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PRELUDE FOR A SUCCESSFUL DIGITAL TRANSFORMATION: EMPIRICAL EVIDENCE FROM INDIAN TELECOMMUNICATION SERVICE PROVIDER

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Abstract

Despite an increased focus on digital transformation, the telecommunication industry has, thus far, seen limited success regarding the effective transformation of its constituent organisations, both globally and in India. Indian telecommunication service providers (TSP) in particular face tremendous pressure to transform successfully in order to leverage the benefits of digital transformation and meet the current business challenges. This research proposes factors from internal organizational perspective that are essential for the successful transformation. This

study has developed a research framework grounded in multiple theories (Resource Based View, Dynamic Capabilities and Disruptive Innovation) and based on detailed literature review. The research model was tested using responses from a robust sample of 294 domain experts in the Indian telecommunications industry. Empirical results indicate that Digital Capabilities, Digital Strategy and Corporate Level Data Strategy has strong significance on the successful Business Performance, followed by IT Function Transformation, and Digital Innovation.

Keywords:
Digital Transformation, Digital Strategy, Corporate Level Data Strategy, Digital Innovation, Digital Capabilities

1. Introduction

With increasing disruptive potential of the digital technologies, organizations envisage to develop themselves into digital enterprises (Legner et al., 2017). Digital Transformation is becoming a critical agenda worldwide, as a result of the opportunities posed by disruptive digital technologies (Hess et al., 2016; Riasanow et al., 2017). The digital technologies present disruptive opportunities as well as threats for big, old companies to transform (Sebastian et al., 2017).

In practice, there are many obstacles to digital transformation (Parviainen et al., 2017). The three key stakes involved in digital transformation are namely strategic stakes, organizational/cultural stakes and implementation related stakes (Henriette et al. 2016). The managers handling digital transformation initiatives face multiple challenges due to lack of clear understanding of how the transformation needs to be carried out (Parviainen et al., 2017).

1.1. Digital Transformation of Telecom Service Providers (TSP)

The digital transformation efforts by the TSP globally have also seen very high failure rate according to the studies (Newman, 2017). IT Function and legacy applications transformation being the most difficult. Other challenges include the complexity (product portfolio, processes, systems etc.), current operational processes and system integration, , weak governance structures, cultural issues, lack of top management support, poor levels of internal collaboration (IT-Business), insufficient alignment of technology and business strategy, poor engagement with suppliers and availability of skills and resources (Newman, 2017). Absence of an exhaustive reference framework covering the critical factors for digital transformation

was identified as one of the top-10 challenges (Newman & Bushaus, 2019).

1.2. Indian Telecommunications Industry and Digital Transformation of Indian TSP

The Indian telecommunications industry is the second largest globally in the telecommunications market, with more than 1.8 billion telephone subscribers, as of July 2023 (TRAI, 2023). Driven by the latest digital communications policy, the state is encouraging the development of networks compatible with 5G communication technology in order to provide remote digital services. The digital transformation of Indian TSP is critical due to the potential and opportunities presented by new technologies, Industry 4.0 and government's Digital India drive. The Indian TSP however are challenged to transform successfully and monetize the digital business models successfully. The incumbents, are also limited by tight budgets and are subject to increasing debt, high costs, reducing revenues, and many other challenges. This has led to major consolidations within the industry.

Most of the studies in the literature on Digital Transformation are exploratory, case based or qualitative in nature, with very little empirical evidence. Even though generic digital transformation frameworks and digital maturity models for carrying out digital transformation do exist in literature, these frameworks are not quantitatively validated. Not only that, none of these frameworks highlight the critical factors exhaustively or in totality nor do they link the factors with the successful business out-come for the TSP during digital transformation. Even though digital transformation is an enterprise-wide change, very few studies exist that quantitatively test the interactions and linkages between organisational factors. Very few studies exist in literature that deal with the success factors for Digital Transformation in the telecommunications Industry (Newman, 2017; Valdez-de-Leon, 2016) leave alone for the Indian context.

This research attempts to bridge these gaps by carrying out a systematic literature review from the organizations' transformation perspective and first devising a conceptual framework consisting of critical factors and their interrelations for successful digital transformation.

The framework hence devised, consisted of constructs like Digital Strategy, Corporate-Level Data Strategy, Digital Innovation, IT Function Transformation, Digital Organisation (culture/people/organisation governance), Transformation Management (governance of the transformation projects) and Digital Capabilities as likely critical for the success of an organisation's digital business.

Research Question - To examine the extent to which internal organisational factors such as Digital Strategy, Corporate-Level Data Strategy, Digital Innovation, IT Function

Transformation, Digital Organisation, and Digital Capabilities influence the Business Performance for Indian TSP.

This was then followed by an empirical validation of the devised conceptual model and its applicability to the context of Indian TSP.

The remainder of the paper is structured as follows. It commences with presenting the findings from the literature review followed by formation of the conceptual framework and theoretical foundation. Next, it elaborates on the overall methodology of the research along with the scale and operational indictors for each theoretical construct and present the results of the empirical validation of the conceptual research framework drawn from the qualitative literature. Finally, it discusses how the framework and the operational indicators of each construct of the framework guides the design of the digital transformation of the organizations on which different strategies, organization design, management and business value can be built. Lastly, it outlines the conclusion followed by future research directions.

2. Literature Review

Due to the lack of a holistic framework for successful digital transformation for Indian TSP in particular, a detailed review of the digital transformation literature was conducted. It was found that the digital transformation of organisations can be said to be related to organisational changes due to digital technologies. These changes are characterised by changes in value networks, the evolution of corporate business models, digitisation of products and business models (Planing et al., 2016), and profound changes to business models (Hess et al., 2016). This leads to the transformation of processes (Legner et al., 2017), resources (Sebastian et al., 2017), operational methods (Legner et al., 2017), organisational governance, and the culture of a company (Sia et al., 2016) “by re-inventing itself for future every-one to every-one digital economy” (Berman & Marshall, 2014).

The systematic synthesis of the literature led to the identification of several internal organizational dimensions for successful digital transformation. These can be broadly divided into strategic, data, customer, IT function, innovation, organisation governance, and digital capabilities-related domains. However, very few studies have taken the theoretical background and related perspectives of the studies into consideration. Due to this, the findings related to these dimensions lack appropriate hierarchy, presenting also the possibility for theoretical overlaps. To effectively address these gaps, the identified domains of Strategy, Customer, Data, IT Function, Innovation, Transformation Management, and Organizational (design, people, and culture) are next reviewed within the context of applicable theories and dimensions of the digital

maturity models for their applicability, in order to derive the framework and constructs relevant for this research.

2.1. Theories

The term digital transformation in business literature signifies the disruptive effects of digital technologies for businesses, indicating how existing organisations need to transform in order to succeed in the digital economy (Nambisan et al., 2019). The transformations due to disruptive technologies have fundamental differences in terms of scope and impact, as compared to the organizational change theories like Business Process Re-engineering (Riasanow et al., 2017).

