

Drivers and the role of Chief Information Officer (CIO) in Digital Transformation: An Exploratory Study

THESIS

Submitted in Partial Fulfilment
Of the Requirements for the Degree Of
DOCTOR OF PHILOSOPHY

By

Raghu Nandan Chawla
2017PHXF0506P

Under the Supervision of
Dr. Praveen Goyal
Co-Supervision of
Dr. Deepak Kumar Saxena



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE
PILANI – 333 031 (RAJASTHAN), INDIA
2023

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

CERTIFICATE

This is to certify that the thesis titled **Digital Transformation - Drivers and Role of Chief Information Officer: Empirical Analysis** submitted by **Raghu Nandan Chawla** ID No **2017PHXF0506P** for the award of Ph.D. of the Institute embodies original work done by him under my supervision.

Signature of the Supervisor:

Name in capital letters: DR. PRAVEEN GOYAL

Designation: Associate Professor, Department of Management, BITS Pilani

Date:

Signature of the Co-Supervisor:



Name in capital letters: DR. DEEPAK KUMAR SAXENA

Designation: Assistant Professor, School of Management & Entrepreneurship, Indian Institute of Technology,

Jodhpur

Date: 27.06.2023

Organisations are constantly adopting non-traditional, digitally transformed business models as a result of pervasive digital technologies. They are incessantly finding newer ways to create value through digital means and building their digital capabilities. This organisational adoption of new-age digital technologies for better customer engagement, digitised operations, and new business models has often been termed the digital transformation (DT). However, despite major emphasis on transforming business models digitally, the focus on understanding underlying factors (drivers) of digital transformation often misses organisational attention. This results in high failure rates of digital projects. A thorough understanding of the drivers enables the organisations to focus, channelize and adjust the intensity of efforts towards DT to complement their business strategy.

Effective management of the new-age digital business models is equally important and demands specialized skills. In this regard, among all the C suite leaders, the role of the chief information officers (CIOs) is the most impacted, who being the head of information technology are considered responsible for driving DT. In its own, the role is transforming from a conventional infrastructure and application manager to a strategic business partner. Therefore, it is vital to evaluate how the CIO's role is evolving, outlining novel responsibilities and essential leadership abilities that will be requirements to contributing effectively to the position of CIO in the future. Guiding the practical aspects appropriately is most crucial to improve the success rate DT initiatives. Therefore, it is essential to develop an implementation framework that guides the execution of DT at organisations, irrespective of the industrial sector.

This research addresses the above perennial aspects of DT. The phenomenon of digital transformation is empirically examined and evaluated through six large scale organisations representing diversified industry verticals. The insights are appraised following the inductive case study-based methodology. The results of the study present the combined elements of strategy, IT leadership and digital transformation both from academic and practical perspectives. The literature review consolidates the research under the overall domain of DT. The dominant research streams as organisational impacts, operational processes, applied applications and insights, and social aspects, further comprising eighteen research streams that exhaustively address research under DT domain, are derived. The empirical results cull

out multiple factors that act as the drivers of digital transformation. Further, the factors that elaborate changing role of the CIO under digital transformation are synthesised and evaluated. The research further uniquely defines a structured and practical approach to implementing digital transformation.

The study contributes to the literature on DT by amalgamating the status of the present research, deriving the research areas and research streams, evaluating the driving forces that motivate the organisations to adopt digital and exploring the role of the Chief information officer in digital transformation. Further, empirical model to implement DT is suggested to address the practicalities of the nascent phenomenon of DT. For the practitioners, the study aims to act as a ready reckoner repository in building knowledge for taking superior strategic decisions to harness the benefits of DT more proficiently. In summary, the study attempts to present a thorough understanding by addressing the "why" and "how" aspects of digital transformation.

ACKNOWLEDGEMENT

I am grateful to my parents, who served the cause of my entire education and always encouraged me to take up the initiatives I wanted to. Their selfless, incessant support and blessings have aided me in channelizing my efforts in the right direction. They are destiny writers.

I am genuinely thankful to the Almighty, who has steered me through various means and forms. I owe you for planning entire things on earth, and I feel genuinely gratified to you for preparing this journey for me. Your planning has enabled me to explore newer and better aspects of life.

I am indebted to my Gurus, Dr Praveen Goyal and Dr Deepak Kumar Saxena, for their guidance at every step and for making this entire effort constructively possible. Both have been very patient and affectionate to me throughout the journey. There were numerous moments of trepidation, but your guidance enabled me to get back on track. They are the real gem of people. Sincere thanks to all the other faculty members of BITS, Pilani, Department of Management, who have been entirely instrumental in shaping this research via their constructive feedback through DRC reviews from time to time. After every discussion, the concepts got more crystallised and synthesised, building more and more confidence in the study. I would like to extend my sincere gratitude to the members of my Doctoral Advisory Committee (DAC), Dr. Udyan Chanda, Dr. Jyoti Tikoria, and Dr. Neetu Yadav, for their ongoing input, time, patience, and effort in reading my thesis and offering insightful comments and suggestions. I will always be thankful to Dr. Satyendra Kr. Sharma and Dr. Gaurav Nagpal for their motivation and personal touch throughout this research.

The BITS, Pilani, Pilani Campus administration has my heartfelt thanks. I would like to express my gratitude to Prof. V. Ramgopal Rao, Vice-Chancellor, BITS Pilani, Prof. Sudhirkumar Barai, Director, BITS, Pilani and Col. Soumyabrata Chakraborty, Registrar, BITS, Pilani, Pilani Campus, for making it possible for me to do research at such a prestigious institution. Additionally, I would like to express my sincere gratitude to Prof. Sanjay Kumar Verma (Dean, Administration), Prof. M. B. Srinivas (Dean, Academic - Graduate Studies & Research), Prof. Shamik Chakraborty (Associate Dean, Academic - Graduate Studies & Research) and Prof.

Jitendra Panwar (Ex Associate Dean, Academic - Graduate Studies & Research) for their invaluable assistance during my doctoral studies.

I must acknowledge my wife for her encouragement throughout this journey. I learned many novel ways of doing things better from her in several instances. My daughter Shivika and my son Shivash, who have grown up as responsible schoolgoers from naughty toddlers, enabling me to explore inquisitively with them. My sisters and both brothers-in-law for their inspiration and guidance, personally and on the research granularities. This was phenomenally instrumental in many aspects. Together we win!!

My heartfelt gratitude to all the other stakeholders from the case organisations, who dedicated their time to the interviews and shared their insights and valuable feedback to make the study more insightful and practical. It was a great pleasure to brainstorm with professionals and real-life practitioners of the digital domain.

Last but not least, I must thank the BITS management department's support staff, who were always willing to extend their support for more than I could ask for. Much thanks to Mr. Nitesh (AGSRD), Mr. Shravan, Mr. Pradeep Swami & Dr. Navin Singh (Associate Dean, SWD) for their always extended support. Also, having wonderful friends was a grateful experience; thanks to DC Trivedi, Dr. Victor, Prateek, Ujjwal, Harshita, Sakshi, Ritika and Rupesh for making it a collaborative and fun-filled experience.

Raghu

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENT	iii
LIST OF FIGURES	ix
LIST OF TABLES	x
ABBREVIATIONS	xi
1.1 Chapter Overview	1
1.2 Background of the study	1
1.3 Concept of Digital Transformation	3
1.4 Research Questions	5
1.5 Objective and Scope of Study	5
1.6 Motivation of the study	6
1.7 Structure of the thesis	7
1.8 Conclusion	9
Chapter 2 – Literature Review	10
2.1 Chapter Overview	10
2.2 Understanding Digital Transformation	12
2.2.1 Introduction to DT	12
2.2.2 Emergence and Progression of the concept	15
2.3 A review of Digital Transformation Literature	19
2.3.1 Data Collection for the Bibliometric Study	20
2.3.2 Research Methodology of the Bibliometric Study	22
2.3.3 Results of the Bibliometric Study	23
2.3.3.1 Overview	23
2.3.3.2 Citation Analysis	24
2.3.3.3 Number of publications per year	24
2.3.3.4 The most frequently cited articles	26
2.3.3.5 Most Contributing and Most influential Authors	29
2.3.3.6 Analysis of Journals by citations	31
2.3.3.7 Analysis of institutions by publications	33
2.3.3.8 Analysis of countries by publications	35
2.3.4 Co-Citation Analysis	37
2.3.4.1 Co-Authorship analysis for frequently cited authors	38
2.3.4.2 Journals Cocitation Analysis	40
2.3.4.3 Co-Occurrence of Author's Keywords	41

2.3.4.4 Country wise Co-authorship Analysis	42
2.4 Emerging research streams in the Field of Digital Transformation	43
2.4.1 Organisational Impacts	44
2.4.2 Applied Applications and Insights	46
2.4.3 Operational Processes	48
2.4.4 Social Aspects	50
2.5 Digital Technologies and Market Dynamics	51
2.6 Drivers of digital transformation	55
2.7 CIO's and Digital Transformation	59
2.7.1 Evolution of the CIO role	60
2.7.2 Role of CIO in DT	64
2.7.3 Digital Transformation Leadership	69
2.8 Research Gaps and Research Questions	71
2.9 The conceptual framework of DT at organisations	73
2.10 Conclusion	75
Chapter 3 – Research Methodology	77
3.1 Chapter Overview	77
3.2 Research Design	77
3.3 Case selection	79
3.4 Case organisation's Profiles	82
3.4.1 Case 1 - AutoCo	82
3.4.2 Case 2 - CementCo	82
3.4.3 Case 3 - HealthCo	83
3.4.4 Case 4 - ChemCo	84
3.4.5 Case 5 - BuildCo	85
3.4.6 Case 6 - TextileCo	86
3.5 Data collection	88
3.6 Data Analysis	90
3.7 Conclusion	95
Chapter 4 – Findings	96
4.1 Chapter Overview	96
4.2 Drivers of Digital Transformation	96
4.2.1 Business Innovation and process improvement	98
4.2.1.1 Ecosystem Redesign with partners	98
4.2.1.2 Establish new market channels	99
4.2.1.3 Internal business process optimisation	99

4.2.1.4 Operational advancements	100
4.2.1.5 Employee demands and Talent Retention	101
4.2.2 Business Sustainability	101
4.2.2.1 Competitive Pressure and Peer influence	102
4.2.2.2 Customer & suppliers' demands and expectations	103
4.2.2.3 Disruption by new entrants	104
4.2.2.4 Fear of going below the benchmark	104
4.2.2.5 Internal business pressure (Cost, Margin, Revenue)	105
4.2.3 Internal organisational aspiration	105
4.2.3.1 Innovation & Proactive utilisation of technology	106
4.2.3.2 Management interest in Digital differentiation	107
4.2.3.3 Motivation of value creation by digital ways	107
4.2.3.4 Social Aspects	108
4.2.4 Unplanned External Exigencies	109
4.2.4.1 Legal & Regulatory Compliances	109
4.2.4.2 Pandemic impact on business	110
4.3 Role of CIO in DT	111
4.3.1 Business & Functional Integration	113
4.3.1.1 IT & Business Liaison	113
4.3.1.2 Legacy Manager & Technology Integrator	114
4.3.2 Communication	115
4.3.2.1 Communication Enabler	115
4.3.2.2 IT representor, Trust & Perception Builder	116
4.3.3 Conformance	117
4.3.3.1 IT Risk Manager	118
4.3.3.2 IT security Enabler & compliance Conformer	119
4.3.4 IT Governance & Operations Management	120
4.3.4.1 Agile Execution & Delivery	121
4.3.4.2 Digital Infrastructure & Platform enabler	122
4.3.4.3 Exigency Manager	124
4.3.4.4 Operations Management	125
4.3.5 People Management	126
4.3.5.1 Digital Culturist	126
4.3.5.2 Talent Manager	127
4.3.5.3 Negotiator	128
4.3.5.4 Partner Alliancer	130

4.3.5.5 TMT influencer and advisor	131
4.3.6 Strategic Management	132
4.3.6.1 Business Strategy complement	132
4.3.6.2 Digital strategy Articulator	133
4.3.7 Technology & Innovation	134
4.3.7.1 Business Need evaluator & Business Process Innovator	134
4.3.7.2 Business Process Reengineer	135
4.3.7.3 Technology consolidator & Application advisor	136
4.3.7.4 Technology explorer	137
4.4 Conclusion	138
Chapter 5 - Discussion	139
5.1 Chapter Overview	139
5.2 Divers of Digital Transformation	142
5.3 Role of CIO in Digital Transformation	152
5.4 How can the organisation attempt a successful digital transformation?	165
5.5 Conclusion	177
Chapter 6 – Conclusion, Research Implications, Limitations & Future scope of research	180
6.1 Chapter Overview	180
6.2 Theoretical Implications	180
6.3 Practical Implications	183
6.4 Limitations and Future scope of study	186
References	189
Annexure 1 - Digital Transformation Research Streams and Authors	209
Annexure 2 - Doctoral Research Consent Form	216
Annexure 3 – Interview Questions (Participant’s Interview)	218
List of Publications	220
Biography of Doctoral Student	221
Biography of the supervisor	222
Biography of the Co-Supervisor	223

LIST OF FIGURES

Figure 1.1: overview of the chapter	1
Figure 1.2: Structure of Thesis	9
Figure 2.1: Overview of Chapter	11
Figure 2.2: Literature Selection Methodology	22
Figure 2.3: Articles Published per Year	25
Figure 2.4: Network of co-cited Authors	38
Figure 2.5: Network analysis of co-cited journals	40
Figure 2.6: Co-Occurrence of author's keywords	41
Figure 2.7: Country-wise Co-Authorship analysis	42
Figure 2.8: Research Streams in Digital Transformation Domain	44
Figure 2.9: The Role of CIO - Credibility with organisational learning	62
Figure 2.10: Conceptual Model of Digital Transformation at the organisation	74
Figure 3.1: Overview of Chapter	77
Figure 3.2: Physical-digital continuum (Berman & Bell, 2011)	80
Figure 3.3: Drivers of DT (First and Second Level Constructs)	93
Figure 3.4: Role of CIO in DT (First and Second Level Constructs)	94
Figure 4.1: Overview of Chapter	96
Figure 4.2: Business Innovation and process improvement (second order themes)	99
Figure 4.3: Business Sustainability (second order themes)	102
Figure 4.4: Internal organisational aspiration (second order themes)	106
Figure 4.5: Unplanned External Exigencies (second order themes)	109
Figure 4.6: Business & Functional Integration (second order themes)	113
Figure 4.7: Communication (second order themes)	115
Figure 4.8: Conformance (second order themes)	118
Figure 4.9: IT Governance & Operations Management (second order themes)	121
Figure 4.10: People Management (second order themes)	126
Figure 4.11: Strategic Management (second order themes)	133
Figure 4.12: Technology & Innovation (second order themes)	135
Figure 5.1: Overview of Chapter	140
Figure 5.2: Conceptualised Model for DT and CIO role in organisations	142
Figure 5.3: Derived drivers of Digital Transformation	143
Figure 5.4: Derived roles of Chief Information Officer	154
Figure 5.5: Digital Transformation implementation (proposed approach)	169
Figure 6.1: Overview of Chapter	182

LIST OF TABLES

Table 2.1: Definitions of Digital Transformation	13
Table 2.2: Overview of Results (Literature Review)	24
Table 2.3: Most cited articles in DT domain	26
Table 2.4: Most Contributing Authors (in context of documents published)	30
Table 2.5: Most Contributing Journals (in terms of total citations)	31
Table 2.6: Most Contributing Journal (in context of total average citations)	32
Table 2.7: Most Contributing Institution (based on number of citations)	34
Table 2.8: Most Contributing Institutions (based on Average Citation per document)	34
Table 2.9: Most Contributing Country (Based on citations)	35
Table 2.10: Most Contributing Country (Based on Average Citation per document)	37
Table 2.11: CIO roles outlined in the existing literature	68
Table 3.1: Profile of case organisations	81
Table 4.1: Drivers of Digital Transformation	97
Table 4.2: Role of CIOs in Digital Transformation	112
Table 5.1: Digital dimension and Sub dimensions	172

ABBREVIATIONS

AUTOOCO	Automobile Case Organisation
BPO	Business Process Outsourcing
BPR	Business Process Reengineering
BUILDSCO	Building Material Case Organisation
CDO	Chief Digital Officer
CEMENTCO	Cement Case Organisation
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CHEMCO	Chemical Case Organisation
CIO	Chief Information Officer
COO	Chief Operating Officer
DT	Digital Transformation
HEALTHCO	Healthcare Case Organisation
IS	Information System
IT	Information Technology
IOT	Internet of Things
MIS	Management Information Systems
RQ	Research Question
TEXTILECO	Textile Case Organisation
TMT	Top Management Team

Chapter1 - Introduction

1.1 Chapter Overview

The chapter presents the introductory details of this research. The background of the study is presented, illustrating the need and significance of this research. The concept of Digital Transformation (DT) is introduced, the research questions are presented, and the motivation of the research is discussed. This is followed by a discussion on the scope and objective of the study, the structure of the thesis, and finally, the conclusion of the chapter is presented.

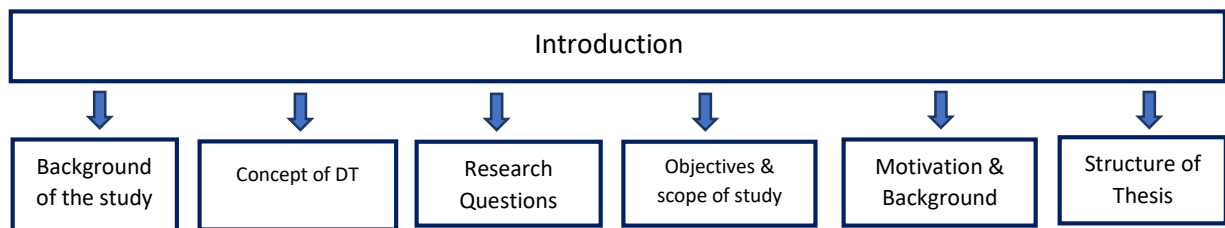


Figure 1.1: overview of the chapter

1.2 Background of the study

Organisations in the corporate world are being influenced by the pervasive development of digital technologies. With the emergence of new digital technologies, businesses in almost every industry sector are embarking on initiatives to reap their benefits in multiple business domains. To the customer side, organizations are constantly inventing new ways to use modern digital technologies to provide customers with value-added services and cultivate individualised relationships (Yoo et al., 2010; Nambisan et al., 2017). On the other side, by building networked collaborations and adopting smart manufacturing practices in operations (Huang et al., 2014; Ghobakhloo, 2020), businesses are aiming to bring collaborative synergies across their supply chains. The advancements in superior mobile connectivity such as 5G and scalable cloud-based infrastructure has enabled for rapidly increasing or decreasing the overall business scale, resulting in cost savings. Further, by adopting data-driven business

practices, the organisations are increasingly targeting to build an edge over their competitors (Zaki, 2019). Consequently, organisations are embracing digital technologies to build ever efficient, intelligent, and self-learning business models. Many new generation organisations like Zomato, Airbnb, Ola and Paytm have transformed them completely on digital-based revenue models, disrupting the established players in their respective industries (Christensen and Overdorf, 2000).

