of FPER using root mean squared error (RMSE).

Insert Table 4 here

Insert Fig. 2 here

5. Summary of findings

The findings of our study confirm the significance of RAEC on customer linking and firm performance in a remote environment. These findings extend the ongoing discourse of remote

working through remote analytics empowerment initiatives (Mariani & Castaldo, 2020). Specifically, the findings ascertain that digital tools & technologies (β=0.300), information access (β=0.162), decision making (β=0.194), knowledge & skills (β=0.235), and training & development (β=0.263) are essential drivers of analytics empowerment capability in a remote environment. Although all the dimensions are proven significant, the most important driver is digital tools & technologies to facilitate RAEC. These findings are consistent with recent research insights (e.g., Hogdgson & Wigglesworth, 2020; Motamarri et al., 2020), which advocate for similar dimensions with an emphasis on digital platforms to empower workforces. Our findings demonstrate the critical role of RAEC in a remote environment, enhancing customer linking (R^2=0.534) and firm performance (R^2=0.521). The results confirm the mediating role of customer linking through remote analytical empowerment capability to enhance firm performance. As part of estimating the indirect effect, we used the variance accounted for (VAF) value, which indicates the ratio of the indirect effect to the total effect as 21%. Thus, customer linking plays a critical mediating role to ensure retention, sales growth, profitability and return on investment.

6. Discussion

6.1. Theoretical contributions

Prior formulations of empowerment have not considered digital platforms, information access, or training in the empowerment construct formulation (Spreitzer, 1995). The recent reformulation of the empowerment construct (Motamarri et al., 2020) in light of the technological and organizational changes have not accounted for remote work. The enabling nature of analytics and empowerment were argued in the literature, but they were not empirically tested before (Kiron et al., 2014). Soga et al. (2022) while unmasking the downsides of flexible work practices from the dimensions of "health, sociocultural, economic, spatial, technical, and political", advocate for the need to investigate FWPs in a wider set of

formulations and contexts. Soga et al. (2021) have argued for empowering and trusting employees as managers themselves cannot execute everything on their own, more so, in a remote work delivery context. Thus, in the context of these advocations, and a significant dearth of empirical studies, the findings of this study extend the theories of empowerment, delegation, analytics/ dynamic capabilities to remote working. First, it extends empowerment theory to analytics-enabled remote work by articulating that analytics-ingrained sub-dimensions, i.e., the antecedents of RAEC. Second, it confirms that RAEC is a second-order construct consisting of five dimensions: digital technology & tools, information access, decision making, knowledge & skills, and training & development. Third, empowerment is said to be an enabler of DCs (Felin & Powell, 2016). The positive impact of RAEC on CULI confirms this finding. Also, the study highlights the mediating role of CULI between RAEC and FPER, which indicates that customer linking as a dynamic capability is one of the core goals of RAEC in a remote setting. Thus, these findings shed light on the micro-foundations of RAEC, which extend dynamic capability theory to the remote working environment. Finally, an analytically empowered workforce is said to contribute to FPER (Ransbotham et al., 2015). The positive influence of RAEC on FPER ascertains this understanding, which is consistent with previous research on big data analytics and firm performance (Akter et al., 2016; Wamba et al., 2017). Our results are also consistent with studies other studies that have empirically and conceptually demonstrated the roles of marketing orientation on FPER and the direct and moderating effects of employee-side initiatives (Babu et al., 2019; Babu et al., 2021; Soga et al., 2021).

Overall, in the context of remote working and the associated complexities, employees need to perform effectively. The conceptualization relied on three streams of literature: empowerment, DCs and analytics. Prior empowerment studies focused on self-efficacy and intrinsic motivation, access to information, decision making, and technology & training

(Bandura, 1977; Conger & Kanungo, 1988). RAEC assess the employees' access to analytics technologies, insights, skills, training, and utilizing those analytics ingredients in decision making. To our best knowledge, this is a seminal investigation that considered the nature of analytics empowerment capabilities of remote employees (Maynard et al., 2012; Motamarri et al., 2020). Thus, the findings of our study extend empowerment, DCs, and analytics capabilities theories to the remote working environment.

6.2. Managerial implications

Senior managers have expressed their dismay that analytics investments are failing to aid the frontlines, and it is also said that organizations are sitting on a vast pool of information that is failing to find its way to affect customer service (Brown, Court, & McGuire, 2014; Raj, Malik, & Kanioura, 2018). To this end, this study's findings have important implications for the managers who are responsible for overseeing the employees and for those responsible for ensuring the employee well-being. First, it is increasingly important to focus on not just analytics technology but making that accessible to employees especially working remotely. Second, remote work also implicitly reduces informal and social encounters among the team members and their supervisors (De Smet et al., 2021; Soga et al., 2021; Soga et al., 2022). This also means that the provision of information access and technology deployment shall be identical for all employees, else access deprived employees cripple service delivery, not necessarily of their fault. Third, technology and information can enable when the interpretive skills of employees match that of the platform expectations. It is important to make tools intuitive so that employees can easily navigate the organizational maze of information sources. This addresses the senior managers' aspirations that big data analytics make an impactful difference at the point of execution (Brown et al., 2014).