2.1.1 Disruptive Innovation

From the perspective of an organisation, digital disruption means that the processes of firms that are heavily invested in their traditional conditions are interrupted due to digital technologies with the need for a response to industry upheaval (Skog et al., 2018). These disturbances at the firm's end are primarily driven by changes in strategy, organisation, deep structures, and the formal systems of the organization (Skog et al., 2018). This radical brand of change is termed as 'disruptive change' and brings about revolutionary changes in the organization (Christensen & Overdorf, 2009). Therefore, organisational change caused by digital transformation is usually examined through the theoretical lens of disruptive innovation (Skog et al., 2018).

2.1.2. Resource Based Theory and Dynamic Capabilities

To examine digital transformation from the perspective of organisational change, various studies have also found that resource based theory and dynamic capabilities are essential in responding to digital disruptions (Riasanow et al., 2017; Teece, 2017a). The resource-based view is an economic theory that claims that firms can achieve competitive advantages by considering individual resources, evaluating strategic potential, then using said resources in alignment with the business strategy of the organisation (Barney, 1991). Grant (1991), further distinguishes between resources and capabilities where base-level capabilities are related to operational and routine activities and the next level is dynamic capabilities. These dynamic capabilities can be divided into 'micro-foundations' and 'higher-order' capabilities (Teece, 2017a). Higher-order dynamic capabilities deal with innovation and new business models, and also guide the development of micro-foundations during digital transformation (Teece, 2010, 2017a, 2017b). The transform function of Teece's dynamic capabilities framework, leads to ambidexterity. The adoption of a new business model also places expectations on the corresponding, required organisational design. Consequently, to enable

innovations in the organisation, the structures and designs of organisations need to be flexible enough to handle this ambidexterity.

2.1.3. Organization Ambidexterity

It is very challenging to change traditional, successful company structures that have evolved from previous external triggers and related changes (Skog et al., 2018). Managers face the dilemma of making choices led by the exploitation of a company's existing capabilities versus the exploration of innovative capabilities. This leads to several paradoxes; therefore, during digital transformation, managers are led into these organizational ambidextrous considerations (Gao et al., 2020). These paradoxical requirements destroy what has been constructed to re-invent an organisation with new technologies, therefore gaining a competitive advantage (Tushman & O'Reilly III, 1996). This structural ambidexterity consists of separate structural units for exploration and exploitation with corresponding competencies, systems, incentives, processes, and cultures each internally aligned and held together by a common strategic intent (O'Reilly III, 2013).

2.2. Digital Maturity Models

The other important aspect considered from theoretical perspective was digital maturity models. Maturity models present a phased approach, consisting of characteristics and capabilities that organisations need to embody for their transition, at each defined stage of maturity (Becker et al., 2010). On the one hand, these characteristics represent the organisational dimensions that change (the defined maturity stages), while on the other, they indicate the direction the change must move in to achieve maturity. To understand if any of the maturity models determine their applicability to digital transformation in relation to Indian TSP, the dimensions of 19 digital maturity models were also reviewed for relevant factors and dimensions.

Developing a digital strategy that embraces corporate and business strategies has been the predominant digital transformation success factor (Porfírio et al., 2021). Adoption of digital technologies like Big Data decision support is heavily reliant on a data environment that promotes transparency and a clear corporate data strategy (Aversa et al., 2021). Enterprises require corporate data strategy and governance to gain strategic benefits (DalleMule & Davenport, 2017). Digital dynamic capability and digital innovation are significant to achieve digital transformation performance (Rupeika-Apoga et al., 2022). Digital business model innovation (BMI) is critical to achieving and sustaining competitiveness in technology-driven environments (Böttcher et al., 2022).

Strategic technology investment helps organizations to develop systematic control operations while the transformation management intensity equips an organization with transformative vision, governance and culture, and such transformative built-in leadership enables the organization to embrace employees with talents and innovativeness and help employees grow their capabilities (He et al., 2023).

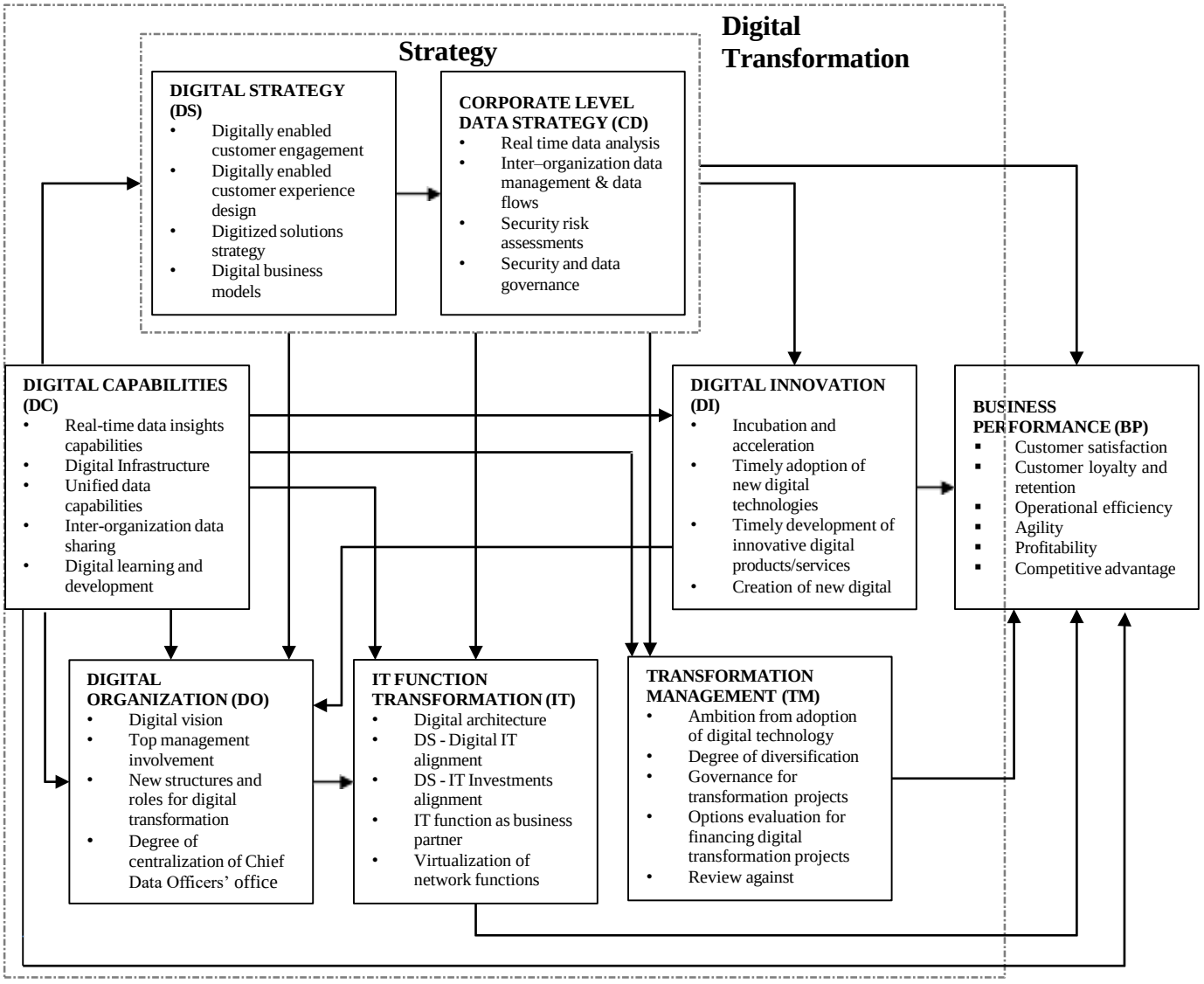
Digital transformation requires specific organizational structures and at the micro level implies organizational changes in roles, individual skills, leadership styles, and managerial approaches (Zoppelletto et al., 2023).