The multidimensional nature of digital technologies poses conflicting situation of decision making for the organisations, such as scalability vs. cost, cloud vs. on-premises installations, and accessibility vs. security. These situations are highly contextual and the organisations have to carefully trade-off decisions one option for the other. As a result, DT initiatives frequently fall short of expectations despite large investments and efforts (Davenport & Westerman, 2018). According to Forbes (2016), there is an 84 percent chance that digital transformation projects would fail, although major consulting firms like BCG, McKinsey & KPMG place the risk of failure between 70 and 95 percent (Block, 2022). Particularly, established organisations frequently struggle with digitalization since they are unsure of where to begin? (Seth, 2021) as they are not able to comprehend the real reasons behind their willingness to digitalize. Understanding the driving forces of digital transformation precisely is the most crucial prerequisite to appropriately plan and channelise the efforts towards digital transformation. A clear understanding supports the organisations setting the strategic objectives and approach right to improve the success rates of DT projects.

Effective management of these modern business models requires a specific set of abilities as organisations aspire to digitally shift their business models more frequently. The CIO's position is the one that is most impacted in this regard among all the C suite executives. The CIO being the head of the IT function is the person responsible for managing and incessantly innovating strategic solutions to the business prospects. He is considered accountable for building and driving the organisation's IT vision, be the organisation a top runner or a close follower. Understandably, the business expectations from digital technologies have added complexity to CIO's role today and for everyone down the line in the hierarchy in IT function. As a result, the role itself is migrating towards strategic business partner from the traditional infrastructure and application management. Even though expectations from the CIOs have increased manifold, the organisations mostly appear to be dissatisfied with their delivery of

digital transformation (Gerth & Peppard, 2020). Therefore, it is critical to reflect on how the CIO's function is evolving, detailing new duties and essential leadership abilities that will be required to participate effectively in the future CIO position. Further, ensuring the successful accomplishment of DT projects is equally if not more important than strategising digital. To increase the overall success rate of DT projects, the practical elements must be well aligned and guided. Therefore, regardless of the industrial sector, it is crucial to create an implementation framework that directs the application of DT at organisations. There have been a lot of studies in many DT domains (Mishra et al., 2018; Muhari et al., 2019; Cortés Sánchez and Julián David, 2019; Hausberg et al., 2019; Vial, 2019, Verhoef et al., 2021). While these studies have presented excellent insights into the literature on DT, yet, a comprehensive understanding of the phenomenon from integrative interlinking of its drivers, technology management aspects and guiding approach is still lacking in academic literature. Thus, an overall holistic insight addressing why and how of the digital transformation is missing from an academic and managerial perspective. This research addresses the above-mentioned aspects following academic literature and empirical investigations from the field. The key concepts are discussed first to lay the groundwork for empirical study.

1.3 Concept of Digital Transformation

The term digital transformation (DT) represents the use of new-age digital technologies (such as social media, mobility, analytics, cloud and internet of things "SMACIT") (Ross et al., 2016) by the business to radically transform their customer offerings, operational processes or the business models to generate new revenue streams (Berman, 2012). Fitzgerald et al. (2013, p.4) define DT as "*the use of new-age digital technologies to enable major business improvements (such as enhancing customer experience, streamlining operations or creating new business models)*".

Emerging from customer connect to redefining the business models, DT has become all-pervasive. Irrespective of the industry type, scale or scope, DT potentially disrupts business processes and creates opportunities at multiple levels. The processes that formed the organisations' core competencies traditionally are no more relevant. As a result, strategy coupled with technology formulates the core aspect of DT (Kane et al., 2015; Chanas et al., 2019). In the past, organisations have been considering information technology as a

commodity with little or no added value (Carr, 2003). Whereas IT strategy has traditionally been regarded as a support functional-level strategy, usually subordinate to the business strategy, the digital business strategy is orchestrated to incorporate digital technology elements into business strategy (Bharadwaj et al., 2013; Haffke et al., 2016). Traditional management approaches, organisational structures, and rules may impede corporate growth in the digital world. Therefore, for its execution, DT demands a clear vision, collaborative efforts, and flexibility in adopting digital business processes (Asim & Nasim, 2022). Consequently, numerous businesses have adopted digitalisation and restructured their organisational structures and managerial roles in recent years (Haffke et al., 2016). As a result, the digitally transformed processes are becoming pivotal to today's organisational strategies, enabling them to expand beyond their traditional business sphere. This, in turn, has resulted in blurring the structural boundaries within and across the entire value chain.

As it impacts a wide trait of business, DT has become a multifaceted phenomenon. By virtue of its ability to develop digital business models, DT allows for new methods based on real time insights to capture business value (Pagani, 2013). The widespread usage of the digital applications with traditional processes has resulted in the emergence of smart products that can generate, store, transmit, and even make decisions. Unlike IT-led business transformation, which focuses exclusively on system automation, DT aims to acquire real-time data from digital devices and apply the insights to restructure business processes (Proctor, 2017). Hence, DT aims to generate synergies by combining information collection, processing, and communication via connected systems (Bhardwaj et al., 2013). Porter and Heppelmann (2015) emphasise the importance of the high end smart and connecting devices in revolutionising the products and bringing transformative improvements in bringing enormous opportunities for new functional capabilities with higher product utilisation. Bhardwaj et al. (2013) argue that the new age of digital technologies generates synergies by merging data gathering, processing, and communication through the networked systems. Hence, it necessitates technological considerations together with strategic interventions.

It is evident that the organisations are largely getting impacted by digital technologies. At the same time, they are planning to use DT to other major business dimensions such as sales and marketing, procurement, HR and finance for multiple applications. This trend is expected to garner more attention as apart from operational advancements, the customers, suppliers,

and employees too are becoming more and more demanding. Consequently, organisations will increasingly reinvent engagements with each of their business partners through innovative digital technologies.

To sum up the discussion above, literally, Digital Transformation comprises Digital and Transformation. 'Digital' stands for the use of new-age digital technologies, and 'transformation' describes comprehensiveness and radical change. It is imperative that the organisations are digitally transforming themselves by innovating novel ways of generating synergies through these new-age digital technologies. The study deliberates more on this phenomenon in the upcoming sections. The research questions are presented in the subsequent section.

1.4 Research Questions

Despite being a key area of interest for both researchers and practitioners, research under DT has prominently been confined to specific business domains or technological applications (Mishra et al., 2018; Muhari et al., 2019; Cortés Sánchez and Julián David, 2019; Hausberg et al., 2019; Vial, 2019). These studies either do not discuss or discuss very little about "Why" and "How" of the phenomenon. Therefore, an integrated and comprehensible picture of phenomenon is still missing, which is critical to be addressed. Further, the methodical guidelines to implement DT in practice are also scarcely elaborated (Matt et al., 2015). In essence, this thesis attempts to understand the phenomenon of DT in real-world settings by addressing three research questions.

RQ1 - What characteristics influence to enable the digital transformation through the organisations?

RQ2- How do chief information officers (CIOs) contribute to digital transformation?

RQ3- How should the organisations attempt a successful digital transformation?

1.5 Objective and Scope of Study

This study attempts to build a holistic understanding of the specific aspects of digital transformation in large size organisations. The study delineates on various aspects of the

phenomenon, such as what are the driving forces prompting the organisations to initiate and adopt DT and how does the IT leadership, specifically the chief information officer, contribute to DT. Further, building the understanding from the case companies, a model is proposed to suggest the organisations how to attempt the DT successfully following a structured approach. By evaluating the factors responsible for DT, the study attempts to evaluate why organisations move and adopt towards DT. Next, addressing the IT leadership role, the study attempts to delineate on “How” does IT leadership (CIO) contributes to DT. Structuring a holistic approach is foremost important when it comes to attempting DT, the study attempts to design a holistic approach to address DT effectively.

Scholastically, the study enriches and consolidates the literature in the overall domain of DT. Chapter 2 provides a comprehensive review of literature on DT, covering various aspects that include emerging technologies, global communities, and academic contributions. The study also elaborates on the progression in the domain of DT since the inception of the concept. Further, the changing role of the CIO in the context of DT is elaborated. This forms the base for studying the empirical and strategic aspects of this phenomenon, which includes the practical objective of this study. By understanding the phenomenon empirically, the study attempts to generate valuable insights into why organisations attempt DT, how do they lead DT through its IT leadership, what are the critical contributions of CIOs from DT's perspective, how does the role of CIO transform itself under DT, and how should DT be attempted in practice. These insights will be helpful for the organisations who are planning to start or are in the middle of implementation or even for progression post-implementation of DT initiatives to guide their efforts impactfully. For the empirical analysis for this study, a total of six large case organisations were selected under different industrial domains. Then the insights were culled out through the semi-structured interviews following the qualitative methodology.

1.6 Motivation of the study

As elaborated above, Regardless of the size or nature of the industry, DT is radically changing organizations at all levels, eventually reducing the efficacy of the conventional core competencies. Modern times need adaptability, and rigid management techniques,

organisational structures, and rules may become impediments to organisational success. Digitally oriented new entrants are challenging the established organisations in all together distinctive ways (Lyytinen and Rose, 2003). Consequently, the organisations are attempting to strengthen their strategic and technical competency through adopting DT. However, this is a difficult task to accomplish in practice. To be successful in leveraging DT requires building a cohesive understanding of the underlying forces promoting DT. However, building this understanding poses practical challenges as DT is highly contextual and organisations usually are not able assess where to start from for their digital initiatives. The effective leadership acts as pivot to accord success of DT initiatives. The organisational leadership has the core responsibility to set up of clear vision, ensuring focused execution and cultural adoption of digital business processes. The role of CIO is most critical as they are responsible for establishing the framework for the digital journey. Further, because DT is a multifaceted and complicated phenomenon, it is not practically feasible to design a widely accepted implementation methodology. Eventually, this ambiguity leads to failure of DT initiatives. This study aims to address these aspects cohesively and present insights that become the baseline to assess, guide and address effective implementation of DT to effectively leverage DT. As a result, the research aims to build a structured approach to enable the upcoming organisations to follow a structured approach to best harness the benefits of DT and to improve the success rates of their DT initiatives.

1.7 Structure of the thesis

The study comprises six chapters - introduction, literature review, research methodology, findings of the study, discussion and implications, future scope & limitations of research. Each chapter presents insights into its unique aspects.

Chapter 1 introduction presents introductory background of the research, delineates on the concept of digital transformation, puts forward the background, research questions and finally presents the scope and motivation of the study.

Chapter 2 presents the theory and literature review to build the theoretical foundation for the study. The chapter exhaustively covers the literature review on DT, elaborating on the concept, emergence and the research streams under the domain of DT. Also, the role of the CIO in DT is discussed at length.

Chapter 3 presents research methodology adopted for the study. The chapter covers details on research settings of the study. The case organisation's profiles are presented, followed by data collection, coding, and analysis.

Chapter 4 deliberates upon the empirical findings of the study. The findings are comprehensively elaborated. The chapter first presents the drivers of DT for the case organisations. This is followed by the contributions of the CIO in digitally transforming the case organisations.

Chapter 5 elaborates the discussions - results derived from analysis of empirical investigations. The chapter presents the evaluated drivers followed by the contributions of CIOs. The chapter further presents the suggestive model comprising bimodal IT and DT application management for the implementation of DT initiatives.

Chapter 6 presents the academic and practical implications of the study. Subsequently, the key limitations of the study are discussed. This is followed by the future research directions where more deliberation can be done by researchers are discussed.

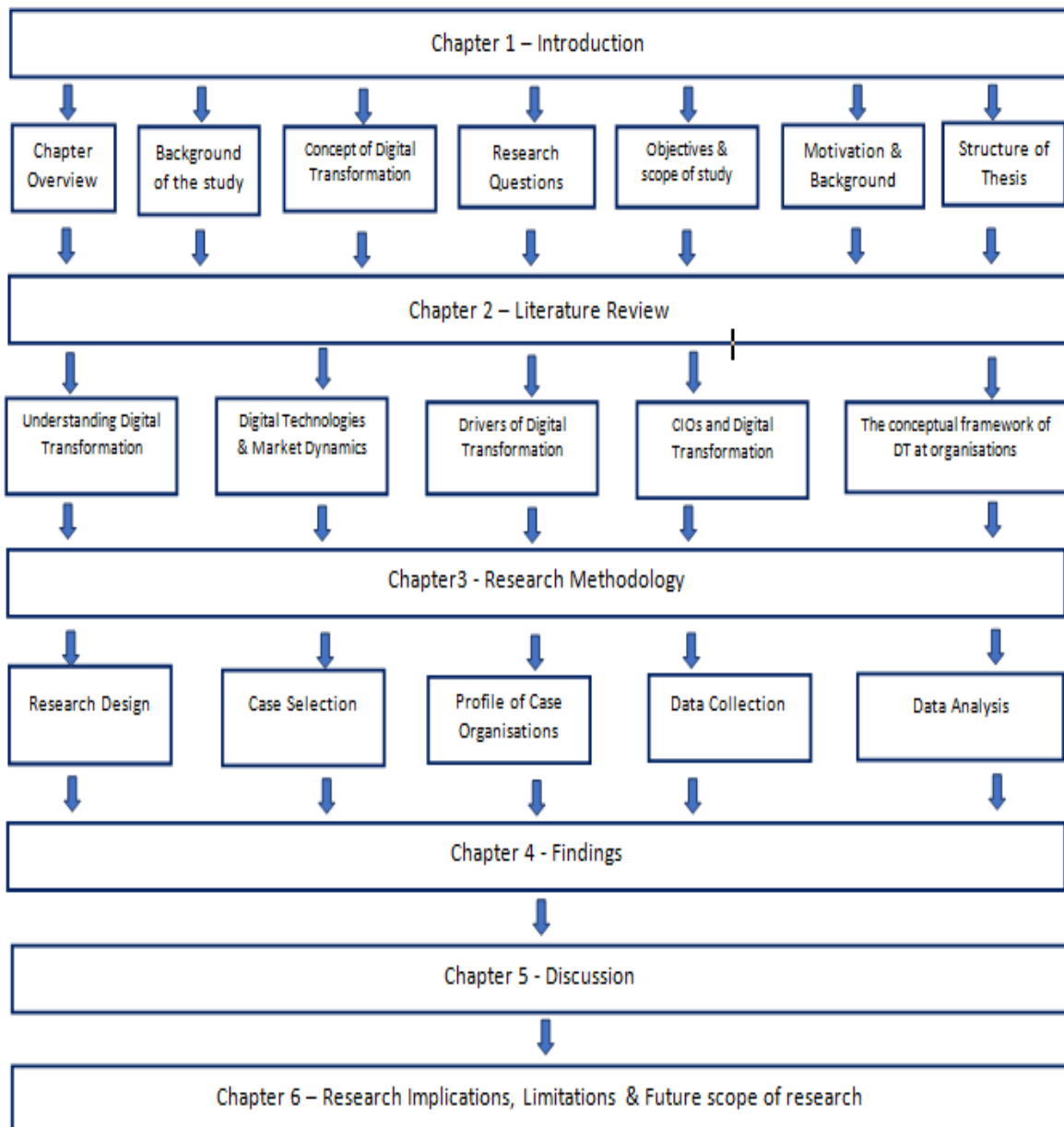


Figure 1.2: Structure of Thesis

1.8 Conclusion

The chapter presents the introductory overview of this research. First, the background of the study is presented, followed by introduction to DT. Subsequently, research objectives and motivation of the study are presented. Finally the research outline of this thesis is presented. The next chapter presents a detailed literature review based on which this study has been conceived and executed.

Chapter 2 – Literature Review

2.1 Chapter Overview

The previous chapter presented the overview of this research. This chapter attempts to present the comprehensive literature on digital transformation (DT) for building a foundation of empirical analysis. The chapter is presented in five sections. Section 2.2 primarily offers an introduction to DT elaborating the phenomenon by presenting the definitions, its progression over time and the emerging research streams gaining attention under the domain of DT. The section represents the bibliometric study published as a part of this research. Subsequently, Section 2.3 presents digital technologies and market dynamics, and sets the context on why it has become important for the organisations to appreciate and explore the dynamics of DT. The section deliberates on why organisations are adopting DT and why DT has become a high priority phenomenon for the organisations. Followed by this, Section 2.4 presents the emerging research streams under DT. Further, Section 2.5 details the digital technologies and market dynamics. This is followed by Section 2.6 presenting the drivers of DT. It elaborates the driving forces pressing organisations to attempt DT as presented in literature. Subsequently, Section 2.7 delineates the literature about the role of the CIO in DT. The section presents the emergence of the CIO role, its progression to date, the digital transformation leadership, and the contributions of the CIO to enabling DT. Finally, section 2.8 presents a conceptual framework integrating the drivers, CIO's contributions, and digital organisational transformation.