Fourth, the quality of decision making is proportional to the quality of the analytics insights at the right interaction point and at the right time (Rana, Chatterjee, Dwivedi, & Akter, 2021). Managers need to ensure a singular truth by eliminating duplication, redundancy, and multiple realities of the same fact and/or about a customer. These steps facilitate remote employees to leverage analytics and enhance organizational process execution. Fifth, markets are volatile, information is impermanent, tools & technologies become obsolete so much so the information deposited in organizational systems, processes, and procedures too become redundant or stale. Continual and regular training and development of employees is not just advisable but a necessity. This is in line with eminent big data analytics Scholars who have been advocating through elaborate empirical studies on the importance of developing capabilities, not just investments in analytics (Mariani & Castaldo, 2020; Mariani & Nambisan, 2021; Mariani & Wamba, 2020). Organizations also need to account for the privacy and security concerns of their tools and take adequate steps to ensure trust and adoption of the tools (Mariani et al., 2021). Sixth, the organizational reward systems shall encourage regular training, and there shall be explicit provision for the employees to devote part of their work time to training and individual development. For example, corporations like Seattle Genetics, SAS, Amazon, Bonobos, AT&T etc., are rated highly for their proactive employee training programs by the famous careers website monster.com (Monster.com, 2021). Training Magazine estimates that the USA spends about US$4.5 Billion per year on training and development (Freifeld, 2018; Monster.com, 2021). Seventh, our research model ascertains the positive impact of RAEC on CULI and FPER. Remote employees shall be encouraged and rewarded for initiative and innovative problem-solving for the effective use of the granted information and digital technology (Babu et al., 2021). For example, as per Edureka, a career site, 77% of corporations consider data analytics an important driver for their business growth (Burns, 2019). Top innovative firms like Google, Apple, and Microsoft employ unique methods to train their

employees to enhance their innovative ability and corporate leadership. Amazon experienced an 832% growth in data mapping specialists and a 505% growth in data scientists (Stringer, 2020). Information Services Group (ISG) reports the recent investments by the Australian Contact Centers in analytics to support remote employees. The contact centers are now relying on analytics to deliver personalized and adaptive services and thereby enhance customer satisfaction (Thoretz & Arvidson, 2021).

We recognize that remote work is not a panacea to all the employee-organizational performance issues. Remote work poses challenges like gender inequalities, work-life balance, health, social isolation, psychological distance from peers, lack of visibility to managers, and trust formation between colleagues and supervisors (Soga et al., 2022). But we ascertain that organizational mechanisms of trusting remote employees with effective delegation and empowerment will bridge several of these challenges associated with remote work (Soga et al., 2021).

Overall, managers shall consider this positive contribution of RAEC on the outcomes and attempt to enhance the working environment provided to their remote workers (Babu et al., 2019; Soga et al., 2021). They need to pay attention to all the five constituent elements to reap the full benefits of remote work. Analytics practitioners shall draw robust plans to cascade down the insights from analytics in a meaningful manner to the employees at the right time, place and work context as well as encourage innovation (Babu et al., 2021; Mariani & Wamba, 2020). Thus, employees can positively impact the CULI and thereby vitality of the organizations amidst uncertainty in a complex, competitive global context.

6.3. Limitations and future research directions

Like any other study, this investigation has some limitations. Different parts of the world have been subjected to multiple waves of the pandemic, and virtually all economies are at

different stages of recovery, and no one has any certainty when things will return to normalcy. Against this backdrop of massive confusion and uncertainty, data was collected from remote employees. Analysts also caution that the performance gains reported are possibly a survival response, and when things stabilize, prior organizational routines might emerge again (D'Auria et al., 2020). About a third of the respondents are from the ICT industry who, to some extent, may have been used to remote work due to the nature of their job. To draw a better and equitable understanding across industries, it is worth collecting samples from multiple industries and analyzing any group-level differences. The data collection procedure is cross-sectional and provides the perceptions of employees at a point in time.

The data collection is confined to Australia which in a way adequately controlled its exposure to COVID-19 in the years 2020-21. It is worth conducting a longitudinal survey later when the environmental factors are favorable. Analysis of that data provides not only a comparative picture of remote working, but it might also reflect a time of maturity of the remote work. It is worth considering collecting data from different geographies to arrive at any geographical and country-specific factors that influence RAEC. The conceptual model has not accounted for any downsides of flexible work practices (Soga et al., 2022). Future studies shall try to conceptualize the simultaneous play of positive and negative elements of FWP on organizational performance. The conceptual model can further be strengthened by incorporating the roles of employee orientation (Babu et al., 2019) and delegation (Soga et al., 2021) on the other model constructs and assessing the overall organizational outcomes. Future research shall explore possibilities to collect multiple sources like matching organizational performance from company reports. This provides an opportunity to validate the correlation between employee reported perceptions and actual performance indicators.