3. Research framework

This section details the how drawing on the theoretical perspectives of resource-based view, dynamic capabilities, disruptive innovation, and organization ambidexterity theories, a detailed review of the digital transformation literature and review of 19 digital maturity models, a research framework (**Transformation Framework)** consisting of critical factors like Digital Capabilities, Digital Strategy, Corporate Level Data Strategy, IT Function Transformation, Digital Innovation and Digital Organization was devised.

3.1. Digital Transformation Framework

Figure 1: *Digital Transformation Framework*



(Source: Authors' Own Illustration)

3.1.1. Digital Strategy

Digital transformation is a continual strategic change having a high value share of digital business in overall strategy (Berghaus & Back, 2016). Traditionally, within the hierarchical view of organization's strategies, business strategy directed the IT strategy of organisations to support business departments. Digital technologies are fundamentally changing traditional business strategy, and they enable dynamic capabilities. The role of IT strategy is changing from that of a functional-level strategy (aligned to business strategy) to one that blurs the distinction between IT strategy and business strategy, creating a digital business strategy or Digital Strategy (Bharadwaj et al., 2013; Mithas et al., 2013). Digital Strategy also affects an organisation's competitive advantage, operational efficiency, and performance (Yeow et al., 2018).

Digital Strategy of an organization as a business strategy, is inspired by the capabilities of powerful, readily accessible digital technologies, intent on delivering unique, integrated business capabilities in ways that are responsive to constantly changing market condition (Berghaus & Back, 2016; Valdez-de-Leon, 2016)

A successful digital strategy is about defining how to leverage digital technologies to enhance customer engagement (Sebastian et al., 2017), to deliver a unified customer experience across all channels (Berghaus & Back, 2016), to integrate the products/services/information and make new combinations of digital services (Sebastian et al., 2017) and digitizing all business model components with their interactions (customers/partners) (Planing et al., 2016). It also deals with strategic decisions and prioritisation of building digital capabilities and digital resources required to build the new digital strategy (Tanner, 2016).

A successful digital strategy comprises of customer engagement strategy that uses digital technologies for competitive advantages, customer engagement, and loyalty, thus resulting in higher profitability (Vivek & Hazod, 2018). The digital customer experiences result in enhanced differentiation, competitive advantages, customer satisfaction, and customer retention (Hansen & Sia, 2015). Digitisation of products, services, and data result in enhanced competitive positioning (Planing et al., 2016).Digitalization of business models result in enhanced competitive positioning (Bärenfänger & Otto, 2015). Prioritisation of building digital capabilities results in the more effective use of resources, enhanced competitive advantages, and economic benefits (Tanner, 2016).

H1.1: Digital Strategy has a significant positive influence on Business Performance

The realisation of Digital Strategy guides the IT Function Transformation of organisations during digital transformation (Ross et al., 2016). Due to the rising digitisation of cross-boundary processes and information, a Digital Strategy also influences inter- and intra-organisational data/information strategies (Bharadwaj et al., 2013). In addition to driving functional strategies, Digital Strategy must be realised through digital transformation strategy (transformation management and transformation execution) for the governance and execution of digital initiatives (Matt et al., 2015). Digital Strategy also drives the necessary changes in organisational structures and governance, digital operations and processes (Sia et al., 2016), and helps in incubating digital innovations within an organisation(Fichman, 2014). Digital Capabilities support the development and refinement of Digital Strategy, which, in turn, configures these resources(Teece, 2010).

H1.2a: Digital Strategy has a significant positive influence on Corporate-Level Data Strategy

H1.2b: Digital Strategy has a significant positive influence on IT Function Transformation

H1.2c: Digital Strategy has a significant positive influence on Digital Organisation

H1.2d: Digital Strategy has a significant positive influence on Digital Innovation

H1.2e: Digital Strategy has a significant positive influence on Transformation Management

3.1.2. Corporate Level Data Strategy

Companies are increasingly looking at adopting digital business models that are driven by data and hence the role of a data strategy is thus changing from mere functional data management to a more strategic procedure at the corporate level (Mazzei & Noble, 2017). In digital businesses, organisations have a large pool of business and customer data. However, not even half of the structured data is leveraged for strategic decisions, and only about one per cent of unstructured data is analysed (DalleMule & Davenport, 2017). The ability to strategically use organisational data (both structured and unstructured) in corporate-level strategy decisions helps organisations to transform their traditional value chains and to build radical digital business models (Mazzei & Noble, 2017).

Real-time data analysis enables data-driven digital business models, competitive advantage, and data-driven decision-making (Pentek & Legner, 2017). Data management is the practice of authority and supervision of data. It seeks to achieve a corporate-wide data strategy, maximizing data resource worth in an enterprise (Alsousi & Shah, 2022). Data management across organisation boundaries enables competitive advantage and strategic benefits (Mazzei & Noble, 2017). As inter-organisation data flows increase, security risk assessments help in preventing data-related loss (Allodi & Massacci, 2017). As inter-organisation data flows increase, data governance helps in preventing data-related loss (Manogaran et al., 2017).

H2.1: Corporate-Level Data Strategy has a significant positive influence on Business Performance

Corporate-Level Data Strategy also drive the other factors during digital transformation. Digital data strategy requires strategic collaboration with IT function and, in turn, influences the requirements of the IT Function Transformation (Berghaus & Back, 2016). For an organisation's data to be used successfully, its data strategy must drive digital innovation towards new analytical innovations (Bärenfänger & Otto, 2015) and encourage new forms of collaboration within the organisation through new structures (Hansen & Sia, 2015). This is also important in cultivating not only a digital mindset but also a data-driven mindset across the organisation (Hansen & Sia, 2015). Global data management will therefore result in data-driven (Mazzei & Noble, 2017) strategic agility (Yeow et al., 2018).