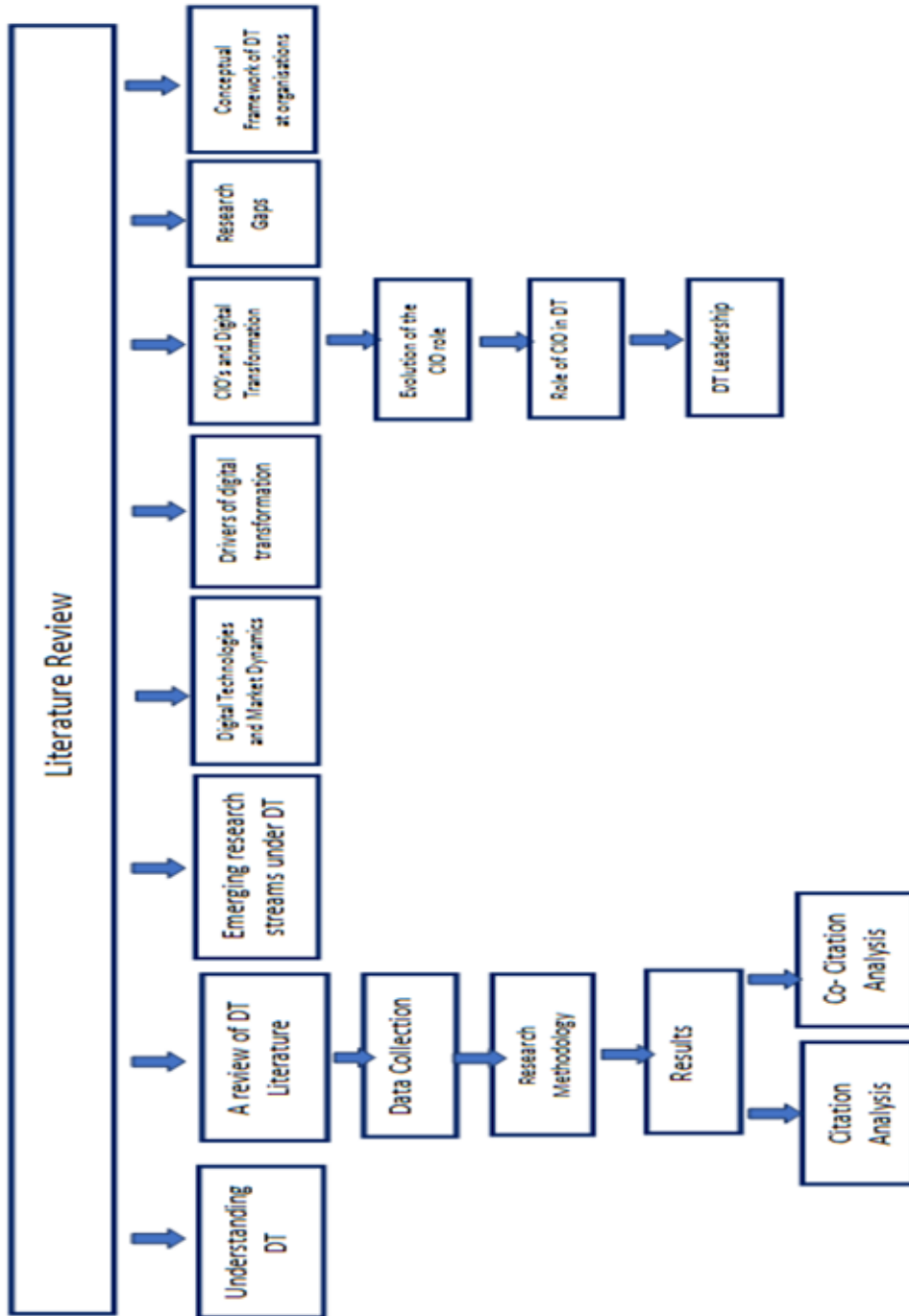


Figure 2.1: Overview of Chapter

2.2 Understanding Digital Transformation

This section presents the details of Digital Transformation as a concept and its journey so far. The section aims at building initial level of understanding on the concept of DT.

2.2.1 Introduction to DT

The term digital transformation borrows its genesis from the proposition that businesses radically transform their goods, production processes, consumer engagement strategies, and corporate practices by using digital technologies (Berman, 2012). Fitzgerald (2013) defines DT as the adoption of digital technologies to facilitate key business improvements. Consequently, scholars across the globe have tried to conceptualise DT from various aspects (ref. table 2.1), however, a common concurrence on any one definition does not exist yet. A common inference is that DT is applying new-age digital technologies (e.g., social media, analytics, cloud and internet of things) for better customer engagements, making digitalised operations or for taking better competitive advantage (Vial, 2019). Therefore, in simple words, DT is *“the novel use of digital technologies to provide better customer offerings, design efficient operations, or create new revenue streams for the business”*. More importantly, although the technologies used for DT may not be new, the value for the business is generated through innovative combinations of information generation, extraction, computation, and communication technologies during the process of DT (Bharadwaj et al., 2013). Therefore, strategy and not only technology forms the core of DT (Kane et al., 2015).

Table 2.1: Definitions of Digital Transformation

Authors	Definition
Liu et.al. (2011);	“the integration of digital technologies into business processes”
Bharadwaj et.al. (2013);	“an organizational strategy formulated and executed by leveraging digital resources to create differential value”
Fitzgerald et.al. (2013);	“the use of digital technologies to enable major business improvements ”
Lucas et.al (2013);	“fundamentally altering traditional ways of doing business by redefining business capabilities, processes and relationships”
Mithas et.al. (2013);	“the extent to which an organization engages in any activity of IT”
Westerman et.al. (2014b);	“the use of technology to radically improve performance or reach of enterprises”
Henriette et.al. (2015);	“a business model driven by the changes associated with the application of digital technology in all aspects of human society”
Piccinini et.al. (2015);	“characterized by the use of new digital technologies to enable significant business improvements”
Schuchmann & Seufert (2015);	“realignment of technology and new business models to more effectively engage digital customers at every touchpoint in the customer experience life cycle”
Chanas & Hess (2016);	“reflect the pervasiveness of changes induced by digital technologies throughout an organization”
Hess et.al. (2016)	“concerned with the changes digital technologies can bring about in a company’s business model, which result in changed products or organizational structures or in the automation of processes”
Vial (2019)	“a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies”

Definitions captured in Table 2.1 suggest that the DT phenomenon has been conceptualised under multiple dimensions as strategic (Singh and Hess, 2017), business model innovation (Berman, 2012; Henriette et al., 2015), organisational impacts (Earley, 2014), DT application such as big data, IoT, analytics, social media, cloud computing, artificial intelligence (AI), augmented reality (AR)/ virtual reality (VR), 3D printing, Blockchain, Machine learning (ML), robotic process automation (RPA) etc. (Mishra et al., 2018; Muhuri et al., 2019, Sharma et al., 2022). Further, studies also focused on various industry verticals such as healthcare, retail, manufacturing, fintech, mining, automobile, telecom and experiential computing (Agarwal et al., 2010; Lerch et al., 2015; Hagberg et al., 2016; Rachinger et al., 2019). Thus, the present body of knowledge has observed a substantial growth of literature around DT, proving that its increasing importance among academic scholars and practitioners.

Researchers advocate that the best organisations combine their digital efforts with strategic leadership to leverage technology for business transformation (Yoo et al., 2010; Hess, 2016; Tumbas et. al, 2018). Bharadwaj et al. (2013) suggests that the synergies in the DT process are generated through various combinations of computing and communication along with technological applications. DT also encompasses innovations for getting real-time data to acquire insights and exploiting these for better decision making (Mishra et al., 2018; Muhuri et al., 2019). This improves competitiveness by engendering the capability of customised application development through digital platforms. However, the scope of DT is vast and it is not just limited to technology but the use the technology for the overall business benefit (Markus and Robey, 1988). Technology is just a part of DT. In practice, DT affects a larger part of organisational ecosystems with increased collaborations of customers and suppliers (Matt et al., 2015; Parviainen et al., 2017). There are numerous industries which have deployed customer relationship management (CRM), employee performance management (EPM) and supplier relationship management (SRM) applications to bring integrated synergies to their business process (Chen, 2016). DT also enables collaborative value enhancements by co-creation and coproduction techniques (Lenka, 2017; Lember, 2019) where the users themselves become the part of offering's design and customisation.

Unlike IT-enabled business transformation where the focus is primarily on automation of systems, DT's objective is to get the real-time data from digital devices and use the insights to redesign the business processes (Proctor, 2017). The decreasing cost and reliable infrastructure are significantly reducing total cost of ownership (TCO) of digital infrastructure, resulting in a manifold rise in the adoption of smart devices which act as a platform for digital technologies. These platforms enable digital technologies to innovatively design various digital applications with multiple permutations and combinations (Yoo et al., 2010). The cloud-based scalable infrastructure, coupled with superior connectivity, is enabling rapid scale up or down of operational capacities in conjunction with customer demand yielding better cost efficiencies. Consequently, digital technologies and their applications are increasingly becoming an integral part of organisational products, processes and even our personal lives. The prevalent use of the digital applications with traditional products has engendered smart products which are capable of data generation, storage, transmission and

even decision making. Reprogrammability, the greatest advantage that these digital applications offer, empowers the customisation of new products and processes swiftly and cost-effectively. In turn, smart product and processes are becoming the core of present-day industrial processes enabling them to manoeuvre beyond their traditional boundaries. Clearly, DT is not only about technology but more about the synergies derived from the combination of information generation, processing and communication via connected systems that these technologies offer (Bharadwaj et al., 2013).

As evident from the discussion above, DT can be presented as the amalgamation of many sub-domains that comprise and impact a wide variety of business aspects. The next section discusses about emergence and progression of the phenomenon.

2.2.2 Emergence and Progression of the concept

Although, DT entails combination of business and technology, the roots of concept can be traced back to the technological advancements. Historically, 1960s established the foundation of the internet by sending a message over ARPANET. Simultaneously, Moore theorised the famous Moore's Law stating that computing power gets doubled every year. The 1970s brought the introduction to home computers, and their rapid adoption to business brought the spike in data entry jobs to digitise the analogue data (digitisation). Subsequently, in 1980s world wide web was introduced, and that started bringing automation to routine jobs. The 1990s saw advancements in telecom with 2G networks getting better data speed and increased mobile phone devices' adoption. By the 2000s, the development trend of digital applications supported by smart devices' launch started worldwide (Heslop, 2019). During the 2010s, pioneering DT projects started showing success, since then, the business are transforming their business models to digitally enabled processes, products and services coupled with advancement in digital technologies.

From the managerial literature's perspective, DT is presented as a broader concept of business transformation, aiming to radically improve the businesses by the novel use of new-age digital technologies. Muzyka et al. (1995) defines the concept of 'transformation' as a fundamental change in organisational logic caused by a fundamental change in behaviours

(Ismail et al., 2017). It was during the 1990s when the organisations started focusing on improving their organisational efficiency by captivating various initiatives. Many models of business process reengineering emerged covering a wide span of organisational processes such as waste reduction, engaged workforce, employee empowerment and portfolio management. The technology was considered important internal dimension to carry out these business transformations, yet it was limited to a support role to core business processes. Venkatraman (1994) published a model about IT Enabled business transformation, which got high academic attention. In this model, author mentioned five levels of IT-enabled business transformation, namely, evolutionary levels (localised exploitation, Internal Integration) and revolutionary levels (Business Process Redesign, Business Network Redesign, Business Scope Redefinition). While the evolutionary levels were associated with localised solutions, they required minimal changes to business processes. On the other hand, revolutionary levels required that IT applications were applied and integrated with business practices. Therefore, the revolutionary levels primarily governed the degree of business transformation. The organisations quickly started realising the importance and plodded adoption of information technology (IT) practices for building an edge over competitors by bringing significant improvements in their business processes. The adoption of IT in business conceptualized many new business processes like development of IT-oriented marketing channels, mass media advertising. It gradually enabled the design of efficient operational processes.

Subsequently, around late 1990s, realising IT's strategic advantage, the organisations started developing core IT competencies to accomplish 'IT enabled business transformation' (Heslop, 2019). These business transformations were achieved by captivating strategic advantages of information and communication technologies at the business place such as embracing new ways of doing business with enhanced IT capabilities, designing efficient business processes, serving extended markets and offering high-quality products. Many researchers (Bharadwaj et al., 2013; Kane, 2014) support Venkatraman's (1994) view on IT-enabled business transformation and suggested that technology alone is not of much value to the organisation, but it is its strategic technological use in some specific organisational context that makes it useful for business. McKeown (2003) suggests business transformation as a predominant

practice where the organisations strategically adopt multiple tools, including the information technology for their competitive excellence in the marketplace.

Since 2010, ubiquity and affordability of internet and communication technologies (ICT) coupled with the use of smart devices have presented novel opportunities to the business. The organisations have started designing their business processes around new-age SMACIT technologies and taking advantage of the enormous amount of real-time data that the digitally enabled smart devices generate. Relying persistently on these technologies, organisations are expanding beyond their traditional business boundaries. Leveraging the digital technologies, the organisations are extending their network capabilities with business partners for building mutual strategic competitive advantages. As a result, new, digitally transformed business models are increasingly emerging (Svahn et al., 2017; Vial, 2019, Choudhury et al., 2021). Industries like media, music, telecom, and publishing have already undergone significant transformations (Berman, 2012). Organisations such as Airbnb, OLA, PayPal etc. have even established new revenue streams by digitally transforming themselves. Eventually, these new-age digital technologies are progressively becoming drivers of business nowadays (Westerman et al., 2014; Hess, 2016).

From the business models perspective, DT influences organisations significantly by generating more cash flows either by digitally supported processes or by new revenue streams. Porter and Happelmann (2014) elaborate on business model innovation, and business model transformation by SMACIT enabled smart devices. The product-based organisations are largely moving towards Servitization (Lerch et al., 2015; Sklyar et al., 2019) by adding service components to their products. Parida et al. (2015) and Kohtamaki et al. (2019) deliberate on the development of new business models of service-enabled products. Digitalisation is also getting leveraged for making new distribution channels for business, Jocevski et al. (2019), mention the use of digitalisation to retailing distribution strategies. The novel use of digital technologies also has ensued enhancements in manufacturing by the use of robotic process automation (RPA), precise and real-time analytics, IoT applications and digital quality control (Sjodin et al., 2018; Caniato, 2016; Hofmann et al., 2019).

For execution, DT entails customised efforts designing, keeping the strategic business aspects in view (Singh and Hess, 2017). Therefore, some scholars call for a new leadership position of chief digital officer (CDO) responsible for the formulation and management of digital organisational strategy (Haffke et al., 2016; Horlacher et al., 2016; Singh et al., 2017). This new strategic position entails strategic and collaborative efforts to design and suit the custom fit digital aspects of the business including new technology decisions, their implementations, and cultural adoptions (Haffke et al., 2016; Singh et al., 2017). As digital initiatives make processes more automated, to govern these, the new digital applications require employees which are more analytical (Dremel et al., 2017) and are oriented towards what can be done with technology. However, just implementing the technology is not enough; its adoption is a prerequisite to making full use of technology. This adoption must be inculcated through cultural transformation. Therefore, the special digital capabilities must be developed in employees for effectively reaping the benefits of Digital Transformation (Berman & Marshall, 2014; Matt et al. 2015; Karimi and Walter, 2015). Singh and Hess (2017) suggest leveraging CDO position to foster the organisational culture conducive to implementing and adopting DT initiatives. As the industry processes are changing fundamentally under the influence of digital technologies, present organisational dynamics is led by the digital driven applications with close integration of IT with business. Therefore, IT has to be aligned to bestfit business requirements. The CIO being the head of the IT are considered responsible for leading and managing the IT through the organisation. He holds the prime responsibility of complete IT strategy and delivery. Understandably, the elevated expectations from business are adding multifold dimensions to the CIO's role. Accordingly, the role is getting more demanding and pivotal to overall business success. The role of CIO in context of DT is further discussed in section 2.7.

From the discussion above, it is evident that the wider span of DT presents opportunities to study DT from various perspectives such as strategy, business models, organisational, technological, and its cultural impacts. The strategic business needs, application design flexibility and ease of usability of digital technologies is making them pervasive. Therefore, organisations are bound to transform themselves digitally. This trend of DT of organisations is promptly rising and moving towards the emergence of newer, ever intelligent, and self-controllable business models. The next section elaborates on the progression of literature

under digital transformation domain. Subsequently, the research streams under DT are presented.

2.3 A review of Digital Transformation Literature

This section attempts to provide an overall holistic insight of the research from academic and managerial perspective under DT. The insights are derived through techniques of bibliometric analysis, which is the research technique to summarise the documents of a specific domain. This technique demonstrates the interconnections of articles on multiple parameters by evaluating the articles' citation and co-citation links (Nederhof, 2006; Kim and McMillan, 2008; Apriliyanti and Alon, 2017; Martinez-Loez et al., 2018; Saha et al., 2020). Specifically, the bibliometric analysis method is selected because the attempt is to discover the overall intellectual structure of research under DT domain from a dynamic and quantitative perspective which has evolved over previous years. Further, notwithstanding the multi-layered concepts around DT, the big of knowledge structure, eminent authors, the academic quality of journals, geographic contributions and key research streams is being provided by examining the extant literature. The insights are presented by thoroughly analysing 234 articles from DT domain published over 20 years and provides the current state of research about authors, journals, geographic spread of research along with existing and emerging research areas to encourage readers for further collaboration and expansion of knowledge in DT domain. The section contributes to the study by organising, rationalising and extending the extant literature under DT domain. The details about progression and current status of research; most cited articles, authors, journals, keywords and contributing communities are analysed and presented using the bibliometric techniques. Furthermore, the section augments DT literature by identifying and proposing four research areas and eighteen key research streams.

Specifically, bibliometric analysis technique was selected as the bibliometric analysis is a quantitative technique for evaluating and monitoring the current status of research of a particular area of scholarly interest (Garfield et al., 1964; Small, 1973, Dzikowski, 2018). The bibliometric analysis draws inferences on articles' interconnection by analysing their citation and co-citation performed by other articles. The review so created is reproducible, systematic

and transparent. As this section aims to portray the overall research landscape of DT dynamically over a period of time, the method of bibliometric analysis, comprising off bibliometric review followed by network analysis, was adopted. The adoption of such approach is deemed ideal as it empowers to derive insights from a vast body of literature (Strozzi et al., 2017). Moreover, as the bibliometric approach relies on objective methodology to cull out insights qualitatively, it is considered better over traditional ways of analysis (such as thematic reviews and SLRs) to derive key insights on research evolution and progression, emerging research areas and key issues influencing research in a specific research domain (Strozzi et al., 2017). This methodology gets the further edge over other methods because unlike bibliometric analysis, traditional methods are based on the subjective selection of literature and classify the research on some predefined parameters, therefore, do not cater to evolutionary aspects of research (Kajikawa et al., 2007).

2.3.1 Data Collection for the Bibliometric Study

The data for this research was extracted from the Web of Science™ (WoS) core collection database. The WoS was selected rather than other databases like Ebsco or Scopus due to various reasons. The literature suggests WoS as one of the most exhaustive database, and it is highly recommended conducting bibliometric type research in business & management domains (Hausberg et. al, 2019). Although Scopus, another one of the most commonly used databases that provide almost 60% larger coverage over WoS (Zhao and Strotmann, 2015), was not used as the data are not as 'clean' with respect to WoS, implying that a few papers appear as different nodes which are not identifiable in citation network (Strozzi et al., 2017). Besides, WoS provides better coverage over Scopus since 1990 with most participating journals in English, along with unique features, to analyse the metadata results based on country of origin, institutions and language (Chadegani et al., 2013). Further, WoS has already been used for data in many bibliometric studies (Apriliyanti and Alon, 2017; Dzikowski, 2018; Saha et al., 2020).

The identification of keywords for this study was accomplished in two steps. First, synonymous keywords related to the concept of DT from previous literature reviews and other similar studies were segregated. In the next step, the identified keywords were

discussed with a panel of industry practitioners and academicians and to have their confirmation and suggestions for adding any left out most commonly used keyword. As a result, "*Digital Transformation*", "*Digitalization*", "*Digitalisation*" and "*Digital Enabler*" used as keywords to retrieve literature. The article selection was restricted to the Social Sciences Citation Index (1970–present), followed by management and business disciplines considering our research interests' scope to business and management domains only. The period for the selection of articles was selected from 1997 to 2021. This was because of two reasons.