7. Conclusion

The effects of remote work on individuals and organizations are still in infancy and detailed and multiple assessments are yet to emerge. The findings of our study identify that digital technology & tools, information access, decision making, knowledge & skills, and training & development are the microfoundations of remote analytics empowerment capability. Overall, senior executives shall recognize that these foundations play a vital role in enabling an organization's remote workforce to link with customers and enhance firm performance.

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Figures and Tables

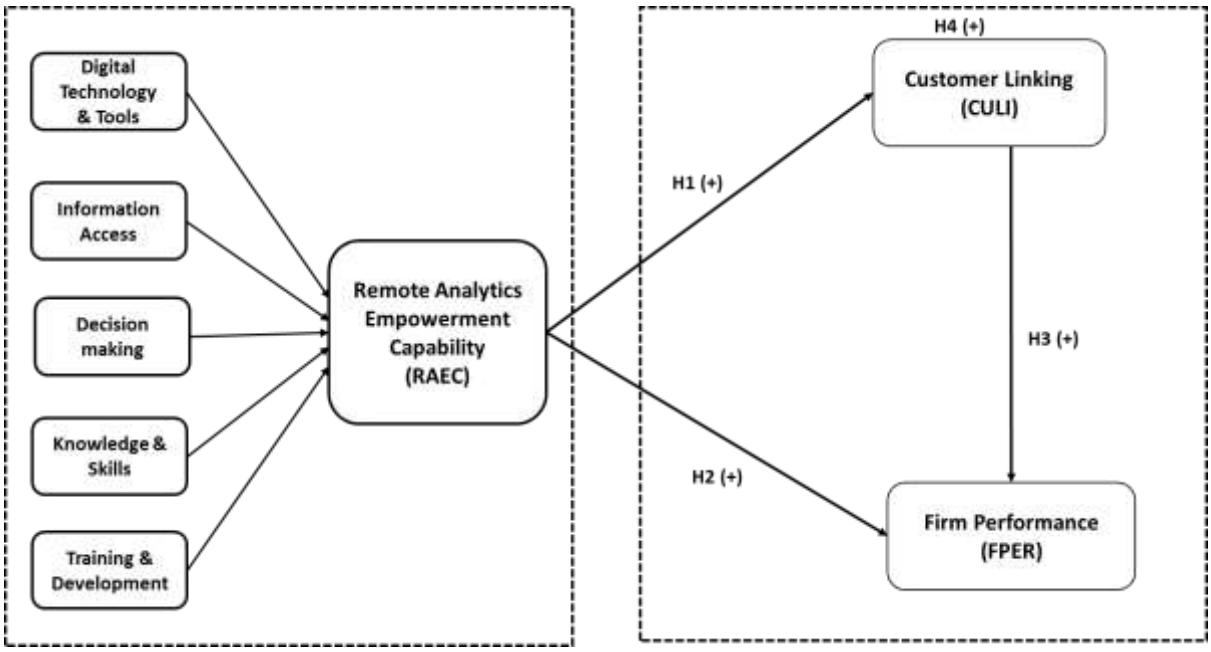

Fig. 1. Research model

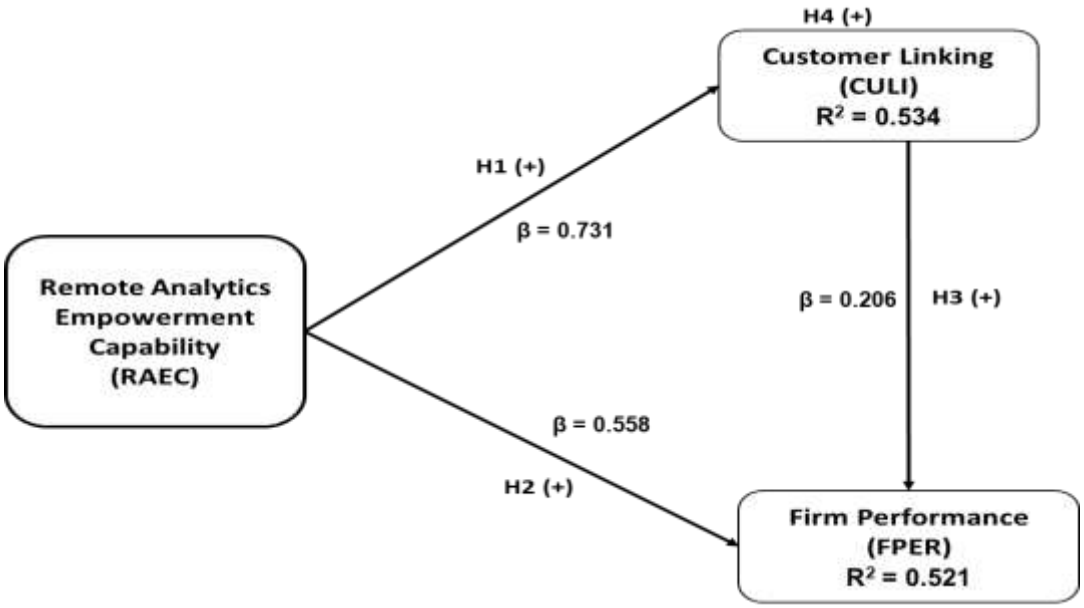

Fig. 2. Structural model

Table 1 Profile of respondents

Items	Categories	%	Items	Categories	%
Gender	Male	45	Age	<25 Years	15
	Female	55		25 < 35 Years	45
				35 < 45 Years	27
				45 ≤ Years	13
Analytics Experience	<5 Years	47	Industry	ICT	33
	5 - <10 Years	41		Professional Service	22
	10 ≤ Years	12		Financial	10
				Retail	21
				Others	14

Table 2 Measurement items assessments

Reflective Constructs	Items	Loadings	CR	AVE
Digital tools and technologies (DTT)	DTT1: My organisation provides me with relevant analytics technologies for remote work. DTT2: My organisation regularly invests in upgrading analytics technologies for remote work. DTT3: My organisation provides analytics technologies that are equal to or better than other organisations for remote work. DTT4: My organisation considers my feedback in upgrading analytics technologies for remote work.	0.810 0.850 0.825 0.723	0.890	0.700
Information access (INA)	INA1: I have access to data-driven insights in remote environment INA2: I have access to data-driven insights about related remote processes and procedures. INA3: I have access to data-driven insights about what remote work environments are required. INA4: I have access to data-driven insights about feedback on our remote works.	0.878 0.898 0.899 0.721	0.891	0.684