H2.2a: Corporate-Level Data Strategy has a significant positive influence on Digital Organisation

H2.2b: Corporate-Level Data Strategy has a significant positive influence on IT Function Transformation

H2.2c: Corporate-Level Data Strategy has a significant positive influence on Digital Innovation

H2.2d: Corporate-Level Data Strategy has a significant positive influence on Transformation Management

3.1.3. IT Function Transformation

Information technology is considered an important factor in value creation during the digital transformation of an organization (Riasanow et al., 2017). It is imperative that IT function also transforms through new organisational designs (Horlach et al., 2018), more collaboration with business functions, and a digital operational backbone consisting of global automated processes (Sebastian et al., 2017). IT capabilities have a positive influence on digital transformation, leading to a positive impact on the firm's performance and agility (Florian, 2018; Nwankpa & Building, 2016). IT capabilities are considered as dynamic, and they focus on its capacity for disruption and/or innovation in the digital transformation of organisations (Florian, 2018).

IT Function Transformation is critical to the creation of value, and for providing agility during digital transformation (Legner et al., 2017; Nwankpa & Building, 2016; Riasanow et al., 2017). The top-down strategic change in IT function and operation helps with the successful realisation of a Digital Strategy (Dremel et al., 2017). IT function must be adapted to the changing dynamics of Digital Strategy and also to work closely with business functions (Piccinini et al., 2015).

To meet the challenges of digitization, the IT function must undergo a change that comprises new modes of internal organization as well as new forms of collaboration and alignment with business departments. It is essentially the operational backbone for core operations consisting of global processes to support digital business strategy (Legner et al., 2017).

Another set of studies state that initiatives implemented during IT Function Transformations uncovered various paradoxes, and that organisational ambidexterity has, in recent years, become commonly known as 'IT ambidexterity' (Brinkhues et al., 2019; Leonhardt et al., 2017). Business departments expect that IT function provides support for digital value creation in addition to integrating and supporting the vital legacy/shadown IT

applications. It was found that operational agility being driven by IT Function Transformation is key to supporting digitisation, and an ambidextrous approach is needed to find the optimal balance (Leonhardt et al., 2017).

This ambidexterity and agility of digital operations, aligned to both Digital Strategy and Corporate-Level Data Strategy, and combined with new, agile systems of IT function, promises to bring about strategic agility for organisations (Piccinini et al., 2015; Valdez-de-Leon, 2016).

H3: IT Function Transformation has a significant positive influence on Business Performance

3.1.4. Digital Innovation

Digital Innovation involves developing mechanisms that help in sensing, seizing and adopting the new opportunities that arise from digital technologies and incubating them within the organization for providing new digital services/products/business models/internal operational processes (Fichman, 2014; Teece, 2010). These new agile mechanisms (Valdez-de-Leon, 2016) form the foundation for introducing process innovations, new digital services, new digital business models, or new digital products by an organisation (Sebastian et al., 2017). Therefore, in-line with the theory of Disruptive Innovation, Digital Innovation plays a crucial role in the digital transformation of an organisation.

It was found that digital innovations related to business model, processes, products, and services (Barthel & Hess, 2019; Berghaus & Back, 2016), and capturing value from them, are critical factors in the success of an organisation's digital transformation (Fichman, 2014; Nwankpa & Building, 2016). To derive the required value, organisations must strategically drive cross-functional innovation (Barthel & Hess, 2019; Teece, 2010; Valdez-de-Leon, 2016). Digital Innovation also influences the organisational structures and the digital innovations driven by a company's digital and data strategies lead to strategic agility for organisations (Valdez-de-Leon, 2016). Digital innovation facilitates the innovation of business models and the launching of new digital products/services to bring about operational agility (Sachsenhofer, 2016).

H4a: Digital Innovation has a significant positive influence on Business Performance

H4b: Digital Innovation has a significant positive influence on Digital Organisation

3.1.5. Transformation Management

The fact that most transformation projects fail if not managed or due to poor transformation management is well documented. Transformation projects are typically complex and sprawling, and they challenge humans' resistance to change. There are hundreds of IT applications that can be moved to the cloud, for example, and they can be delivered over several

years.

Managing digital transformation effectively helps to coordinate the many independent threads of digital transformation and helps organisations to navigate through their digital agenda (Hess et al., 2016). Multiple transformation projects that stem from digital strategies should be managed by top management and guided by a clearly formulated roadmap (Matt et al., 2015). A digital transformation management coordinates the many independent threads of digital transformation through governance, performance management, and management support (Hess et al., 2016). Digital Transformation should follow a defined strategic plan, with periodic review of its measurable goals which are further linked to the business performance parameters (Berghaus & Back, 2016). It was found that when the digital transformation initiatives were governed, the likelihood of a successful digital transformation was higher (Westerman et al., 2011). For a Transformation Management strategy to be successful, it must be driven by Digital Strategy and Corporate-Level Data Strategy for the alignment with organization's technological ambition from adoption of new technologies (Berghaus & Back, 2016; Hess et al., 2016). Transformation Management provides the operational efficiency required to enhance business agility and reduce time to market (Valdez-de-Leon, 2016).

H5: Transformation Management has a significant positive influence on Business Performance

3.1.6. Digital Organization

Cultivating the vision and leadership for digital transformation and organizing for digital business requires a change of mindset and new structures for the new digital culture across organisations at all levels (Hansen & Sia, 2015). It was found that deep organisational changes in structure and governance are necessary to realise digital transformation initiatives (Berghaus & Back, 2016; Hess et al., 2016; Horlacher et al., 2016). The new roles, responsibilities, and structures help organisations to implement other key digital initiatives, such as IT Function Transformation which, in turn, lead to business benefits (Andersson et al., 2018). Organising for digital transformation also supports ambidexterity, which is required for incubating innovations in an organisation (Andersson et al., 2018; Berghaus & Back, 2016). Both structural and cultural changes are required to increase the acceptance level of the increasing digitalisation of an organisation. Organisations also need to develop or acquire digital competencies and know-how among employees (Berghaus & Back, 2016). Digital Organisation provides the required operational efficiency, which can result in enhanced business agility and reduced time to market (Valdez-de-Leon, 2016). It is necessary to empower employees by moving decision-making down the hierarchy (Valdez-de-Leon, 2016). All

employees at all levels, including top management, must update their digital skills (Legner et al., 2017). New structures, the evolved roles of top management, digital teams, new digital roles that are agile and cross-functional, and more collaboration between employees, partners, and customers are required for successful digital transformation (Hansen & Sia, 2015).