First, the initial research revealed that the publications in our context before 1997 were just minimal. Second, new age digital technologies primarily need internet for their execution and the technologies like internet started getting popularisation around 1997 (Hausberg et al., 2019). As a result, the digitalisation gained its recognition in the disciplines of business and management after 1997 only. The articles and review papers published in listed journals were only considered for the data set. Conference papers and book chapters were not considered as the content in later is usually referenced from the journals only (Ngai, 2005; Goyal et al. 2013). Further, selected the articles were published in the English language. Figure 2.2 demonstrates the literature selection methodology.

The search was conducted in WoS basic search section with search query as (("Digital Transformation") OR ("Digitalization") OR ("Digitalisation") OR ("Digital Enabler")) in the abstract, title and keywords section of the journals. The search query was created in conformance with methodological guidelines suggested by WoS. The initial search resulted in 2889 articles. The search parameters were refined by selecting the Social Science Citation Index database and time period of 1997 till 2021. This resulted in 1277 articles. Further, the selection were confined to business and management disciplines and English as the language. This restricted the articles to 281. A thorough review of these articles' abstracts was performed. It was observed that in some of the articles, even though DT or other search term was mentioned, the context of the article was not directly relevant to this research. As an example paper by Roth (2020) titled "Of wolves and dogs and other false distinctions: A rejoinder to Wallis" which actually relates to system theory. A total of 47 such papers were selected, and these were excluded from further analysis. Finally, total 234 articles were listed, and these were selected to process further.

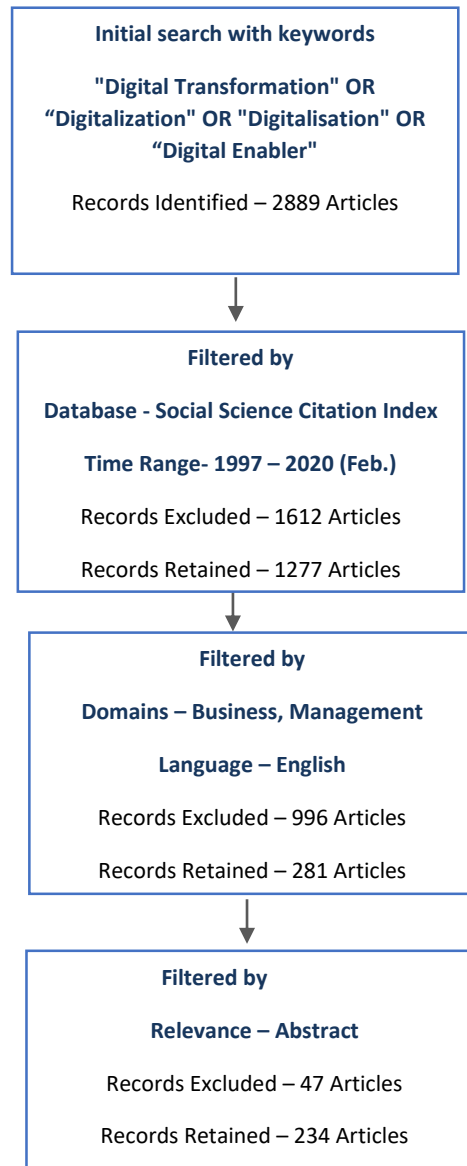


Figure 2.2: Literature Selection Methodology

2.3.2 Research Methodology of the Bibliometric Study

The objective of this section is to derive the insights from the advancement of literature under DT, year on year, rather than providing just a static view of it. Bibliometric study is considered most suitable for these types of studies (Nederhof, 2006; Apriliyanti and Alon, 2017). Therefore, for this illustration, the bibliometric technique and its associated tools were adopted to cull out insights from the articles published over the last 20 years in the digital transformation domain. To carry out this rigorous bibliometric analysis, methodological guidelines in accordance to Apriliyanti & Alon (2017), Dzikowski (2018), Modgil et al. (2020),

Martinez-Lopez et al. (2018) were followed. For conducting the analyses, 2 software packages, Histcite and VOSviewer were used. Firstly, to analyse the productivity and influence of authors, publications, journals, Institutions, and countries of research, citation analysis was accomplished using Histcite. Histcite was used because of its capability to interpret WoS downloads directly and to handle large data sets. The analysis was done considering citations as a basis to measure productivity and influence (Van Raan, 2003). Then in next step, network citation analysis was performed using VOSviewer, which is based on VoS (visualisation of similarities) as clustering methodology. This methodology uses the majorisation algorithm, which formulates the clusters by minimising the weighted sum of the squares of Euclidean distances between items (Eck et al., 2010).

Clusters so formed were identified using the VoS clustering technique. First, *co-citation analysis* was attempted to derive the structures of cited documents. This analysis epitomises the citation strength by which the articles are cited with each other (Small, 1973; Marshakova, 1973) as the commonly cited documents tend to form clusters of common research streams. Then a *co-occurrence analysis* of keywords published in the author's keyword section of the research papers selected was performed for this study. This analysis analyses the keywords that are frequently occurring in the selected articles (Su and Lee, 2010). Further, the research clusters were formed and with content analysis of these clusters the key research themes were derived.

2.3.3 Results of the Bibliometric Study

This section presents the key findings from of the bibliometric analysis performed. The citation, co-citation analysis and the co-occurrence of author's keywords are respectively in this section. Next, the research streams derived from the review of the published documents are derived and presented.

2.3.3.1 Overview

Based on the search methodology, 234 published articles from 106 journals authored by 583 authors associated with 360 Institutions from 40 Countries with 1910 Citation references (Table 2.2) were evaluated.

Table 2.2: Overview of Results (Literature Review)

Overview of Results	
Articles Found	234
Cited References	1910
Journals	106
Authors	583
Institutions	360
Countries	40

2.3.3.2 Citation Analysis

The fundamental assumption of citation analysis is that authors refer the work, which is related to their disciplines. Therefore, the citation is considered a measure of influence (Van Rann, 2003; Dzikowski, 2018). This section discusses the citation analysis on articles published per year, most frequently cited articles, authors, journals, institutions, and countries.

2.3.3.3 Number of publications per year

The articles year-wise chronologically are presented *from 1997 to 2021* in Figure 2.3. The trend shows that during 1997 to 2009, DT's concept was emerging and research was in the very nascent stage during that period. This may be because the baselined digital platform technologies like the internet were being adopted and getting established in industries during that time. Also, the business's primary focus was on business process transformation with

traditional information technology practices while digital technologies were being experimented by some early mover organisations.

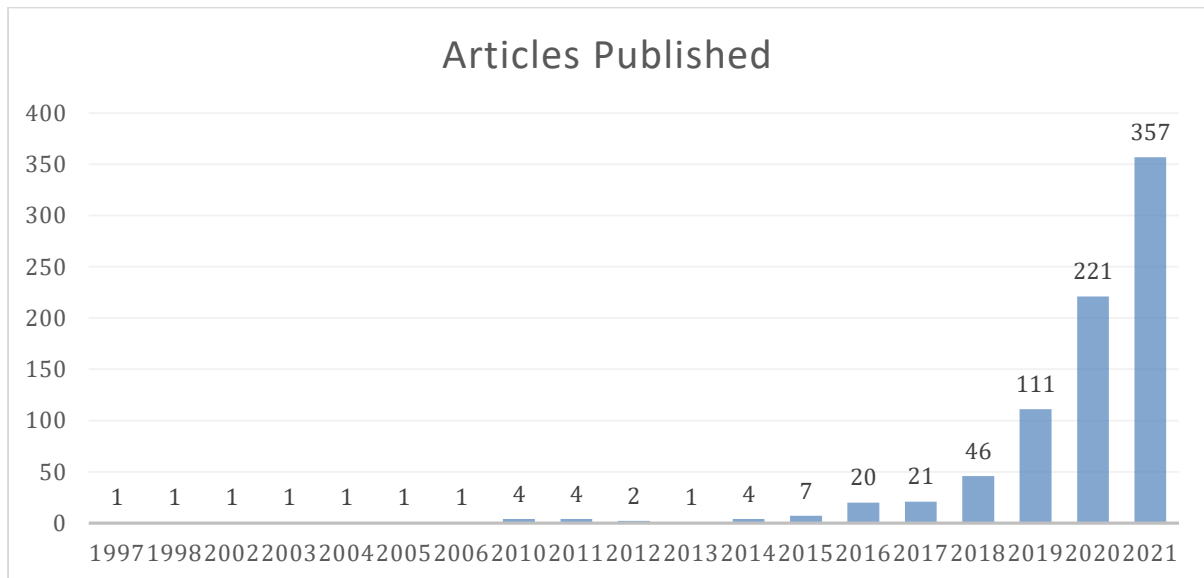


Figure 2.3: Articles Published per Year

The research in DT domain started picking up from 2010 and till 2013 were early days. The articles published year on year during this period were almost constant. The number of publications increased considerably from 2014 onwards, reflecting that the businesses started adopting the digital technology-enabled processes and research on DT started getting more attention. Since then, there has been an increasing trend in the year on year publications. The year 2021 has seen the highest count of publications up till now. The publications in 2020 and 2021 have outcompeted the two-period moving average trend line, which shows that the research in the DT area has gained good momentum. This upswing in the number of publications since 2018 can be attributed to increasing publications related to new DT applications (specifically in manufacturing), case-based digital transformation implementation insights and strategic implications of DT research areas. This illustrates that versatile applications of new-age digital technologies are being adopted strategically and DT initiatives are getting popularity in actual practice at the organisations. Further, newer insights are emerging from the organisations who took the DT initiatives sometimes back and are now sharing their learnings on this subject. This is a very positive sign, and more

contributions are expected to establish best practices providing practical insights on effective implementation of DT for the benefit of new adopters.

Looking at this trend and pace of articles published till 2021, it can be well derived that the upcoming trend of publications under DT will prevail further. This consistent growth of publications in this research area reflects that the phenomenon has picked up as a matter of interest among the researchers. The continuous push for digital technologies emerging from customers, competitors, internal organisational stakeholders, and employees will continue to drive this phenomenon's speedy popularisation.

2.3.3.4 The most frequently cited articles

In this section, the top-ranking documents based on their citations in the WoS database from the initial set of 234 articles are presented. This set of articles presents the average citation rate of 8 citations per article. However, 27 per cent of articles have never been cited, and 56 per cent have been cited between 1 and 10 times. To search the top-cited articles, the minimum citation limit of 20 per article was set. This resulted in 24 top-cited articles (please see Table 2.3)

Table 2.3: Most cited articles in DT domain

S No	Title	Authors	Publication Year	Total Citations
1	The Digital Transformation of Healthcare: Current Status and the Road Ahead	Agarwal et al.	2010	204
2	Computing in everyday life: A call for research on experiential computing	Yoo, Youngjin	2010	186
3	Measuring the digital divide: a framework for the analysis of cross-country differences	Corrocher, N; Ordanini, A	2002	91
4	The digitalisation of retailing: an exploratory framework	Hagberg et al.	2016	62

5	Options for Formulating a Digital Transformation Strategy	Hess et al.	2016	53
6	Digitalised Product-Service Systems in Manufacturing Firms A Case Study Analysis	Lerch, Christian; Gotsch, Matthias	2015	49
7	Digital Science and Knowledge Boundaries in Complex Innovation	Dougherty, Deborah; Dunne, Danielle D.	2012	43
8	The Role of Dynamic Capabilities in Responding to Digital Disruption: A Factor-Based Study of the Newspaper Industry	Karimi et al.	2015	41
9	Managing technological change in the digital age: the role of architectural frames	Henfridsson et al.	2014	40
10	The influence of virtual direct experience (VDE) on on-line ad message effectiveness	Griffith, DA; Chen, QM	2004	40
11	Does finance solve the supply chain financing problem?	Caniato et al.	2016	39
12	The digital transformation of Traditional Businesses	Andal et al.	2003	36
13	Open Innovation: RESEARCH, PRACTICES, AND POLICIES	Bogers et al.	2018	34
14	Developing Global Service Innovation Capabilities How Global Manufacturers Address the Challenges of Market Heterogeneity	Parida et al.	2015	33
15	External Knowledge and Information Technology: implications for process innovation performance	Trantopoulos et.al.	2017	32

16	Hummel's Digital Transformation Toward Omnichannel Retailing: Key Lessons Learned	Hansen et al.	2015	32
17	How Chief Digital Officers Promote the Digital Transformation of their Companies	Singh, Anna; Hess, Thomas	2017	30
18	The new normal: Market cooperation in the mobile payments ecosystem	Hedman et al.	2015	25
19	Digitalisation Capabilities as Enablers of Value Co-Creation in Servitizing Firms	Lenka et al.	2017	23
20	Creativity in strategic lock-ins: The newspaper industry and the digital revolution	Rothmann, Wasko; Koch, Jochen	2014	23
21	Consumers and Brands Across the Globe: Research Synthesis and New Directions	Gurhan et al.	2018	21
22	Impact of e-book technology: Ownership and market asymmetries in digital transformation	Jiang et al.	2010	21
23	Digital innovation and transformation: An institutional perspective	Hinings et al.	2018	20
24	How Big Old Companies Navigate Digital Transformation	Sebastian et al.	2017	20

Only 10% of articles received 20 citations or above. Interestingly, 21 of the 24 top-cited articles were published after 2009. This is understandable since older articles have more time to gather citations. Evidently, this inference is further supported by the above investigation (section 2.3.3.1) that the research got pace and popularisation after 2009 in DT domain. The prior studies such as "The influence of virtual direct experience (VDE) on on-line ad message effectiveness" (Griffith and Chen, 2004), and "The digital transformation of Traditional Businesses" (Ancion et al., 2003) etc. primarily focused on broader aspects of business transformation using IT and conceptualisation of DT. While in post-2009 studies the

emergence of multiple research streams such as Industry-specific aspects of digitalisation (Agarwal et al., 2010; Lerch et al., 2015; Hansen et al., 2015), Digital Innovation (Yoo et al., 2010; Dougherty et al., 2012; DT strategy in practice (Karimi et al., 2015), emerging organisational roles under DT (Kohli et al., 2011; Hansen et al., 2011) etc. is observed. In a nutshell, the observation indicates that the research trend confined from broader to more specific research streams post 2009.

Most cited articles primarily belong to *Digital Innovation, Strategy and Digitalized application streams* indicating that these research streams lead the trends in overall DT research. The article “The Digital Transformation of Healthcare: Current Status and the Road Ahead” by Agarwal et al. (2010) published in Information Systems Research is the most cited document. In this publication, the authors emphasised the transformation of healthcare warranted by information technology through IT design, implementation, measurement of payoff, extending the role, and adopting information technology practices. This paper is still the top-cited reference and leads the research trend in DT as digital transformation in healthcare has a significant contribution in recent (2018 onwards) researches. The next highest cited article “*Computing in everyday life: A call for research on experiential computing*” (Yoo, 2010) focuses on implications of digitally mediated experience in daily life enabled by digitalised computing capabilities.

2.3.3.5 Most Contributing and Most Influential Authors

To analyse our research objective on most cited articles and eminent authors, the citation analysis on authors was performed. Table 2.4 displays the most contributing authors in terms of number (count) of articles published. The number of papers published by the author and the citations received by the author present the impact of most productive author (Dzikowski, 2018). *Vinit Parida and Thomas Hess* are the most contributing authors with 7 and 4 articles published respectively. On the basis of total citation received *Ritu Agarwal, Catherine Desroches; Guodong Gao (Gordon) and Ashish Jha* are the most cited authors (Table 2.4) with citation scores of 204 each followed by Youngjin Yoo with citation score of 186.

Table 2.4: Most Contributing Authors (in context of documents published)

Rank	Author	Documents Published	Citations
1	Parida, Vinit	7	78
2	Hess, Thomas	4	86
3	Wincent, Joakim	3	58
4	Mathiassen, lars	3	51
5	Roth, Steffen	3	11
6	Oghazi, Pejvak	3	8
7	Hagberg, Johan	2	67
8	Benlian, Alexander	2	64

With 7 widely cited research publications, *Vinit Parida*, a Chair Professor of entrepreneurship and innovation at Lulea University of Technology is evidently the most contributing author. He is best known for his research contributions in the fields of service innovation, servitisation, digitalisation of industrial ecosystems and agile business model innovation. *Thomas Hess*, a professor at the Munich school of management, has focused on the digital transformation of companies, strategic aspects of digital technologies and information systems. He has got his work published in many journals of repute like JSIS, MIS Quarterly Executive and JMIS. His paper on "How Chief Digital Officers Promote the Digital Transformation of their Companies" has got great scholarly attention. *Joakim Wincent*, a professor at the Institute of Technology Management with Transfer Center for Technology Management (TECTEM), has been exploring research in artificial intelligence and innovation management. He has published many research papers related to management decisions on artificial intelligence and machine learning, organisational innovation and entrepreneurship in various journals like Technological Forecasting and Social Change, Harvard Business Review and Journal of Business Venturing.

2.3.3.6 Analysis of Journals by citations

This study recognised 234 articles published in 106 journals. This section illustrates the analysis of journals based on the citations they attracted. The number of studies published by the particular journal and the citations received by the journal present the impact of most productive journal (Dzikowski, 2018). Only 24 out of 106 (22.6%) journals have published 3 or more publications. This indicates that the majority of DT research publications are centralised around some key prominent journals. Based on total citations, *MIS Quarterly* ranks highest with 224 citations on published articles (See table 2.5).

Table 2.5: Most Contributing Journals (in terms of total citations)

Rank	Journal Name	Focus Area	Documents Published	Citations
1	MIS Quarterly	Business, Management Information Systems	4	224
2	MIS Quarterly Executive	Information systems practices	12	207
3	Information Systems Research	Theory, research and intellectual development of information systems	1	204
4	Journal of information technology	Organisational, social and management issues in IT	5	136
5	Technological forecasting and social change	Methodology and practice of technological forecasting	21	111
6	Research-technology management	Digital innovation and management	6	102

7	International journal of retail & distribution management	Production and consumer Management	4	69
8	Electronic commerce research and applications	Knowledge, technology theory and applications for electronic commerce	3	46
9	Organisation science	Organisational Research	1	43
10	Journal of management information systems	Business, Management Information Systems	1	41

In terms of the highest average citation per article, Information systems research ranks first with an average citation score of 204 followed by MIS Quarterly at an average of 56 citations per articles (see Table 2.6). Only 19 out of 106 (18%) journals have more than 20 citations.