Decision making (DMA)	DMA1: The remote analytics environment in my organisation allows me to correct problems when they occur. DMA2: The remote analytics environment allows me to exercise control over how I solve problems. DMA3: The remote analytics environment allows me to rely on data over experience in making decisions. DMA4: The remote analytics environment allows me to be creative in dealing with problems.	0.867 0.888 0.844 0.713	0.871	0.633
Knowledge & skills (KNS)	KNS1: I have the necessary analytics skills to best serve remote work environment. KNS2: I have the necessary analytics knowledge to serve remote work environment. KNS3: I have mastered the analytics skills necessary to serve remote work environment. KNS4: I am confident about my analytics ability to serve remote work environment.	0.890 0.855 0.867 0.750	0.915	0.712
Training & Development (TRD)	TRD1: My organisation provides regular analytics training on remote work. TRD2: My organisation provides regular analytics training on the tools I am expected to use in remote work. TRD3: My organisation invests in my analytics skill development to serve remote works. TRD4: My organisation regularly communicates about the changes in the analytics skill to serve remote works.	0.855 0.940 0.857 0.752	0.891	0.694
Customer Linking (CULI)	CLN1: Establishing connections with new customers. CLN2: Enhancing communication with key target customers. CLN3: Maintaining connections with all the customers.	0.880 0.932 0.844	0.916	0.785
Firm Performance (FPER)	FPER1: Customer retention FPER2: Sales growth FPER3: Profitability FPER4: Return on investment	0.819 0.870 0.849 0.722	0.889	0.667
Formative constructs	Items	Weights	VIF	
Control Variables (COV)	Firm size Firm type Experience	0.308 0.086 0.839	1.216 1.055 1.171	

Table 3 Correlations and AVEs*

	DTT	INA	DMA	KNS	TRD	CULI	FPER	COVA
DTT	**0.836**							
INA	0.511	**0.827**						
DMA	0.544	0.433	**0.795**					
KNS	0.481	0.438	0.412	**0.843**				
TRD	0.513	0.491	0.471	0.435	**0.833**			
CULI	0.533	0.513	0.595	0.530	0.507	**0.886**		
FPER	0.381	0.411	0.488	0.527	0.564	0.581	**0.817**	
COVA	0.186	0.137	0.133	0.238	0.100	0.056	0.063	**N/A**

**Square root of AVE on the diagonals.*

Table 4 Results of the structural model

Hypotheses	**Main Model**	**Path coefficients**	**Standard error**	***t*-statistic**
H1	RAEC → CULI	0.731	0.038	18.926
H2	RAEC → FPER	0.558	0.061	9.073
H3	CULI → FPER	0.206	0.071	2.889
H4	RAEC → CULI → FPER	0.150	0.052	2.858