H6: Digital Organisation has a significant positive influence on IT Function Transformation

3.1.7. Digital Capabilities

Digital Capabilities are considered higher-order dynamic capabilities that deal with innovation and new business models, and also guide base capabilities related to product development (Teece, 2010, 2017a, 2017b).

Digitalisation describes the process of incorporating Digital Capabilities into resources that are primarily physical (Fichman, 2014). Digital Capabilities, such as digital platform and digital content, within resources are either instilled through digitisation or as born-digital content (Tanner, 2016). To have a successful digital transformation, organisations need to develop the corresponding Digital Capabilities for digitalization (Westerman et al., 2011).

Digital Capabilities help organisations in undertaking digital transformation and help in creating operating models for competitive differentiation (Kieran, 2011). It was found that Digital Capabilities are critical enablers of digital business success (Sebastian et al., 2017) and to have a successful digital transformation, organisations need to develop the corresponding Digital Capabilities for digitalisation (Berman & Marshall, 2014; Kieran, 2011; Westerman et al., 2011). The operational backbone and the digital services platform that were judged to be important for transformation depended on the base of technology, but what made them powerful were the business capabilities that the digital technology enabled (Sebastian et al., 2017). With the advent of digital technologies like big-data analytics, it is possible for organisations to digitise customer engagement and use the generated digital data for the co-creation of value and competitive advantage. The Digital Capabilities related to the analytics of data, and enabling insights for real-time decision-making, also need to be developed at the same pace as data is generated (Gimple et al., 2018). To experience a successful transformation, all transformation factors need to be supported by Digital Capabilities across entire organisations (Gimple et al., 2018).

H7.1: Digital Capabilities have a significant positive influence on Business Performance

H7.2a: Digital Capabilities have a significant positive influence on Digital Strategy

H7.2b: Digital Capabilities have a significant positive influence on Corporate-Level Data Strategy

H7.2c: Digital Capabilities have a significant positive influence on IT Function Transformation

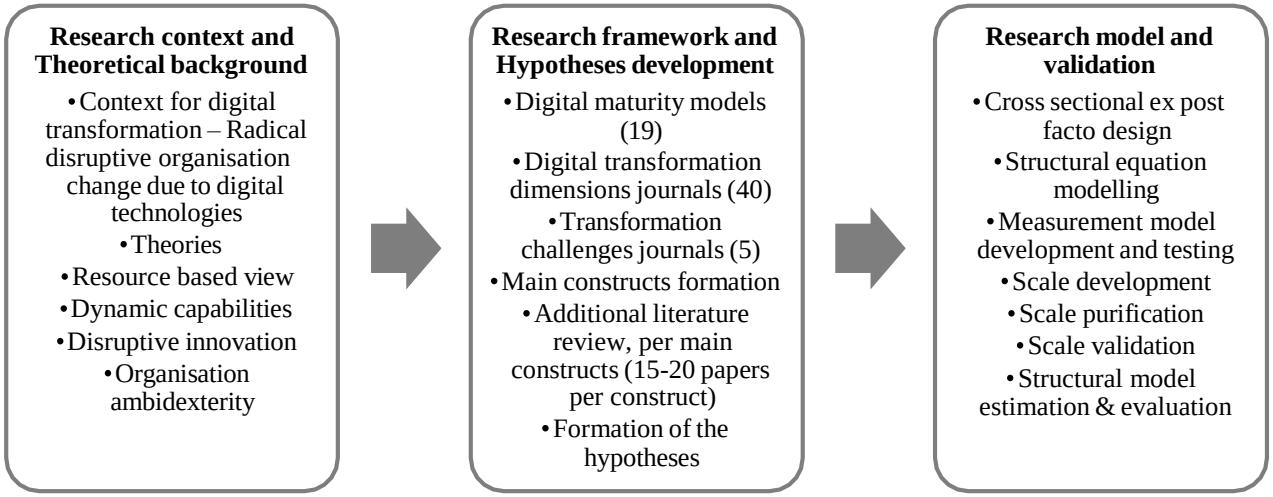
H7.2d: Digital Capabilities have a significant positive influence on Digital Organisation

H7.2e: Digital Capabilities have a significant positive influence on Digital Innovation

H7.2f: Digital Capabilities have a significant positive influence on Transformation Management

4. Research Methodology

Figure 2: *Research Methodology*



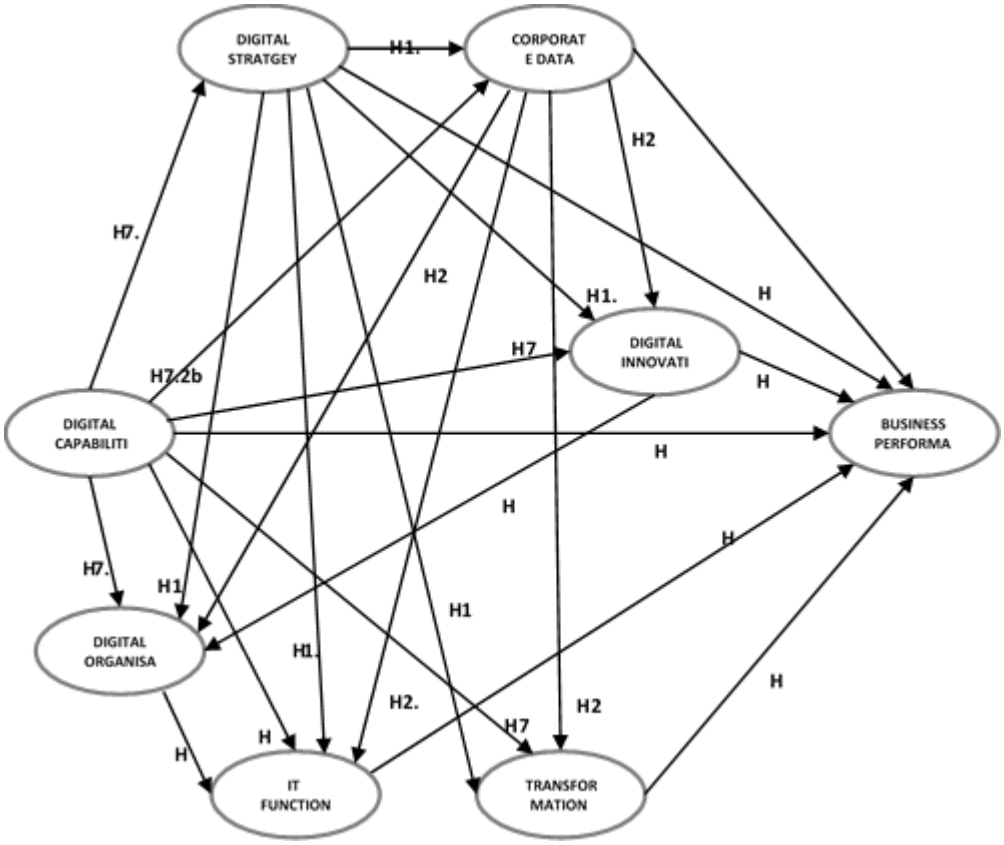
(Source: Authors' Own Illustration)