Table 2.6: Most Contributing Journal (in context of total average citations)

Rank	Journal Name	Documents Published	Citations	Average citation
1	Information systems research	1	204	204
2	MIS quarterly	4	224	56
3	Organisation science	1	43	43
4	Journal of management information systems	1	41	41
5	Journal of advertising	1	40	40
6	Journal of information technology	5	136	27
7	Psychology & marketing	1	23	23
8	Journal of international marketing	1	21	21
9	California management review	2	36	18
10	MIS quarterly executive	12	207	17

Evidently, researchers from a variety of fields contribute to the study of DT, including information systems, strategy, technology, general business management, marketing, innovation, and computer applications, demonstrating its multidisciplinary nature. In this context, *Technological forecasting and social change*, one of the best journal (out of top-cited journals) with highest 21 publications, focuses on new developments and technology trends in DT. One of the prominent journals in the information systems field, *MIS Quarterly*, stands the most contributing journal with highest average citation score. The most cited article by Aggarwal et al. is published in *Information systems research journal (ISR)*. *ISR* is best acknowledged for paying most attention to new research and development trends in DT domain. All of the above-mentioned journals are the top category journals, mostly covering practical aspects of organisations. These journals are referred by practitioners' and academicians world over. This indicates that the research in digital transformation domain is practice-oriented. Further, most of the top 10 journals are associated with "Information systems and Management" category under SJR rankings, depicting that the digital transformation is prominently interrelated to organisational management domains complemented by information technology.

2.3.3.7 Analysis of institutions by publications

This section mentions the most productive institutions in terms of contribution to DT research. The number of documents published by the institution and the citations received by the institution present the impact of most productive institution (Dzikowski, 2018; Saha et al., 2020).

Only 7 out of 360 (2%) institutions have more than 5 documents published indicating that there are some core institutions leading research in DT domain. Based on the number of citations *Harvard University* stands first with 204 citations (see Table 2.7), the most cited article also originated from this university. Similarly, on the measure of highest articles published, *Lulea University of Technology* stands first with 8 articles published. The most contributing author Vinit Parida with research interests in servitisation has contributed from this university.

Table 2.7: Most Contributing Institution (based on number of citations)

Rank	Institutions	Published documents	Citations
1	Harvard University	1	204
2	Massachusetts General Hospital	1	204
3	University of Maryland	1	204
4	Temple University	3	202
5	Bocconi University	3	119
6	Lulea University of Technology	8	79
7	University Gothenburg	5	79
8	University of Boras	2	68
9	Fordham University	2	64
10	Copenhagen business school	2	57

Based on average citations per document (table 2.8), again Harvard University, Massachusetts gen hosp and University of Maryland stand most contributing with average citation score of 204 per article followed by Temple University with average citation score of 67. This shows that even though there are institutions with more articles published, the most cited institution is Harvard University.

Table 2.8: Most Contributing Institutions (based on Average Citation per document)

Rank	Institutions	Published documents	Citations	Average Citations
1	Harvard University	1	204	204
2	Massachusetts General Hospital	1	204	204
3	University of Maryland	1	204	204

4	Temple University	3	202	67
5	Technical University of Darmstadt	1	53	53
6	University of Munich	1	53	53
7	Fraunhofer Institute for Systems and Innovation Research	1	49	49
8	University of Colorado Denver	1	41	41
9	Michigan State University	1	40	40
10	University of Hawaii Manoa	1	40	40

2.3.3.8 Analysis of countries by publications

This section includes the ranking of countries in terms of published research on DT. The number of documents published by each country and their average citations (see Table 2.9) derives the most productive and contributing countries (Table 2.9) in DT's research areas. Only 6 out of 40 (15%) countries have published more than 20 articles.

Table 2.9: Most Contributing Country (Based on citations)

Rank	Country	Documents Published	Citations
1	United States of America	45	819
2	Germany	40	311
3	Sweden	37	287
4	Italy	23	203
5	England	27	171
6	Denmark	8	136

7	Finland	29	135
8	France	15	86
9	Switzerland	13	72
10	Singapore	2	48

Based on total citations received, the *USA* comes up as the top productive and contributing country. In terms of productivity, 19% of the total articles produced are from the USA, which is marginally higher than 17% from Germany. However, in terms of influence, the USA stands far ahead having highest, 36% of total citations followed by Germany at 13%. Sweden, Italy and England occupy the subsequent places. This may be attributed to the highest research in the US as the US has the highest synthetic index of digitalisation (Corrocher et al.; 2002). Interestingly, based on average citations per country (Table 2.10), Singapore stands first.

Table 2.10: Most Contributing Country (Based on Average Citation per document)

Rank	Country	Documents Published	Citations	Average Citation
1	Singapore	2	48	24
2	Turkey	1	21	21
3	USA	45	819	18
4	Denmark	8	136	17
5	Belgium	3	38	13
6	Italy	23	203	9
7	Austria	4	35	9
8	Czech Republic	2	16	8
9	Germany	40	311	8
10	Sweden	37	287	8

Evidently, the United States of America, Germany, Sweden, Italy, England and Finland have contributed the most towards research publications under DT. The research from Germany appears to contribute more towards digitalisation of manufacturing (conceptually Industry 4.0) maybe because of the government incentives. In contrast, research from the USA seems to be versatile, covering various research streams under DT. However, none of the research emerging from APR countries yet appear in the most contribution countries.

2.3.4 Co-Citation Analysis

The co-citation analysis is performed to demonstrate the association between authors, topics, journals and keywords (Pilkington and Liston-Heyes, 1999). The most frequently cited co-authors and journals to disclose the overall intellectual structure (Chen et al. 2010) of research are demonstrated. This analysis was carried out in VOSviewer. VoSviewer uses VoS clustering algorithm to formulate the clusters and defines the item location on the network

map by minimising a function which measures similarity among items (Van Eck et al., 2010, Strozzi et al., 2017).

2.3.4.1 Co-Authorship analysis for frequently cited authors

Author co-citation analysis was conducted to develop a deeper idea of theoretical development of 234 publications in the field of digital transformation with the cited author as a unit of analysis using VOSviewer. From the selected 234 articles cited references of 9162 authors were identified. For simplicity of analysis, the authors with a minimum of 15 citations were selected; this resulted in 49 authors. Thereafter, a co-citation analysis was conducted on this data. Figure 2.4 displays the network of co-cited authors.

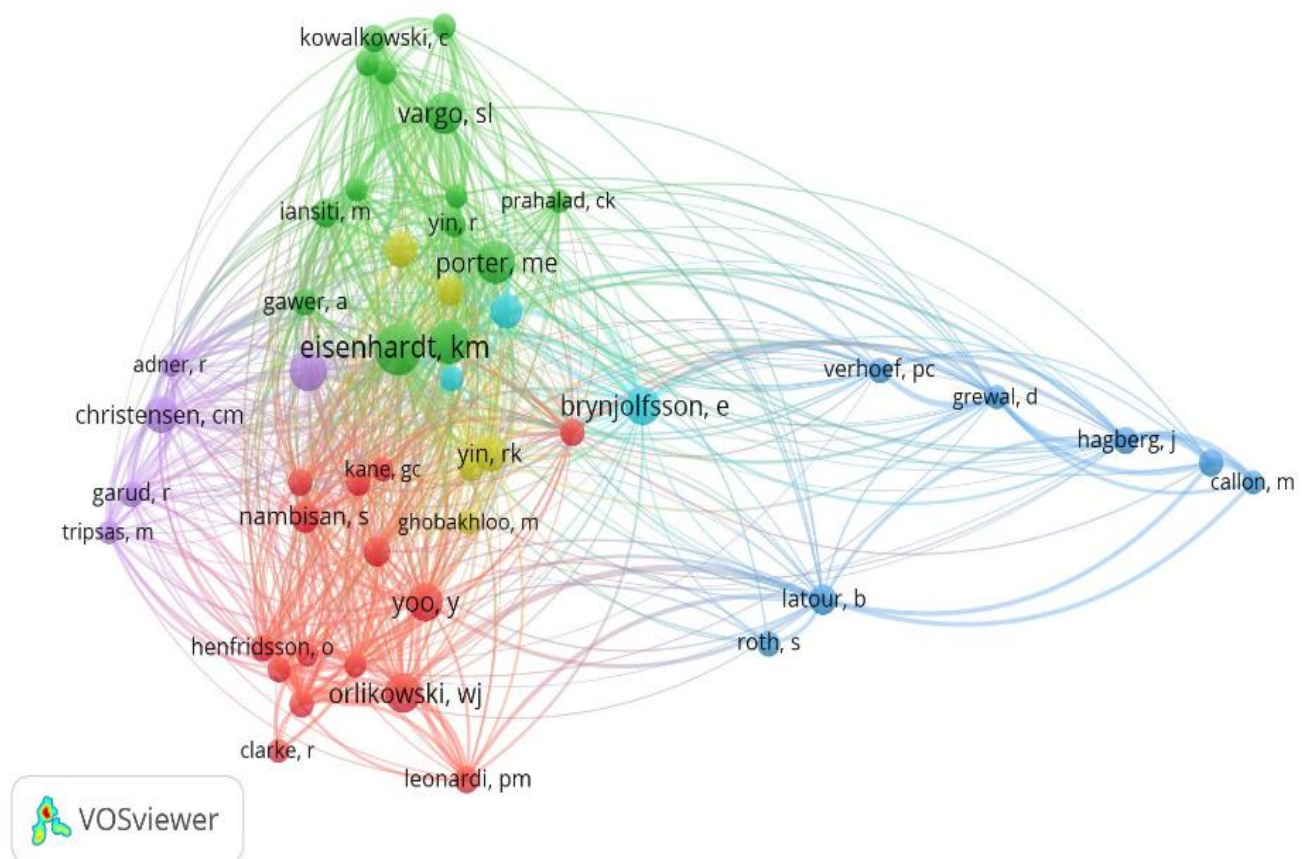


Figure 2.4: Network of co-cited Authors

Each colour in Figure 2.4 represents a different cluster that indicates a group of related items. In this way, an insightful breakdown of cocitation results is obtained. The cluster on the top coloured "Green" emphasises co authorship broadly related to new business models that are co-created digitally through smart connecting devices. Similarly, cluster "Red" represents the Digital Innovation, cluster "Blue" emphasises about the impact of new age technologies, techniques and approaches on human and social aspects. Correspondingly cluster in purple colour represents the digital disruption related coauthorships.

Further, multiple cluster formation in Figure 2.4 depicts that the research in DT domain has multidimensional origins. Interestingly, most co-cited authors appear to be clustered together, indicating that the domains under DT are closely interrelated. *Eisenhardt, KM* (65 citations), *Teece, DJ* (49 citations), *Porter, ME* (47 citations), *Vargo, SL* (44 citations) emerge as the topmost cited co-authors. This means that the work of these authors makes the base for other researches under various domains.

The most cited reference, "Building theories from case study research" by Eisenhardt (1989) delineates on the process of theory building using case study. This depicts that the case studies find a major significance in guiding the research under DT and the theories are being derived from practice-oriented results. This strengthens the assertion that the research under DT is practice-oriented. Next, most co-cited article by Porter and Heppelmann (2014), "How Smart, Connected Products Are Transforming Competition" accentuates the importance of IT in revolutionising the products by employing sensors, storage, connectivity enabled high-end multiprocessing devices and bringing transformative improvements in bringing enormous opportunities of new functional capabilities with higher product utilisation. This paper seems to be driving the smart product and strategy related forthcoming researches. Similarly, "Organising for Innovation in the Digitized World" by Youngjin et al. (2012) argues on the innovations by the combinations of digital technology platforms by taking advantage of reprogramability of digital technologies. Another pivotal node, "The second machine age: Work, progress, and prosperity in a time of brilliant technologies" a book by Brynjolfsson McAfee (2014) reveals about the future digital technologies driving our lives and economy and the shifts these technologies will bring in personal, professional and economic aspects. The authors also discuss the strategies for survival and prosperity in the digital era. Evidently,

these nodes seem to be contributing the most to form future research directions for researchers.

2.3.4.2 Journals Cocitation Analysis

This section presents the journals co-citation analysis with the journal as the unit of analysis. For the 234 articles selected a total of 5258 distinct journals have been identified. For better clarity of results, the threshold of 50 citations for a source was selected resulting in 41 journals.

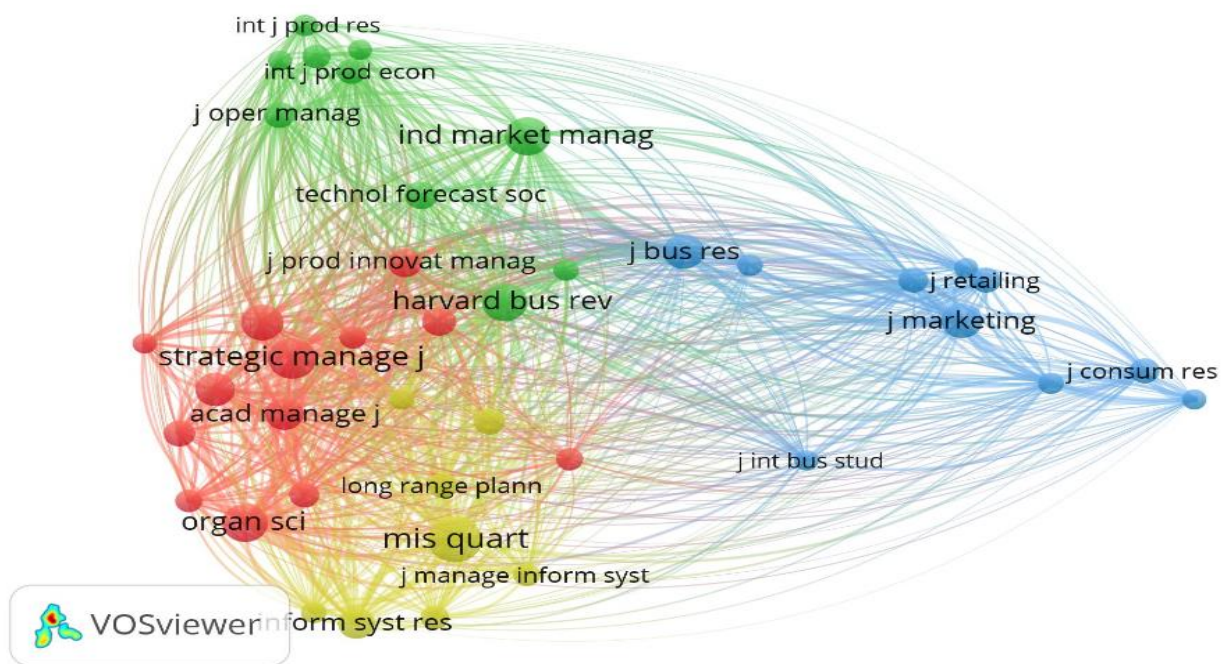


Figure 2.5: Network analysis of co-cited journals

The result of this analysis provided four journal clusters. The *MIS Quarterly* (317 citations), *Strategic Management Journal* (251 citations), *Organisation science* (216 citations), *Harvard Business Review* (212 citations) and *Academy of Management Review* (181 citations) have resulted into most repeatedly co-cited journals.

Primarily there are 4 dominant clusters which can be categorised as business management, strategy, and marketing and operation management (Figure 2.5). The figure displays strong co-citation relationships in intradisciplinary areas. Strategy and business management

journals seem to have strong and frequent co-citation trends, while consumer marketing appears to have distant links with limited connections. MIS Quarterly, Information System Research, SMJ, HBR, TFSC, Industrial Marketing Management and Journal of Business Research represent major nodes that are strongly co-cited for interdisciplinary publications. Hence, these journals form the basis of core co-cited research areas.

2.3.4.3 Co-Occurrence of Author's Keywords

The technique analyses the co-occurrence of the author's keywords mentioned in the publications for the identification of key research topics of related disciplines. For analysis, the grammatically different but same meaning key words were clubbed and then set the minimum occurrence of keywords to 5; this resulted in 19 keywords. Network analysis for these is presented in Figure 2.6.

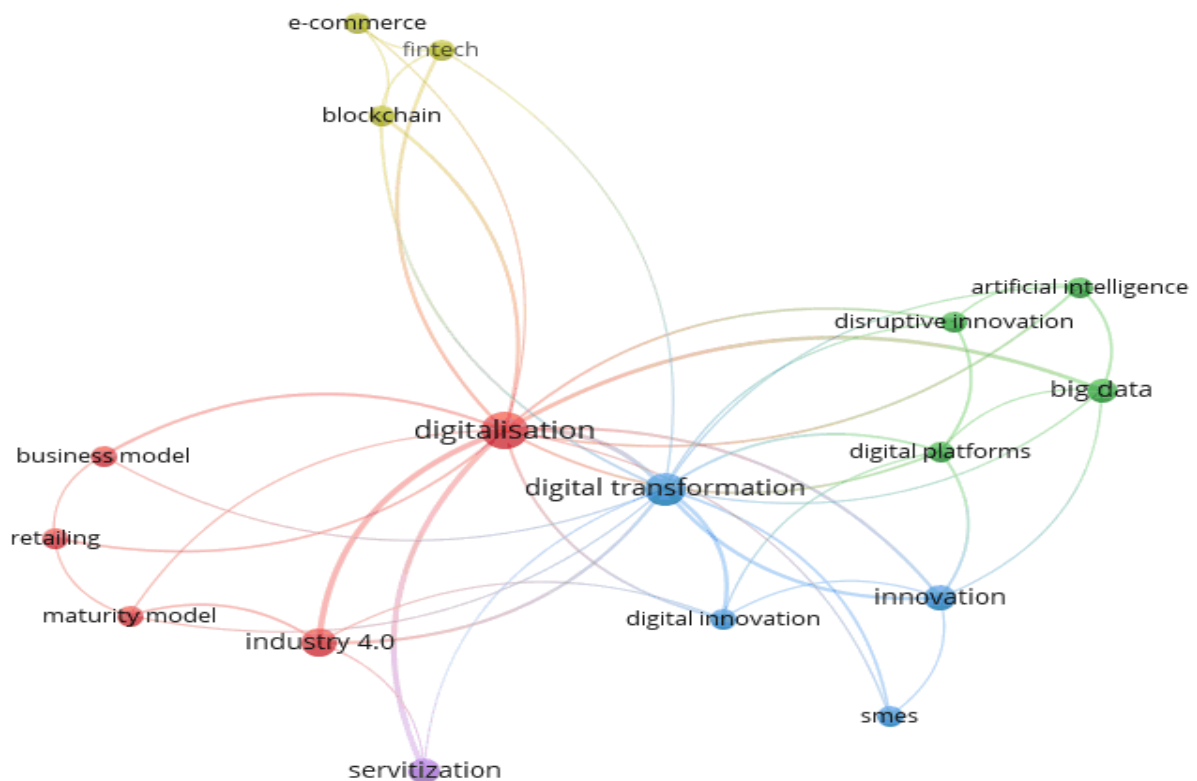


Figure 2.6: Co-Occurrence of author's keywords

Figure 2.6 depicts that both "Digital Transformation" and "Digitalisation" are almost invariably used in literature. However, the keyword "Digital Transformation" (main node) has

more strength of relationship with respect to "Digitalisation" with other keywords. The connection strength in Figure 2.6 reveals that all nodes are centred around the main node indicating that their applications are the driver of DT. "Industry 4.0" is closely connected to "digital innovation" and "digitalisation", "artificial intelligence" is closely connected to "big data", "innovation" and "digital platforms" suggesting that these groups have interrelated dependencies. Similarly "block chain" is closely connected to "fintech" and "digitalisation" depicting the use of block-chain technology in the field of fintech to design applications for fast, low-cost encrypted ledgers with real-time verification of funds transactions and digital contracting (Schmidt, CG., and Wagner, SM., 2019; Gomila et al., 2019). The keywords also demonstrate some key business domains such as Servitization, e-commerce and SME's where the DT research is picking up.