As depicted in Figure 2: Research Methodology, systematic literature review of the digital transformation literature was conducted to operationalize and develop the model. For the purpose of the systematic literature review, 19 digital maturity models and 60 Digital Transformation articles ranging from 2003 until 2019, broadly classified in the three categories: Digital Maturity Models (19), Digital Transformation (DT) Challenges (5) and DT Dimensions (40) were considered. The resulting dimensions were grouped into organisational constructs and underpinned by theoretical perspectives that included the resource-based view, dynamic capabilities, disruptive innovation, and organisational ambidexterity. This framework was then operationalised from digital transformation literature by performing an additional journal search of 15–20 papers per construct. The research framework thus obtained, consisted of constructs, sub-constructs, and the relationship of the constructs to Business Performance and also among each other. Structural equation modelling (SEM) a group of statistical techniques that examines the structure of interrelationships of independent and dependent variables (J. Hair et al., 2010) was adopted for validating the model in the context of Indian TSP. From the two methods of SEM, namely covariance-based SEM and variance-based partial least squares

(PLS), the latter was chosen because the research involves theory extension and the proposed model had formative as well as reflective measurement model specifications (Hair et al., 2017; J. F. Hair et al., 2011). PLS is also the most preferred tool for testing models containing multidimensional aggregate constructs in IS and management research and PLS path modelling can also be used for models with formative constructs or a mix of formative and reflective constructs' as against the other methodologies (Polites et al., 2012). ADANCO 2.1.1 that is widely used by researchers to model causal relationships between one or more composites and to generate hypotheses, was used for SEM Modelling.

4.1. Research Model Constructs and Measures

Figure 3: *Research Model and Hypotheses*



(Source: Authors' Own Illustration)

To develop the operational constructs/items properly is challenging due to limited scale development procedures (J. Hair et al., 2010). Systematic literature review of the digital transformation literature was hence conducted to operationalize the theoretical constructs. *Theoretical concepts from design science, so-called artifacts, are human-made creations* (Henseler et al., 2016) and *due to the constructivist nature of this type of theoretical concept,*

recent literature suggests to operationalize artifacts by the composite model (Benitez et al., 2019). Hence, this research has selected the *composite* (composite formative) measurement option with *Mode B* weightage option (for consistent scores) for all the constructs in measurement model except for the dependent construct - Business Performance (BP). The BP construct was defined as a *factor* (reflective) and *Mode a consistent* weightage option in ADANCO, since the respective indicators are reflective of the business performance. The operationalized constructs for each of the identified constructs are detailed in Table 1.

Table 1: Operational Constructs and Indicators

Constructs (Source)	***Indicators***
Digital Strategy (Berghaus & Back, 2016; Valdez-de-Leon, 2016) Composite Formative, Mode B	• Customer engagement strategies enabled by digital technologies (Sebastian et al., 2017) for connecting or engaging with customers to co-create value (Vivek & Hazod, 2018). • Designs offering digitally enabled customer experiences (Hansen & Sia, 2015) to address customer expectations and digital lifestyles(Berghaus & Back, 2016). • Digitised solutions strategy (Sebastian et al., 2017): strategic move towards digitising existing products, services, and information (Planing et al., 2016). • Digitised business models(Planing et al., 2016), developed through interaction with both customers and business partners and in its internal operations (Bärenfänger & Otto, 2015). • Strategic decisions over prioritising the digital capabilities and resources required for digital transformation and establishing a digital resources ecosystem (Tanner, 2016).
Corporate-Level Data Strategy (Mazzei & Noble, 2017) Composite Formative, Mode B	• Innovative use of organisation data for real-time analysis and decision-making (Pentek & Legner, 2017). • Inter-organisation data management and data flow between stakeholders, extending outside organisation boundaries (Mazzei & Noble, 2017). • Security risk assessments for inter-organisation shared resources (Allodi & Massacci, 2017). • Security and governance for inter-organisation shared resources and new data strategy (Manogaran et al., 2017).
IT Function Transformation (Legner et al., 2017) Composite Formative, Mode B	• Integrated digital enterprise architecture consists of platforms that provide digital services (Legner et al., 2017). • Agile digital IT systems and services that use agile development methodologies (Dremel et al., 2017; Gerster & Dremel, 2019). • Integration of digital IT systems with legacy IT systems and bi-modal IT architecture (Horlach et al., 2016, 2018). • Alignment of IT investments with digital business strategy (Mithas et al., 2013). • Role of IT function shifting from the traditional functional support role to that of a business partner (Riasanow et al., 2017). • End-to-end standardised business processes (Ross et al., 2016) for reshaping the operating model (Sánchez, 2017). • Digitisation and automation of organisation processes to build the foundational capabilities to cope with digital transformation(Legner et al., 2017). • Ability to orchestrate the network infrastructure using network functions virtualisation and creating software-defined networks (Rotsos et al., 2017).

Constructs (Source)	*Indicators*
Digital Organisation (Sia et al., 2016) Composite Formative, Mode B	• Digital vision for the digital business (Schallmo et al., 2018). • Top management's involvement in steering digital initiatives (Sia et al., 2016). • New organisation structures in alignment with Digital Strategy (Sia et al., 2016). • Degree of centralisation of CDO's office (Horlacher et al., 2016). • Fostering digital mindset across all levels of organisation hierarchy(Kontić & Vidicki, 2018).
Digital Innovation (Fichman, 2014; Sebastian et al., 2017; Teece, 2010) Composite Formative, Mode B	• Focused groups for steering and incubating Digital Innovation in the organisation (Sia et al., 2016) • Timely adoption of new digital technologies (Fichman, 2014; Teece, 2010). • Timely development of new digital products or digital services (Berghaus & Back, 2016; Fichman, 2014). • Timely creation of new digital business models using digital technologies(Sachsenhofer, 2016). • Timely creation of new digital business models (Sachsenhofer, 2016). • Innovating internal organisation processes using digital technologies (Fichman, 2014).
Transformation Management (Hess et al., 2016) Composite Formative, Mode B	• Prioritisation of digital technologies adoption according to the organization's technological ambition (follower, adopter or innovator)(Hess et al., 2016). • Degree of diversification and future business scope of the organisation(Hess et al., 2016). • Governance, management, and new processes for transformation projects(Hess et al., 2016). • Options evaluation for the financing of new projects related to digital transformation(Hess et al., 2016). • Periodic review of digital transformation projects against measurable goals and KPIs(Hess et al., 2016).
Digital Capabilities (Teece, 2010, 2017a, 2017b) Composite Formative, Mode B	• Real-time insights capabilities from organisational data (Kunz et al., 2017). • Inter-organisational information systems to connect all stakeholders in the ecosystem (Mazzei & Noble, 2017). • Digital infrastructure forming the operational backbone (Sia et al., 2016). • Unified and integrated data capabilities for corporate-level data management (Mazzei & Noble, 2017). • Data-sharing capabilities across the organisation's boundaries (Mazzei & Noble, 2017). • Digital enablement of the learning and development function of organisations (Seufert & Meier, 2016). • Digital competencies of employees across all company levels (Sia et al., 2016). • Ability to scan for strategic innovation (Teece, 2010, 2017a).
Business Performance (Mithas et al., 2013) Reflective, Mode A-consistent	• Improved customer engagement and loyalty (Hasnin, 2018). • Enhanced customer satisfaction (Leipzig et al., 2017). • Improved customer retention (Leipzig et al., 2017). • Enhanced competitive positioning of products/services (Planing et al., 2016). • Increased profitability (Zhang et al., 2019). • Improved operational efficiency (Valdez-de-Leon, 2016). • Strategic agility in responding to changing business environments (Mazzei & Noble, 2017; Yeow et al., 2018).