In summary, the keyword network analysis shows that *Digitalisation* and *Digital Transformation* are the most prominent keywords followed by *industry 4.0*, *Big Data*, *Servitization* and *Ecommerce* as keywords in the literature of digital transformation. The other emerging keywords are *Digital innovation*, *Blockchain*, *Fintech*, *Retailing*, *Digital Platforms*, *Artificial Intelligence* and *Innovation*. These have the potential of guiding future research in digital transformation domain.

2.3.4.4 Country wise Co-authorship Analysis

This section demonstrates the geographic regions for research collaborations. For analysis (Figure 2.7) set of 5 as minimum number of documents per country was selected, this yielded 15 countries in 4 clusters.

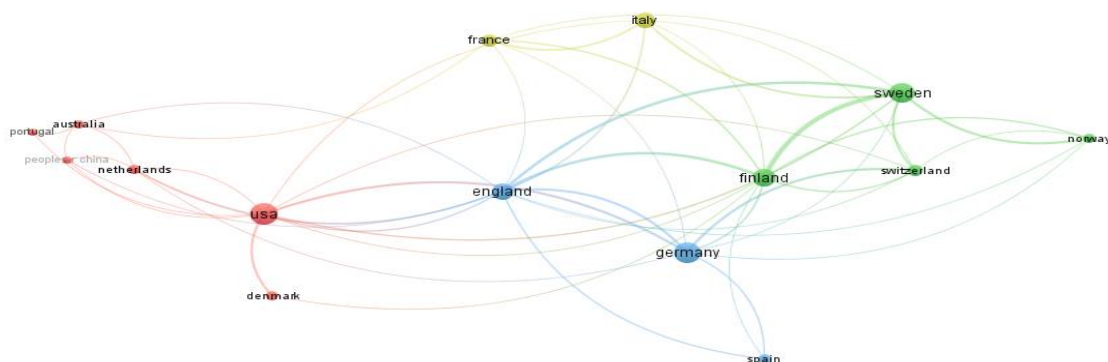


Figure 2.7: Country-wise Co-Authorship analysis

The Cluster 1 (red colour) with a set of 6 countries, exhibits the USA as a major contributor in collaboration with Australia, The Netherlands, Denmark, China, and Portugal. This means that major researches emerging from the USA are in collaboration with other countries in cluster 1. This is followed by Cluster 2 (green colour), having collaborations from Finland, Norway, Sweden and Switzerland, Cluster 3 (blue colour) comprises of England, Germany, Spain and cluster 4 (light green) has France and Italy. Interestingly the co-authorship yet is revolving around the USA and EU primarily. Overall, US seems to be the pioneer in co-authorship. Further, more research collaborations and contributions will emerge soon from other global regions as digital applications are getting popularised and adopted in developing countries at a fast pace.

2.4 Emerging research streams in the Field of Digital Transformation

To evaluate the research streams in the field of DT, the data was extracted from the Web of Science™ (WoS) core collection database with "*Digital Transformation*", "*Digitalization*", "*Digitalisation*" and "*Digital Enabler*" as keywords. Then clustering on the data file was performed to amalgamate the articles that share the same characteristics. To conduct this analysis, citation analysis functionality from VOSviewer was used. This yielded the initial clusters, which were used as a baseline for further analysis. The abstracts of all articles were reviewed and the clusters were reformulated accordingly. A thorough reading of complete article was performed wherever required for more clarity, and thereafter the article was placed in the appropriate cluster. In totality, four clusters representing major research areas were formulated which were further categorised in *eighteen research streams* and subsequently in their respective *research domains*. The four research areas formulated are *Organisational Effects, Applied Applications and Insights, Operational Processes and Social Aspects*. These research areas along with their research streams are being presented in Annexure 1. The comprehensive view of research streams is presented in Figure 2.8, followed by research area wise discussion on these research streams.

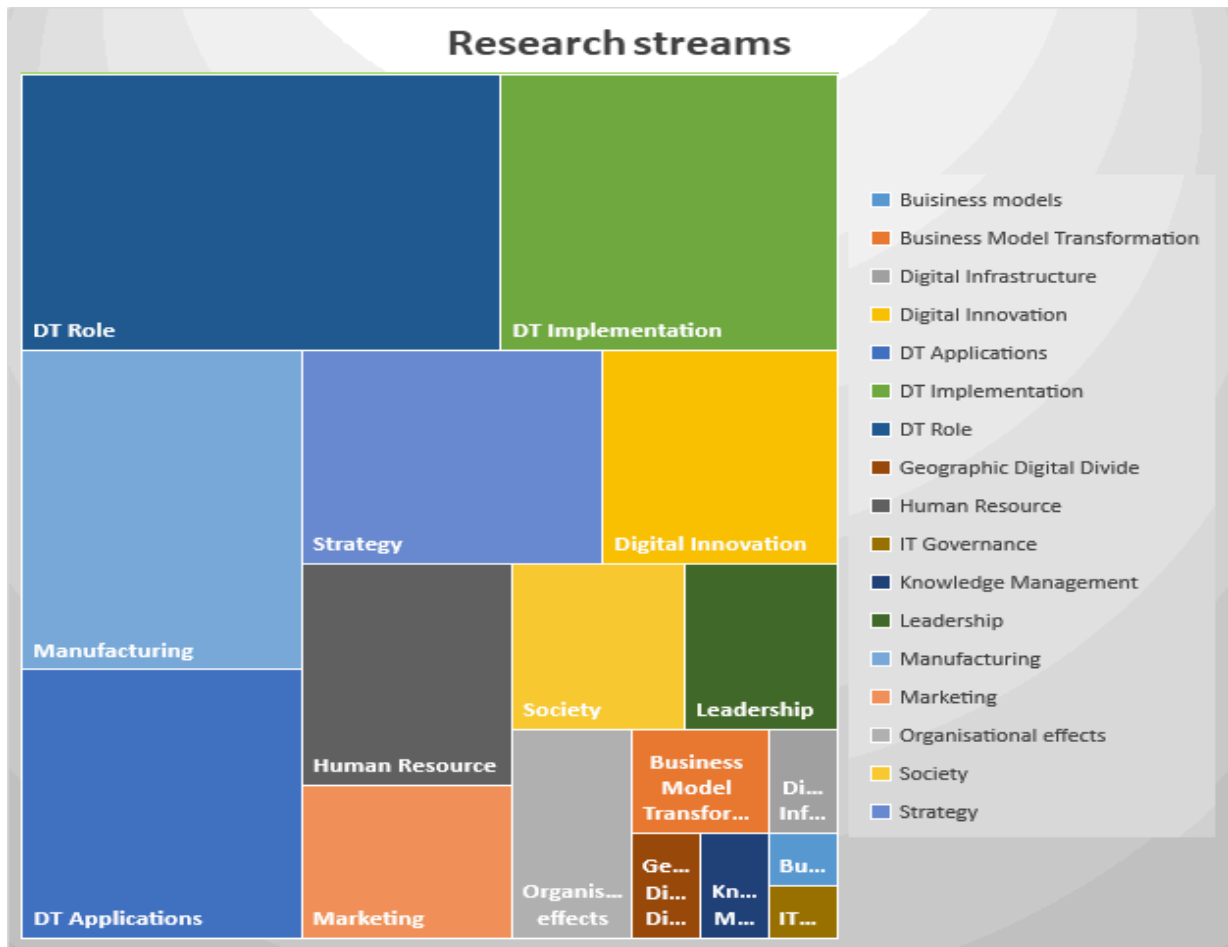


Figure 2.8: Research Streams in Digital Transformation Domain

2.4.1 Organisational Impacts

First research area, Organisational Impacts, reveals the research streams by which DT influences the organisations. Under this research area, the main research streams are *Business Model Transformation, Digital Infrastructure, Digital Innovation, Leadership and Organisational Impacts*. Prominent research in this research area broadly elaborates on the effect of digitalisation on business models of specific industry types. Diverse Industry types are deploying Digital technologies to transform their business models in different ways. Zeng et al. (2016) deliberated the impact of digitalisation on changing the business model of publication industry, as the users themselves were becoming the digital content builders, hence giving rise to user involved business models through co-creation. In the context of impacts of digitalisation on business models of Automobile and Media Industries, Rachinger et al. (2019), elucidated that digitalisation has influenced both industries. However, in

different ways, while automobile Industries focus more on production processes by applications of Industry 4.0, on the other hand, media utilises digital techniques towards content building applications. Recently, Mellet & Beauvisage (2019) present how cookie-dependent architecture has become the backbone of the online advertising industry's market infrastructure.

Many researchers have proposed that digitalisation creates new forms of knowledge (Yoo et al., 2010; Bharadwaj et al., 2013, Rachinger et al., 2019). In practice, this is achieved by integrating the knowledge of various complex fields and complementing them with digital techniques and technologies. Dougherty and Dunny (2012) developed theory on the role of Digitalization for innovation in complex field of drug discovery. Henfridsson (2014) proposed the new architectural approach for enhanced speed of digitised product innovation by the use of digital properties. Trantopolous et al. (2017) mentioned that the external sources of information such as customers, suppliers, competitors or universities are pivotal to the organisation's innovative success. The authors present the knowledge-based view of the firm engaged with information technology for effective process innovation. Similarly, Steininger and Getzemier (2019) share the music industry's ongoing transformation through crowd forecasting. Their article provides a methodology to estimate the forecasting of success of songs for the newer artist for whom the earlier records were not available.

For DT to be successful, it has to be made a strategic priority in the organisation. Leadership plays a vital role in how digital transformation is strategically placed and culturally adopted (Berman & Marshall, 2014) in organisations. Singh and Hess (2017) deliberate on creating a new position and role of chief Digital officer in digital transformation officer to assign the digitalisation responsibilities distinctively. Westerman et al. (2019) mention culture as the biggest challenge of DT, suggesting Impact, Speed, openness and autonomy as four key areas of digital culture. These values have to foster a culture where employees continuously feel motivated with more engagement and responsible for changing the company. Belian and Hafke (2016) mentioned that the mutual understanding of CIO and CEO is important for successfully exploiting information technology. Caputo et al. (2019) describe the relation of soft skills, Information technology and big data for the increase in a firm's economic performance.

2.4.2 Applied Applications and Insights

The second research area, Applied Applications and Insights emphasise on applications of DT, its role in the specific Industry sector and the practical aspects of the implementation of DT. This research area comprises of three prominent research streams. First, "*Digital Transformation Applications*" (DT Applications) - providing insights on various technological applications like *big data, cloud computing, social media, artificial intelligence (AI), AR/VR, 3D printing, block chain, ML, RPA, industry 4.0 or internet of things (IoT)*, "*Digital Transformation Implementation*" (DT Implementation) – emphasising implementation insights from the *case based researches* and "*Digital Transformation Role*" (DT Role)- covering the *role of DT for a specific Industry type*. In the context of Marketing Innovation where DT is being used for designing innovative and creative solutions for customer's needs to achieve better competitiveness, Ungerman et. al. (2018) studied the effects of innovative marketing in the context of Industry 4.0 on 50 enterprises and presented that increasing the competitiveness, work efficiency and corporate culture changes as the most important impact areas. Further, regarding advanced manufacturing technologies (AMT), Szalavetz (2019) presented that use of advance technologies like Industry 4.0, which propelled the upgrading of capabilities by acting as enabler of innovative collaboration. The supply chain bullwhip effect and uncertainties lead to inventory planning issues (Kumar & Bardhan, 2022). The use of block chain-based applications is also rising fast. The block chain technology has got applications in the supply chain, digital contracts and additive manufacturing. Schmidt and Wagner (2019) present how the blockchain is used the supply chain to develop trusted relationships leading to a reduction in transaction costs by transparent and valid transactions. Also blockchain applications are increasingly being demanded by customers who are interested to ensure quality through all production processes. Likewise, Schildt (2016) explained the optimisation of open-ended systems to leverage big data for shaping organisational design. Blackburn et al. (2017) explored how big data disrupts the research and development function in organisations by planning and enabling new approaches for research.

On the one hand, digitalisation has disrupted the established organisational processes; on the other hand, it has opened new business channels. There have been various studies on hands-

on facets of DT implementation at organisations. These studies provide lessons and excellent insights on practical aspects of digital transformation in different industry types. Agarwal et al. (2010) present their findings on the healthcare industry's Digitalisation progression and how the industry will get transformed by adopting digital technologies. Rothman and Koch (2014) described the impact of DT on newspaper Industry in Germany, where the industry has extracted the benefits of DT and significantly improved publication content quality. Sebastian et al. (2017) in their paper "how big old companies navigate digital transformation" elaborate on how the organisations move for leveraging DT by building their strategy around Customer Engagement, Digitised solutions supported by the operational foundation and agile digital service platform. Verhoef et al. (2021) delineate about firms willing to digitally transform should have digital assets, digital agility and networking capabilities along with agile and analytical internal IT functional structure. In a similar context, El Savy et al. (2016) elaborated how popular toy manufacturer Lego led its way to DT and transformed the business model through digital technologies. This article provides excellent insights into how the organisation who wants to build their digital capability right from beginning should move ahead themselves for DT. In the same year, 2016, Sia et al. brought practical insights from the banking industry. In their article "how dbs bank pursued a digital business strategy", the authors explained how DBS bank reacted to digital threats and achieved DT of their bank. Dremel et al. (2017) provide their recommendations on overcoming the challenges of DT specific to manufacturing domain in the context of their study of DT at Audi by the use of big data analytics. Frank et al. (2019) present a framework for business model innovation for product-based firms bringing Digital transformation by Servitization and Industry 4.0. On the similar lines Nittala et al. (2022) discuss the advancements in service innovation through layered modular architecture. The authors present a framework of different combinations of the Servitization's levels- smoothing, adapting and substituting along with three levels of digitisation - low, moderate and high. Brivot (2014) presented empirical research on the law firms and mentioned how 22 law firms used digital transformation to reorientate their business transformation. DT is leading to the ongoing transformation of great importance in the retail sector also. Hansen (2015) present the digitalisation of Hummel and lessons learnt from that. In the same context, Hegberg et al. (2016) designed retailing framework consisting of exchanges, actors, offerings, and settings. In summary, these articles touch upon various industry types such as Heavy materials, healthcare, retail, Mining, Telecom, Education, and

Fashion, Computing and fintech and present excellent lessons that are derived out of these case studies. A detailed list of articles in these research streams is listed in Annexure -1 (annexure section).

2.4.3 Operational Processes

Digital Transformation is becoming the driver for the fourth industrial revolution by influencing the organisations' business functions. Our third research area "Operational Processes" accentuates the impact of digital transformation on the *organisational business functions comprising manufacturing, sales, finance, supply chain, human resource, strategy and IT governance*. The majority of research under this research area are in manufacturing functions (Lerch et al., 2015; Hess et al., 2016; Lenka et al., 2017; Sjodin et al., 2018). This is because the novel digital technologies, such as IoT and Industry 4.0, are leading innovations like smart manufacturing and smart factories. These smart factories have more automated controls with least human interventions and enable real-time interactions with users for information exchange. Smart factories offer a number of advantages over conventional factories, including better process performance, product quality, sustainability, safety, and cost reduction (Sjodin et al., 2018). The authors of the article proposed a maturity model for smart factory implementation. In a similar concept, Ponsignon et al. (2019), present the qualities required to be present in quality management function and the proposed methodology by which quality management function can drive the digitalisation of organisations. The industries are also concentrating on service digitisation to sell them as a part of products. Parida et al. (2015) suggest digitalisation as one of the competency in global service innovation capabilities fostering better interaction among the organisation and its partners. Lerch and Gotsch (2015) emphasise on emerging trends to digitalisation and Servitization in the manufacturing industry where products are increasingly being bundled with services to make new digitised products service systems. The foreseen advantages of digital technologies have also posted opportunities for supply chains. Caniato et al. (2016) mention the "extent of trade process digitalisation" as moderating variable among supply chain partners to reduce the cost of financing for supply chain operations. Sabri et al. (2018) mention the impact of innovation on supply chain configuration. Srari and Lorentz (2019) proposed a grid to design application, communication of the state of digitalisation and designing a future strategy of digitalisation in purchase and supply chain function. DT has

affected the routine functions of the supply chain, Bienhaus and Haddud (2018), elaborated the impact of digitalisation on supply chain processes in procurement functions, such as supporting daily business activities and better decision-making lead efficient, effective and revenue-oriented business models. Further, they evaluated the barriers and ways to overcome those barriers for effectively utilise digitalisation in the procurement function.

Organizations must develop unique capabilities for customer engagement and value co-creation in order to improve their competitiveness. Lenka et al. (2016) mentioned three digitalisation capabilities - intelligence capability, connect capability, and analytic capability, that enable value co-creation in business to business relationships. In the same context of B to B relationships, Pagani and Pardo (2017) elaborate on the impact of digitalisation on B to B exchanges. Lember et al. (2019) emphasised that the use of digital technologies does not necessarily derive benefits of co-production and co-creation as the technology-related decisions are often taken by a third party rather than the users of co-production. Fritze et al. (2019) mentioned that the customers get attached to the digital service once they have experienced that thereafter they are reluctant to leave the service. Quinn et al. (2016) elaborate on the effect of digital technologies on marketers and selection and execution of marketing strategies on the target market (Roy & Kamath, 2020). Likewise, Fletcher and Griffiths (2020) present how pandemic situation and lockdown brought more volatility and uncertainty to less digitally oriented organisations and suggest the organisations to be more digitally mature to leverage flexibility and sustainability.

With the faster pace of automation, Digitalization is influencing the human resource also. The jobs and their key skill requirements are getting digital-oriented, Dengler and Metthes (2018), in their article "The impacts of digital transformation on the labour market: substitution potentials of occupations in Germany" mentioned the effects of automation of tasks by Digital Technologies on labour markets deriving that about fifteen per cent of jobs at Germany are at risk. Digitalisation has also enabled opportunities in labour markets. Pongratz (2018) mentions the emergence of online labour markets like freelancing activities performed by self-employed enabled by digital service platforms. With the increasing trend of digitalisation, organisations are increasingly becoming interested in deploying their internal social media networks. These networks are deployed to foster better employee engagements,

knowledge management and then deriving business models for the organisations (Sievert and Scholz, 2017). Further Jandric (2018) related digitalisation of the labour market and economic performances of a country will be driven by workforce adaptability, industry type and skills requirements. Gregory et al. (2018) bring forth IT consumerisation was the changing needs to customers influence managers' IT activities in the organisations leading to the IT governance transformation. Gregorio et al. (2019) mentioned that DT is changing the employability skills required for marketing resources by analysing the job postings. The authors evaluated five employability skills categories having the most in-demand skills. Similarly, Gong et al. (2020) highlighted that governments adopt DT to improve their services and to be more efficient and implement their initiatives in waves for adoption at various administrative levels.