4.2. Data collection technique, respondents and sampling

A five-point Likert scale questionnaire survey was constructed from the operational to collect survey responses. The survey instrument was reviewed in multiple rounds by internal experts and a small pilot with (sample size -52) was carried out for scale verification. The finalized survey instrument of 8-factors and 50-items, was then delivered electronically through LinkedIn to the main sample. The survey respondents were carefully chosen after a critical review of their profiles based on their expertise in digital transformation and seniority within the Indian telecommunications industry value chain. The survey targeted the decision makers, strategy makers and experts who had planning and hands on work experience in the digital transformation initiatives with the TSP. From the total of around 800 connection requests sent to LinkedIn respondents, around 600 accepted the connection request, from which 294 connections filled the survey. This accounted for 75% connection request acceptance and 49% response rate from the survey requests sent out. The reported data indicated that more than 50% of the respondents were with more than 15 years of experience and around 20% of the respondents were from 10-15 years of experience band. Around 40% of the respondents were from the Senior Digital Transformation Experts working with the TSP while the rest were distributed across different stakeholders in the entire Telecom value chain, namely: Telecommunication Regulatory Association of India, Management Consultants, Systems Integrators, Telecom Software/Hardware Vendors and Digital Service Providers. The guideline for the minimum sample size in a PLS-SEM analysis should be equal 10 times the largest number of formative indicators used to measure one construct or 10 times the largest number of structural paths directed at a particular construct (J. Hair et al., 2010). With larger data sets (N = 250+), consistency at large is achieved when an appropriate number of indicator variables (4+) are used to measure each of the construct (J. Hair et al., 2010). Hence, for the validation of an 8-factor 50-item scale, sufficiently large amount of data was collected on the sample of 294 respondents. The data collection period for the scale validation began in March 2019 and finished in August 2019. There was no missing data encountered, as all the questions were marked compulsory in the survey.

5. Data analysis and results

5.1. Evaluation of the Measurement Model

The constructs marked as composite Mode B in ADANCO were assessed for multicollinearity. The values of variance inflation factor (VIF) of all constructs were evaluated

and there were no major collinearity issues based on the threshold value (<5) suggested for VIF (J. Hair et al., 2010). Since there were no multicollinearity issues, significance of weights and loadings were evaluated (Benitez et al., 2019). Based on bootstrapping outputs, all indictors' T Values for outer loadings and outer weights for the associated significance testing were found significant. For Business Performance (BP) in particular, Dijkstra-Henseler's rho (ρA) and Cronbach's Alpha both were reported at 0.88 each, with Average Variance Extracted (AVE) value of 0.523. Based on the results discussed above it is concluded that the measurement model is meaningful (J. Hair et al., 2010).

5.2. Evaluation of the Structural Model

The structural model was assessed for multi-collinearity and the significance of the relationships specified by the hypothesis (Hair et al.2014) using the bootstrapping procedure (4,999 samples). No collinearity issues were found. ADANCO 2.1.1 provides tests of model fit, which rely on bootstrapping Since the standardized root mean squared residual (SRMR) value is less than 0.08, the model is deemed fit and correct. These values indicate substantially strong predictive power of the model. (Henseler, 2017). As a thumb rule, R^2 values of 0.75, 0.50, or 0.25 for endogenous latent variables can be respectively described as strong, moderate, or weak (Reinartz et al., 2009). The variance explained by structural relationships was 32% for Digital Strategy (R^2 – 0.38: moderate), 54 % for Corporate Level Data Strategy (R2 – 0.54: moderate), 75% for IT Function Transformation (R^2 – 0.75: strong), 56% for Digital Organization (R^2 – 0.56: moderate), 60% for Digital Innovation (R^2 – 0.60: strong), 62% for Transformation Management (R^2 – 0.62: strong) and 60% for Business Performance Innovation (R^2 – 0.60: strong). As the R squared value of Business Performance (BP) is 0.605, the research framework is acceptable and supports the structural equation modelling.

5.3. Hypothesis testing

Table 2: *Hypotheses Testing (Direct Effect)*

Hypotheses	Relations	Original coefficient (β)	t-value	p-value (α-1-tailed)	Supported (YES/NO)
H1.1	DS -> BP	***0.22	3.8175	0.0001	YES
H1.2a	DS -> CD	***0.39	6.5602	0.0000	YES
H1.2b	DS -> IT	***0.17	4.1489	0.0000	YES
H1.2c	DS -> DO	***0.20	3.1206	0.0009	YES
H1.2d	DS -> DI	#0.07	1.1562	0.1238	NO
H1.2e	DS -> TM	*0.08	1.6029	0.0545	YES
H2.1	CD -> BP	#0.03	0.3976	0.3455	NO
H2.2a	CD -> DO	*0.14	1.9201	0.0275	YES
H2.2b	CD -> IT	***0.34	6.861	0.0000	YES
H2.2c	CD -> DI	***0.19	3.0234	0.0013	YES
H2.2d	CD -> TM	***0.17	2.7834	0.0027	YES
H3	IT -> BP	**0.20	2.2135	0.0135	YES
H4a	DI -> BP	**0.16	2.0936	0.0182	YES

H4b	DI -> DO	***0.28	4.2155	0.0000	YES
H5	TM -> BP	*0.17	1.8788	0.0302	YES
H6	DO -> IT	***0.13	2.6161	0.0045	YES
H7.1	DC -> BP	*0.14	1.4617	0.0720	YES
H7.2a	DC -> DS	***0.57	7.7189	0.0000	YES
H7.2b	DC -> CD	***0.45	9.9054	0.0000	YES
H7.2c	DC -> IT	***0.37	7.3431	0.0000	YES
H7.2d	DC -> DO	***0.26	3.6106	0.0002	YES
H7.2e	DC -> DI	***0.59	11.8717	0.0000	YES
H7.2f	DC -> TM	***0.61	11.6008	0.0000	YES

DS: Digital Strategy, CD: Corporate-Level Data Strategy, IT: IT Function Transformation, DO: Digital Organisation, DI: Digital Innovation, TM: Transformation Management, DC: Digital Capabilities, BP: Business Performance

Significance levels:
*** Strongly significant at $\alpha < 0.01$ (1-tailed test) and t-value > 2.59
** Moderately significant at $\alpha = 0.01$ to 0.04 (1-tailed test) and t-value = 1.96 to 2.59
* Just significant $\alpha = 0.05$ to 0.10 (1-tailed test) and t-value = 1.65 to 1.96
# Not significant $\alpha > 0.10$ (1-tailed test) and t-value < 1.65

(Source: Authors' Own Illustration)

Based on the cut offs of the t-values and p-values provided above, the effect of the significance levels and relative significance of the constructs was analysed. From 23 direct effect hypotheses, 21 hypotheses where the *direct effect* significance was either strong/moderate/just enough significance, were accepted and 2 hypotheses where *direct effect* was not significant, were rejected.

5.3. Total effects

Success factor studies should concentrate on the impact of success drivers. So along with hypothesis testing, practically it helps in identifying the relative effect of the various factors on the dependent variable (Albers, 2010). Based on the cut offs of the t-values and p-values provided in

Table 3: Total Effects, the effect of the significance levels and relative significance of the constructs was analyzed

Table 3: Total Effects

Indepen variable	Dependent variable						
	D	C	I	D	I	T	B
DS		*** (t=6.56, p=	*** (t=6.49, p=	*** (t=4.37, p=	**0.14 p=0.01	*** (t=3.03, p=	*** (t=5.22, p=
CD			*** (t=7.47, p=	**0.19 p=0.01	**0.18 p=0.00	**0.17 α=0.00	**0.16 p=0.00
IT							**0.20 p=0.01
DO			*** (t=2.61, p=				**0.03 p=0.04
DI			**0.04 p=0.03	*** (t=4.22, p=			**0.17 p=0.01
TM							**0.17 p=0.03
DC	*** (t=7.72, p=	*** (t=11.76, p=	*** (t=22.97, p=	*** (t=14.69, p=	*** (t=19.18, p=	*** (t=19.28, p=	*** (t=12.21, p=

DS: Digital Strategy, CD: Corporate-Level Data Strategy, IT: IT Function Transformation, DO: Digital Organisation, DI: Innovation, TM: Transformation Management, DC: Digital Capabilities, BP: Business Performance

Significance levels:
*** Strongly significant: $\alpha < 0.01$ (1-tailed test) and t-value > 2.59
** Moderately significant: $\alpha = 0.01$ to 0.04 (1-tailed test) and t-value = 1.96 to 2.59

* Just significant: α = 0.05 to 0.10 (1-tailed test) and t-value = 1.65 to 1.96
# Not significant: α > 0.10 (1-tailed test) and t-value < 1.65

(Source: Authour's Own Illustration)

It was found that Digital Capabilities had the strongest total effect on Business Performance, followed by Digital Strategy and corporate level data strategy. IT Function Transformation, Digital Innovation, Transformation Management, and Digital Organisation each had a moderate total effect on Business Performance. Transformation management had a just significant total effect on Business Performance, while Digital Organisation had no significant effect on Business Performance. Aside from Business Performance, Digital Capabilities also had a strong total effect on all the other constructs (IT Function Transformation, Transformation Management, Digital Innovation, Digital Organisation, and Corporate-Level Data Strategy).

6. Implications

First, by examining the underlying factors, a reference framework was developed that is grounded in multiple theories and operationalized using digital transformation literature including digital maturity models. This theoretical framework extends the current Digital Transformation literature by providing first order operational constructs and also theorizing the relations between different constructs. Second, this study has developed and validated the measurement instrument that aims to correctly capture each construct. Third, to our knowledge, this is one of the first studies that offers a quantitative validation to various factors that havean influence on the success of digital transformation. The study has not only quantitatively validated influence of digital strategy but also has validated the changing role of data strategy from a functional level strategy to a corporate level data strategy (Mazzei and Noble 2017).

On the practical implications front, the results of the study will help digital transformation planners to develop a roadmap and prioritize key milestones to act as a bridge between the challenges faced by them and their actual digital transformation actions. For instance, it is evident from the results that IT Function Transformation which happens to be the major challenge currently, can be successfully handled by aligned realization of Digital Strategy and having a guiding Corporate Level Data Strategy in place. These efforts need to be supported by developing the corresponding Digital Capabilities for each of the critical factors. It is also evident from the analysis of the total effects, that Digital Capabilities, followed by Digital Strategy and Corporate Level Data Strategy have the strongest relative total effect on the business performance outcomes during digital transformation. The scale and indicators for each construct were also evaluated for their relative significance during SEM validations. This will

help the digital strategists to prioritize the initiatives for each construct as well. Hence, successful realization of our empirical model will help the organizations to prioritize their efforts towards a successful digital transformation.

7. Conclusion

The empirical validation of the conceptual model in the context of Indian TSP, outlines their significance of the critical success factors to practical business issues. The measurement model validation using the sample of digital transformation experts from the Indian TSP, established the robustness of the proposed model. Furthermore, the structural model examination validated the theorized relationships between various proposed factors and the successful business performance outcomes, thereby highlighting the serious need to devise appropriate strategies for successful transformation. It is concluded that developing appropriate Digital Capabilities for all factors had the strongest total significance followed by Digital Strategy, Corporate Level Data Strategy, IT Function Transformation, Transformation Management, Digital Innovation and Digital Organization in order to have successful Business Performance outcomes from digital transformation. This research also contributes significantly to the body of knowledge constituting digital transformation literature by devising a conceptual framework from systematic literature review and with theoretical underpinnings. Even though there are studies in the digital transformation literature that have applied these constructs in isolation, this study integrates these with their theoretical interactions.

8. Limitations and future research

This research has explored significant factors for successful transformation of the Indian TSP. In order to have manageable set of indicators and given the constraints of time and budget, only the ones considered important for the Indian TSP were considered in the conceptual model for further quantitative analysis. However, given the generic nature of the Digital Transformation literature, the model can also be adapted and tested empirically in other geographies and other industries in future. Future research can also build further on the proposed framework to add more factors, more indicators and also validate the second order indicators identified by this research to extend the framework further.

The conceptual model and the research mode/scale can be further validated for TSP in countries other than India to highlight the geographical similarities and differences. The conceptual model can also be verified in industries such as manufacturing, retail sectors like consumer-packaged goods or fast-moving consumer goods, as digital strategies and digital capabilities are not holistically built there.

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