From the strategy perspective, in the article "options for formulating a digital transformation strategy" Hess et al. (2016) elaborated on how the organisations should approach digital transformation initiatives. The authors present a set of eleven strategic questions that the managers can use as guidelines during the implementation of digital transformation. Andal (2013) in their research on the effects of NIT (new information technology) on 20 organisations, discussed the value chain transformation with nine drivers of new technologies and three mediation strategies for the organisations. Hinnings et al. (2019) suggest studying digital innovation and transformation from the organisational perspective. They suggest bringing out changes in business processes by novel innovations on applications of digital technology and achieving these changes by arrangements of "digital institutional infrastructures", the digital institutional building blocks and the organisational forms. Powell et al. (2016) elaborate on the insights extracted from websites of the organisations and suggest new methods that can be used to study the organisations by their websites. DT brings synergies by fostering inter-organisational collaborations, but this knowledge's protection remains a key concern (Ilvonen et al., 2018) present requirement of knowledge protection in their literature review.

2.4.4 Social Aspects

The fourth research area relates to digitalisation and *its social aspects*. Digitalisation has become component of *society's sustainable development* (Jovanovics et al. 2018) as the social

environment is becoming dependent on technological capabilities. The authors use digital competitiveness of nations by an index DESI (Digital Economy and social Index) to analyse how the digital performance of the EU affects economic, social, and environmental components. The authors conclude that Cultural component, Health and Wellbeing, World order, Prosperity and Equality are correlated with digitalisation level. Corrocher and Ordanini (2002) suggested a new model for measuring the digital divide within a group of countries using the synthetic index of digitalisation. Park et al. (2015) studied the level of digitalisation convergence among 108 countries and categorised them into three groupings. The study also identified per capita GDP, tertiary education entrance rate, the ratio of urban population and the share of service trade in GDP as the factors that drive a country's digitalisation convergence level. Ossewarde (2019) argued that social theory should be revised to include new challenges emerged due to digital transformation in visual and intellectual ways of life. Guy (2019) elaborated Digital culture as a component of society's digital transformation and made the theoretical distinction.

2.5 Digital Technologies and Market Dynamics

Pervasive digital technologies are driving organisations to embrace non-traditional digitally transformed business models constantly. Although digital transformation is gaining attention among academics and professionals, the research on the empirical aspects is still lacking (Haverkort and Zimmermann, 2017). According to Brynjolfsson and McAfee (2014) research conducted from an industrial perspective, the development, spread, and deployment of new technologies in the digital transition encounter numerous challenges. Therefore, it is important to build a comprehensive understanding of the elements that lead to the adoption of digital technologies in organisations to evaluate the performance of the digital projects. This understanding is also important to set measures and, more importantly, to influence the factors that drive success for digital transformation.

According to Kane et al. (2017), companies must match their strategy, people, culture, technology, and structure to satisfy the expectations of many stakeholders in order to attain digital maturity. Thus, DT is an organisation-wide phenomenon. It is not confined to a particular department or function and impacts a whole gamut of stakeholders. The

application of digital technology results in the creation of (and subsequent changes to) market products, corporate processes, or models (Nambisan et al., 2017). Therefore, to drive success in DT, it is foremost imperative to understand their requirements and build a thorough understanding of what is driving their expectations from technology. Next, as the organisations feel the need to build a foundation of innovation to succeed in DT, the drivers are important to be clearly demarcated to drive organisational efforts towards innovation. Therefore, it is necessary to understand the reasons that are pressing the organisations to adopt DT. In simple words, why do organisations decide to digitise their ways of generating value? This aspect is further delineated in section 2.6, Drivers of DT.

Another aspect of evaluating the organisational DT is looking at it from an innovation perspective. Lusch and Nambisan (2015) discuss two prominent ways through which innovation happens via digital technologies. First, digital technologies enable digital connectivity resulting in increased speed of data transfer and communication. Second, digital technologies enable novel products and services through innovation. Similarly, Yoo et al. (2012) mention "convergence" and "generativity" as two distinctive characteristics of digital technologies. Convergence means digital technologies reorient themselves to bring previously separate user experiences together; for example, the use of telecom and the internet together through smartphones has brought a lot of opportunities for the organisations. Generativity means the technological ability to create unprompted change in response to a vast, diverse and uncoordinated audience (Zittrain, 2006). Through Generativity, digital technologies foster innovation; for example, the smartphone can be reprogrammed and used for many applications to cater to the different needs of the users, and new capabilities can be added cost-effectively and at a fast pace. Schumpeter (2000) describes that organisations innovate in five major domains product, suppliers and organisation, production operations and customers. In that way, Organisational change that occurs as a result of digital transformation might be considered an innovation (Netheler, 2018). Therefore, the process of technology adoption plays an important role in innovation. Rapid technical advancements in digital technologies have empowered radically new utilisations from digital along with physical components to result in novel goods and services over the previous decade (Yoo et al., 2010). Further, the authors mention that digital technologies have three different characteristics: reprogrammability, data homogeneity,

and the self-referential aspect of these digital technologies differentiates innovation through digital technologies from earlier technology-based innovations.

Pagani (2013) discuss that value creation and disruption through digital technologies led to innovation and cross-boundary industrial collaboration. The author explains that value networks emerge as the technology advances and value creation and capture aspects change leading to disruption of positions. Huang et al. (2017) discovered three processes by which digital businesses innovate to rapidly increase their user base: data-driven operations, immediate-release (agile), and swift transformation. The ability of an organisation to frame and monitor innovation prospects by analysing massive amounts of data is referred to as a data-driven operation. The instant release refers to a business's ability to reduce the time between concept and deployment of a service by doing user-responsive testing & change alongside better service perception (Roy & Mukherjee, 2018). Swift transformation refers to a company's capacity to rebuild its identity and reimagine its fundamental in-house digital technologies for a new commercial environment.

It is often suggested that digital technologies are disruptive by nature (Moreau, 2013). Lytinen and Rose (2003) elaborate on technological disruption as transformative changes that alter the existing rules of competition. Industries such as media, telecom, music, hospitality, and healthcare have undergone significant transformations (Agarwal et al., 2010, Berman, 2012). Amazon, once known primarily for e-retailing, like AWS, its cloud service, is the biggest revenue contributor. The disruption also emerges from the new entrants that bring novel customer offerings through lean and agile operations and challenge the established market players (Seth, 2021). This also holds valid for niche markets. Because incumbent corporations focus on serving customers and meeting their demands, they go wrong in observing potential niche market competitors who take over the industry (Christensen, 1997). However, Nunes and Downes (2013) debate that in the digital era, competitors do not start with selected customer segments, but they disrupt the entire industry following the big bang approach because of their low price, better performance and greater customised approach. Following the low-cost innovation strategy, the product and services can quickly be designed and launched virtually at high speed. Further, Bughin and van Zeebroeck (2017) argue that new digital entrants disrupt the market by creating

competitive dynamics by taking market shares from established players and putting pressure on prices and altering consumer behaviour through their innovative ways.

By virtue of its omnipresent impact, the DT is a strategic phenomenon which presents many options to the organisations. Bharadwaj et al. (2013) distilled these new alternatives into four key components of a digital company strategy: speed, scale, scope, and sources of value creation and capture. For example, the connected digital portals in supply chain enable better collaborations among the partners that foster collective synergies using scale, scope and speed in creating better business value. Implementing DT demands a high level of agility. This in turn benefits to attain agility in business processes. Digital technologies also produce new digital tools that increase working productivity in addition to automating internal corporate processes. Huang et al. (2017) note that through user-responsiveness and quick modifications, the case company was able to reduce the period between service idea and deployment. Similarly, the speed enabled by digital technologies build the competitive advantage for the organisation as the product can be made available globally immediately after the launched time (Bharadwaj et al., 2013). DT also increases the speed of organisational decision making by the connected systems which enable quick data sharing. This phenomenon also creates new revenue streams for the organisations. As Pagani (2013) elaborates the value networks are generated to the multisided digital platforms. Hence organisations generate revenue not only from core streams but also from associated digital non core streams. For example, the intermediators in digital media marketing not only sell services but also the data that the organisations use to select and target customers. To this end, digital processes (for example, eCommerce, digital channels, online platforms, CRM systems etc.) enable new business processes through better interactions with business. ICT-enabled customer self-service allows businesses to gain better efficiency, lower costs, and potentially improve consumer experience (Davidson, and Vargo, 2015). DT facilitates the co-creation of value and better understanding with partners. Svahn et al. (2017) discuss Volvo cocreating new technological solution for their connected car project with Tuneln yet not exchanging money but in turn earning revenue from alternative stream of advertisement. Similarly, DBS bank formed a new relationship with academic institutes, technology partners, startups, and merchants in order to tap into outside expertise and speed up the digital invention (Sia, Soh and Weill, 2016). DT innovations also fasten the pace of

organisational change as it demands agility to be successful (Yoo et al., 2010). Consequently, organisations adopt the agile methodologies for the project management. Further, Seth (2021) suggests that to survive in the digital era, organisations have to build small but fast and in interactions. These incremental changes are easier to be adopted and reduce the risk over traditional water fall approach. According to Dremel et al. (2017), AUDI could strategically prioritise resources across several parallel projects of different business departments, and demonstrate analytical skills, and IT competencies across departments and locations through agile software techniques.

As discussed above, digital advances have the potential to drastically alter industry competitive dynamics, that in turn makes digital transformation a top priority for many organisations (Hess et al., 2016). Further, it is evident that together with their distinctive characteristics, the digital technologies foster innovation that unfolds new opportunities for the organisations (Nambisan et al., 2017). However, directing the efforts in right direction is very important for the success of DT. Therefore, Understanding the forces that motivate organisations to innovate and undergo digital transformation is crucial. A thorough understanding of these underlying forces will enable organisations to better strategise implementation of the DT. In essence, the need to elaborate the drivers of DT is evident. The drivers of digital transformation are deliberated upon in the upcoming section.

2.6 Drivers of digital transformation

Evidently, DT comprises of a variety of disciplines, so the nuances for DT too emerge from a variety of disciplines. These nuances (drivers) push the organisational need for adopting DT. Many researchers have described the drivers of DT with their own understanding. Berghaus and Back (2017) mention the key aspects of organisations adopting DT is to enable digital readiness of the organisation for being aware of changing circumstances and being able to react rapidly when necessary. Netheler et al. (2018) describe the drivers as “preliminaries, *expectations about future benefits*, that positively trigger and influence the preadoption processes”. Similarly, Osmundsen et al. (2018) defines drivers as “external or internal triggers for why organisations engage in digital transformation”. To formulate a consistent understanding, for this research drivers are considered as “*the perceived organisational*

expectations that motivate and influence the organisations to innovate, orient and adopt the digital technologies”.

Because unlike the IS oriented change which is restricted to information systems (Zhu et al., 2006), the DT impacts a larger sphere of the organisations including workplace and human capital (Brynjolfsson and McAfee, 2014). Hence, it is important to demarcate the drivers from success factors. While the success factors denote “few things that must go well to ensure success” (Boynton and Zmud, 1984, pp. 17-27), drivers are seen as expected or anticipated benefits that occur from the employment deployment of technology rather than actual outcomes. Having defined the understanding on drivers, this section will now elaborate on how the drivers have been evaluated in literature.

Netheler et al. (2018) elaborates the drivers in three categories *internal, external* and *organisational*. The authors elaborate, external drivers are a push that are foremost to come up (such as *legal regulations*) and readily get adopted, the organisational drivers represent the motivation of the organisations to go digital and internal drivers emerging from employee. Similarly, Berghaus and Back (2017) discuss organisations facing regulatory changes are forced to transform their business models through the adoption of digital technologies. These are virtually the forces which pressurize the organisations to act *for innovation, customer orientation* or *supplier collaboration* for various needs. The organisational drivers push innovation and bring workplace efficiency. The operational expectations of *reduction in turnaround time* (TAT) and *quality improvement* alongwith *process flexibility* also push the organisations for adoption of digital. Using *workplace digitalisation* results better coordination among workforce resulting that reduces the coordination costs (Coarse, 1937). The digital processes also reduce the error rates that the organisations target. Wan and Cheng (2019) emphasise digital revenue increase as a prominent push to digital adoption.

Mocker and Fonstad (2017) mention *digitally enhancing the products* is the foremost consideration for the organisations. Further, the authors mention *developing disruptive business models* to stay competitive and to generate novel revenue streams as the motivations for going digital. Neteller et al., 2018 mention *process improvement* is the most important driver in manufacturing industries. Kagermann et al. (2013) describe *standards* and *security issues* as the two important prerequisites for DT which in turn safeguard the organisations from various perceived penalties. The organisations target to bring *flexibility to*

their manufacturing operations through digitalisation (Netherler et al., 2018). Porter (1985) mentions *changing product designs with integrated technology-supported service models* as paradigm shift. The organisations rely on *technology offerings for novel product mix* becomes the driver of digitalisation. Similarly, Berghaus and Back (2017) mention *digital shift in the competitive landscape of industries* forcing to adopt digital technologies to innovate new ways to compete with rivals and new entrants. Haffke et al., 2016 mention the digitalisation *pressure emerging from competitor's adoption and demonstration of new digital capabilities* and disruptive business models, consequently influencing the move towards DT. Karimi and Walter (2015) in the context of the newspapers industry mention that organisations *build dynamic capabilities* by reconfiguring their business and by building digital capabilities to respond to business pace opportunities and challenges. Similarly, Bienhaus and Haddud (2018) and Bockschecker et al. (2018) mention setting up of new business model is pressing organisations for DT. The authors discuss about easy of scalability and revenue generation capability of digital business models. On the same lines Dombrowski and Fochler (2018) describe digital becoming prioritised because of organisation's inclination of new servitisation based distribution channels in manufacturing industries.

Devenport (1993) mention *complying to customer requirements versus controlling costs* as two conflicting aspects, which the organisations attempt to attain through technology. Emphasising digital leadership qualities, flexible and scalable digital operations, *digitalised customer experiences*, and *developing digital innovations* can assist an organisation in transitioning and attaining the desired objectives of digital transformation (Leischnig et al., 2017). Subsequently, Haffke et al., 2017 identify *changing customer behaviours and expectations* triggering DT. Delone and McLean (2003) mention *management support* as an important driver of digitalisation who provide necessary resources for process improvement and horizontal integration. On the similar enhanced value proposition pushes organisation for DT. Consequently, Organisations also emphasise to *enhance their core competencies* through DT. Piccinini et al. (2015) highlighted the necessity of exploiting customer and end-user information to create personalised, advanced digital products and services. In the similar context, Vial (2019) mention the general availability of *utilising data form digital technologies for strategic decision making* as the drivers of DT to address customer's needs analytically. Organisations leverage digital for building customer and vendor alliances. As Bilgeri et al.

(2017) elaborate that for *greater business unit collaboration* and *building external alliances* are critical. These partnership collaborations also facilitate for resolving pricing conflicts. Roumani (2016) asserted that as an organisation's digital transformation progresses, it achieves higher customisation and customer satisfaction while lowering selling costs. Westerman, Bonnet, and McAfee (2014) suggest Companies should establish a strategic scorecard that includes both financial and digital measurements to track digital transformation activities.

The *employee push* is also considered as an important driver of digitalisation as employees expect workplace digitalisation and tools that facilitate their better efficiency and bring a positive experience (Netheler et al., 2018). In the same context, Brynjolfsson and McAfee (2014) describe employees as information source driver to digitalisation as they emphasise risks related to digitalisation and its adoption. Employees also leverage these digital technologies to *innovate more at their workplace* (Mueller and Renken, 2017). On the same lines Grotherr et al. (2019) discuss DT becoming a prominent prerequisite for employee engagement. However, if the organisation is not culturally transformed, employees face challenges in adoption and therefore continue with earlier practices without adopting DT (Mihailescu and Mihailescu, 2017). Similarly, Wessel et al. (2020) elaborate the *change in environmental factor* as organisational drivers for DT. Li et al. (2018) argue the drivers as mostly externally driven.

The highlighted drivers are notions that businesses must consider before implementing a new technology. Though the focus of organisations on digital technologies is increasing, but they may still face issues when it comes to implementation. Therefore, it is important to understand the drivers that push the adoption of digital technologies in the organisations. Knowing the drivers only, the organisations can strategise their action plans to achieve success in DT initiatives.

As, thoroughly understanding the underlying forces is important, the strategic management of DT is equally critical. The chief information officers (CIOs) are often tasked to implement and manage DT. The upcoming section delineates the literature review on the aspects of CIO's and digital transformation.

2.7 CIO's and Digital Transformation

Although recent literature on DT proposes the new position of a Chief Digital Officer (CDO), currently most organisations have Chief Information Officer (CIO) helping their DT efforts. Hence, while not diminishing the CDO role, this review focusses on CIO role as the majority of research pertains to CIO. McCarthy et al. (2021) define CIO as the acknowledged head of IT for the organisation. To support its operations, the organisation requires quite a number of IT applications. The ask for these IT applications might be backed by enumerated reasons such as establishing new business process, achieving operational efficiency and process control, sales requirements, record keeping, legal aspects, competitive pressures etc. In its simplest form, each of these applications need IT infrastructure for their deployment and putting them in use. Traditionally, the manager accountable for managing this IT infrastructure to keep the applications live has been termed as chief information officer.

DT being a complex and multidimensional phenomenon, it is not possible to universally establish a common implementation approach. Additionally, DT is highly contextual; therefore, the leadership forms the foundation for the digital journey. Consequently, the leaders' expectations have shifted dramatically as the organisations look at leader's wisdom to effectively lead DT. To effectively avail the benefits offered by digitally transformed business models, the organisations are consistently expanding their management capabilities. As the recognised head of IT (McCarthy et al., 2021), the Chief Information Officer (CIO) is tasked with strategising, executing and making DT long-lasting at their organisations. Under the influence of DT, CIOs' expectations are continuously shifting from being IT department supervisors to strategic partners. Accordingly, the focus of CIOs is switching on strategically leveraging the digital technologies rather than on which technology. Competing in the digital era demands, contributions from multiple perspectives, including strategy, technology, business processes, diversified stakeholders, organisational culture and talent, to mention a few. When it comes to practicalities, this is not as easy as thinking around, so many dimensions often result in confusion, misalignment, talent attritions, and cost overruns (Seth, 2021; Mishra & Sharma, 2021). This multidimensionality of DT, in turn, often puts CIOs to the test by offering counterfactual scenarios such as scalability vs cost, accessibility vs security, cloud vs on-premise infrastructure deployments, and outsourcing vs in-house teams. These

scenarios are tough and must be carefully shaped for the organisation's benefit. Therefore, despite the significant investments and efforts, DT initiatives hardly deliver. This makes the phenomenon a strong prospect for further investigation on how do CIOs contribute to ensuring the success of DT initiatives.

It is evident from the discussion above that significant technology advancements have changed computing from a rudimentary office tool to an important organisational resource. Information technology use and management have undergone numerous changes as a result of this revolution, including the extent and variety of the technologies. As the qualification and knowledge of the users of information technologies have changed, the same is true for IS professionals. The responsibilities of the CIOs have undergone significant changes because of changing technologies. Therefore, understanding how the role has transformed itself is important to observe the adaptability and for the projection to newer responsibilities of CIO role under DT. In the next section, the evolution and progression of CIOs role is discussed.

2.7.1 Evolution of the CIO role

In his groundbreaking study, Mintzberg (1971) observed managers at work and proposed eight responsibilities that all managers, regardless of their position or function need to perform (Hütter & Riedl, 2017). Researchers and academics gave a lot of attention to this role classification study (Carroll & Gillen, 1987; Thornton & Cleveland, 1990; Grover et al., 1993; Kinicki & Vecchio, 1994; Gilbert et al., 2011; Feldman et al., 2020) from a variety of business domains used his role classifications to conceptualise roles in their own studies. This seminal study was eventually recognised by information technology researchers, and managerial principles were also applied to the IT field. Ives and Olson (1981) mention the IS manager's role as a technician with essential coordination, motivation, and planning responsibilities for a remote and unimportant support function (IT). As the organisations expanded and with the addition of more resources, IS manager's role kept growing horizontally. In Mid 1980s these executives tussled with the organisations for their vertical growth as they too were managing a complete function but had significantly less credibility. This got organisational attention and ultimately led to the emergence of the CIO as a title (Chun and Mooney, 2009). With the emergence of new technologies and increasing adoption of computing devices during the

early 1990s, the organisations started realising the value that IT could bring to the organisation. Accordingly, CIOs started getting more attention. As a result, CIO's role started shifting from a core technical role to a strategic IT planner and architect. Their increasing involvement in strategic initiatives also impacted their organisational position, and in turn, at many organisations their reporting was attached to the CEO (Applegate and Elam, 1992). Hence, the CIO role has gradually evolved from IS executive to MIS manager to Chief Information Officer and has been very dynamic due to internal and external factors (Chun and Mooney, 2009).

CIOs generate organisational value in key business areas byways of contributing to ongoing business initiatives, managing executive relationships, communicating IS performance and building IT vision for the organisation (Earl and Feeny, 1994). Feeny and Willcox (1998) note nine core capabilities that CIO need to possess to effectively manage IT. These nine capabilities are categorised under three major domains of the CIO's responsibilities – Business and IT vision, Design of IT architecture, and Delivery of IS. Ross and Feeney (1999) classify three roles of CIO's as functional head, strategic partner and business visionary and note that transition from the latter roles to the former happens when increased credibility is achieved over time (Figure 2.9). However, it has to be noted that attaining mastery in one role is a prerequisite to moving to the next level. Extending this model, Chun and Mooney (2009) proposed two possible role extensions from the business visionary role as chief innovation officer and director of IT. While the Chief innovation officer role encompasses responsibilities towards cross-functional integration, innovation management and formulating digital strategy, the role of IT director is centered at managing IT support and cost management with reporting to CFO.

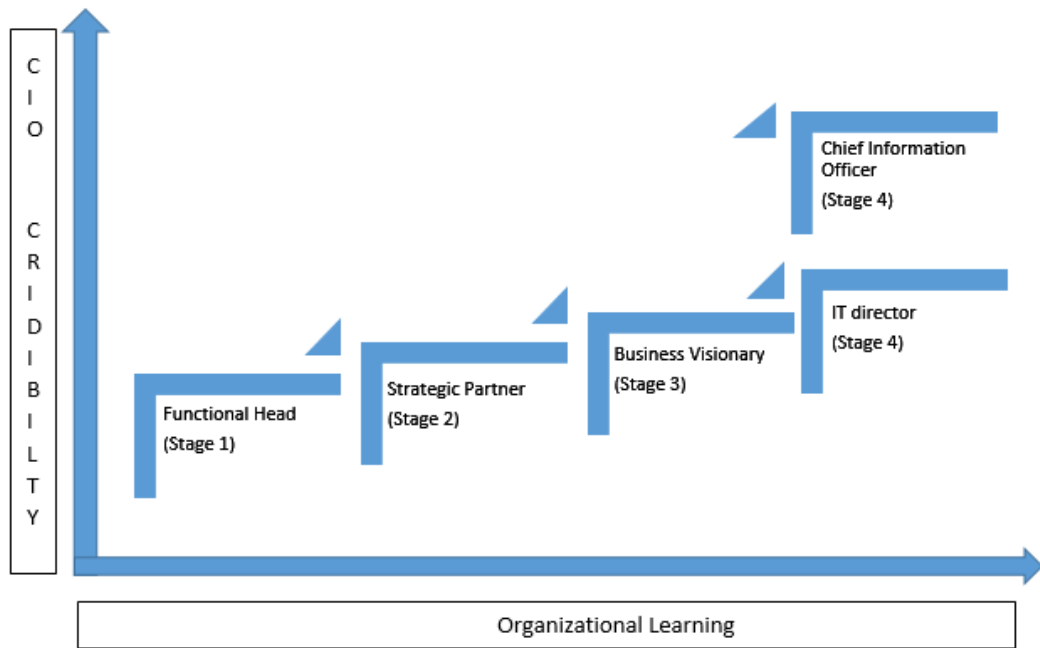


Figure 2.9: The Role of CIO - Credibility with organisational learning

(Adapted from Ross and Feeny (1999), Chun and Mooney (2009))

An inference that can be drawn from the understanding above is that, conventionally, IT's primary role has been limited to keep the lights on (MIT technology review insights, 2020), and IT was considered a commodity with no additional value (Carr, 2003). The role was recognised as a back-office runner with almost no active contribution to core business. Computing services were merely considered support services that existed behind the scenes in the organisation. The C suite perception of IT was limited to up keeper of the data centre, network and database services. As the internet services got popular, the IT security task was added to this perception, but it remained limited to just a support role. With the increased focus on cost controls, the CIO's reporting was aligned to the Chief Financial Officer (CFO), and IT outsourcing became a part of present-day IT strategy (Lacity et al., 2009; Mazumder, & Garg, 2021).

However, industry demands are changing fundamentally in the modern era. Present-day organisational economics is derived from data-driven decisions with close integration of IT with business (Artemenko, 2020). Now, the business strategy is designed to best fit the business necessities. Accordingly, IT is aligned to best complement the business requirements. Organisations are changing the way they deliver value based on the insights on

real-time analytics. With the advent of tracking cookies and big data, now the customers get engaged even before the product inquiry and are tracked throughout their lifetime journey with the organisations. Products are digitally designed, keeping customer requirements under consideration. Similar changes are evident in the supply chain (Deshpande et al., 2022), where the traditionally physical processes are now driven by smart sensor-driven processes (Klötzer and Pflaum, 2017). It is estimated that during the years 2013 to 2015, more than ninety percent of the world's data was generated (Becker et al., 2018), and it is forecasted that over 100 billion devices will connect to the internet by 2025 (Diamandis, 2015). These increased data-driven organisational demands have made business more dependent upon IT. In turn, this has lifted the expectations, and the role of IT functions in the organisations. The CIO being the head of the IT function is the person responsible for managing and persistently innovating strategic solutions to the business prospects. He is considered accountable for building and driving the organisation's IT vision, be the organisation a top runner or a close follower. Understandably, these business expectations have added complexity to CIO's role today and for everyone down the line in the hierarchy in IT function.

Considering these changes, recent literature envisions a new role of CDO for leading digital initiative (Rickards et al., 2015; Horlacher and Hess, 2016; Sibanda and Ramrathan, 2017) in the organisation. By establishing these types of positions, the business gives digital transformation more power and ownership, increasing the likelihood of success (Hess et al., 2016). The emergence of this unique position represents the organisational consideration to address their digital transformation requirements (Haffke et al., 2016). One of the crucial requirements for a successful DT is positioning the appropriate leaders, yet only one-third of the organisations have established a CDO role (McKinsey, 2018). It is argued that for leading DT, CIO is a better candidate because the CIO, by virtue of being already established in the position, has a better understanding and know-how of the business processes and IT landscape (Haffke, 2016; Singh & Hess, 2017). Further, CDO always looks at CIO for necessary infrastructure deployment for DT initiatives and hence synergies between the two are essential (Horlacher and Hess, 2016). Seth (2021) discusses that anyone (CIO or CDO) who leads DT has to be accountable and responsible to lead and govern it comprehensively. Notwithstanding this debate, this thesis considers the most senior IT executive, who leads the digital transformation of the organisation, as the CIO, irrespective of his/her actual job title.

To contextualise the role of the CIO in digital transformation, the next section discusses digital transformation leadership.

2.7.2 Role of CIO in DT

Over the last three decades, many researchers have shared their perspectives on information technology attributes and changing role of the CIO. This section discusses the role of CIO as described by other research in the prevailing literature.

Feeny and Willcox (1998) categorise nine core capabilities under three major domains as Business and IT vision, Delivery of IS and Design of IT architecture which CIOs need to possess for effective management of IT. Ross and Feeney (1999) mention functional head, strategic partner and business visionary as three roles that CIOs have gradually transitioned after achieving credibility in each position. Subsequently, Peppard et al. (2011) mention five different CIO roles "Utility IT Director, Evangelist CIO, Innovator CIO, Facilitator CIO, and Agility Director CIO", and the maturity of IT leadership capability is one of the critical factors in determining CIO's role and performance. Likewise, Preston et al. (2008) deliberated that the variations in the corporate performance are derived CIO's leadership profile and his involvement in strategic decision making. The authors present CIO's leadership profiles as IT Orchestrator, IT Laggard, IT Advisor and IT Mechanic. Likewise, Guillemette and Pare' (2012) discuss "Architecture Builder", "Partner", "Project Coordinator", "Systems Provider", and "Technological Leader" as five distinct IT management profiles. Chen & Wu (2011) argue that IT and managerial competencies significantly impact CIO's performance. Likewise, Hütter & Riedl (2017), in their excellent literature review of CIO roles, define six CIO roles as the technology provider, innovation driver, strategic supporter, integration advisor, business thinker and relationship manager. The authors elaborate that CIOs' performance depends on their personal competencies, hierarchical position, management environment, and technical skills. More recently, McCarthy et al. (2021) suggest eight digital transformation leadership (DTL) characteristics as a digital strategist, digital architect, digital culturalist, organisational agility, customer centrist, business process optimiser, digital workplace landscaper and data advocate. As evident, many researchers have elaborated on the role of CIOs with their own understanding.

From the management's standpoint, the CIOs being the head of IT, are accountable for performing several distinct tasks and duties, categorised as supply-side and demand-side responsibilities (Chen et al., 2010). The supply-side responsibilities are the foundational IT support responsibilities, such as purchasing and implementing the technology that the CIO is expected to deliver to business; the demand side responsibilities, on the other hand, are the innovation-oriented competencies (such as innovation and digitalisation) aimed at improving organisational outcomes. Achieving both supply and demand-side objectives demands CIO's active involvement (Chen et al., 2010) to strategise and manage competing priorities. As the ubiquitous digital technologies are progressively becoming a competitive tool, the CIOs are increasingly embracing the use of new-age digital technologies to innovate and create better business value. Consequently, the persistent use of digital technologies is driving organisations to embrace new digitally transformed business models (Chawla & Goyal, 2021).

Sobol and Klein (2009) emphasise that although technical skills are important, the CIOs who think strategically contribute more to the business. Applegate & Elam (1992) suggest that senior IT executives must bring strategic business objectives to their position by broadening their knowledge and skills in business strategy. Gottschalk (1999) proposes that CIOs must attain strategic roles by building relationships with their peers. Preston, Leidner, and Chen (2008) emphasise that top management team (TMT) members should primarily acknowledge that IT can contribute value to the business. CIO's structural relationship with TMT, CFO and CEO defines the influence of the CIO in strategic decisions making for the organisations. CIOs create a shared vision for strategic alignment of IT strategy with business strategy (Preston & Karahanna, 2009; Joshy & Thakurta, 2022) and educate TMT about what digital technologies can offer to the business (Weill & Woerner, 2013). Further, many times, even though the TMT members have heard about competitors' technological success stories, they are not sure how to replicate them in their business place (Leidner and Mackay, 2007). In such situations, the CIOs provide organisation specific insights to TMT on building strategic digital capabilities (Preston and Karahanna, 2009).

The CIOs need a high level of technical expertise (Smaltz, Sambamurthy and Agarwal, 2006) to manage IT and equip the organisational users with necessary IT tools. Technical competency is also required to manage increased IT infrastructures complexity (Sobol and

Klein, 2009), as the infrastructure sophistication enables the organisation to use IT applications in their competitive strategies (Armstrong & Sambamurthy, 1999). As DT entails flexible applications designs (Sambamurthy, Bharadwaj & Grover, 2003), therefore infrastructure agility is a precondition for successfully implementing DT applications. The CIOs carefully plan the budget and IT spending to bring business agility (Leidner, Beatty & Mackay, 2008). But more importantly, in the context of DT, allying IT to business is one of the foremost tasks of the CIOs. Therefore, the CIOs must possess foundational knowledge about the business process along with technical skills (Preston et al., 2008). Hence, while acting as C level executives, the CIOs focus on organisational strategy and, at the same time, acting as technical managers, they rationalise the IT infrastructure to control costs. Peppard, Edwards & Lambert (2011) suggest that the CIO's comprehensive understanding of business processes is a must to provide business innovations. Sia, Soh, and Weill (2016) discovered that DBS bank's senior business leaders were educated as digital adopters promoting digital innovation in their respective business domains.

For achieving and supporting the strategic organisational objectives operationally, the CIOs establish an effective governance structure. Through the governance mechanism, the CIOs aim to establish better business coordination, resource deployment, Risk management and focus on the strategic business processes (Weill, 2004). When the number of non-standardised digital applications is large, CIOs have functional challenges in managing operations. To cater this, they efficiently delegate operational management to use technology appropriately (Chun & Mooney, 2009). To put strategic plans in action, CIOs rely on their resources. But they are often confronted with resource limitations (Leidner, Beatty & Mackay, 2008). The CIOs have to persuade the resources and negotiate with C suite peers to influence their behaviour to overcome resistance (Enns, Huff & Higgins, 2003). With the pervasive accessibility of new digital platforms, everyone is becoming tech-savvy (Capitani, 2018), and the talented workforce have digital workplace expectations from their employers. Persuasive CIOs are able to more effectively set the goals for business improvements by leveraging digital technologies. Applegate & Elam (1992) propose that the senior IT executives must prepare the career development strategies for grooming the next generation of IT executives.

To leverage the agility of digital technologies and to keep themselves aware of digital marketplace trends, the CIOs build strong networks with technology partners and non-IT peers (Weill & Woerner, 2013). They then leverage this acquired knowledge at their workplace to innovate new ideas, evaluate business initiatives and formulate contracts and service level agreements (Li, Ding & Wu, 2012). Further, CIOs actively manage their relationships with internal and external partners for their own career accomplishments also (Spitze & Lee, 2012). With an increased organisational emphasis on digitalisation, IT security becomes a quite important consideration. CIOs need to closely consider confidentiality, integrity and availability of data (Solomon and Chapple 2005). Feng & Wang (2019) present that CIO's risk aversion and IT security breaches are negatively associated. Apart from the loss of reputation, there could be legal compliances resulting in severe consequences. Hence IT security has become a high priority consideration (Singh et al., 2022) for CIOs. DT entails experimenting across the organisation with new-age digital technologies and demands change in the community's behaviour (Hansen et al., 2011). To achieve this, CIOs build an innovation culture and encourage employees to experiment with digital technologies (Preston, Leidner & Chen, 2008). They leverage their communication skills to motivate the employees across the organisation (Preston and Karahanna, 2009). Business and IT trustworthy relationships become a major success factor for leading through digital initiatives. Tan & Gallupe (2006) claim that mutually trusted relationships with business executives result in better coordination between business and IT and result in better-integrated performance. To foster organisation-wide collaborations, the CIOs have to build inter-unit relationships, come out of the IT department boundaries, break the organisational silos and communicate effectively with business (Grover et al., 1993). Smaltz, Sambamurthy and Agarwal (2006) suggest that CIOs should communicate with users in the business terminology with clarity and persuasively. To gain the trust of TMT members & peers, CIOs share knowledge with them and consequently, leveraging these relationships, CIOs get involved in strategic business decisions more exclusively (Kearns & Lederer, 2003). The IT educated business peers provide more intuitive inputs to CIOs (Armstrong and Sambamurthy, 1999). This closed collaboration, in turn, enhances the repo of IT among the business functions. A consolidated summary of CIO roles is presented in the table No. 2.11. As evident from Table 2.11, the role has continuously expanded from being focused on technology and

operations to including innovation and strategy (Davis & McDonagh, 2015; Ross & Feeny, 1999).

Table 2.11: CIO roles outlined in the existing literature

<i>(Adapted from Hütter & Riedl, 2017)</i>	
Authors	A defined role of CIO
Grover et al. (1993)	Entrepreneur, Leader, Liaison, Monitor, Resource Allocator, Spokesman
Ross & Feeny (1999)	Business visionary, Functional head, Strategic Partner
Smaltz et al. (2006)	Information steward, Integrator, IT educator, Relationship architect, Strategist, utility provider
Leidner and Mackay (2007)	Big-bang CIO, Keep-it-running CIO, Value-adding CIO
Preston et al. (2008)	IT advisor, IT laggard, IT mechanic, IT orchestrator
Chun & Mooney (2009)	Innovator and creator, Landscape cultivator, Opportunity seeker, Triage nurse and firefighter
Chen & Wu (2011)	Business visionary, Business System Thinker, Entrepreneur, Informed buyer, Infrastructure builder, Organisational designer, Relationship builder, value configure.
Peppard et al. (2011)	Agility IT director CIO, Evangelist CIO, Facilitator CIO, Innovator CIO, Utility IT director
Guillemette and Paré (2012)	Architecture builder, Partner, Project coordinator, Systems provider, Technological leader
Li et al. (2012)	Information strategist, Integrator, IS contract oversight, IT Strategist, IT manager.
Weill & Woerner (2013)	Embedded CIO, Enterprise processes CIO, IT services CIO, External customer CIO

In summary, with greater technological awareness, DT is grabbing central organisational attention. Managing the elevated level of business expectations from IT demands a digitally

oriented mindset at all the organisational levels. The onus of DT primarily lies in CIOs. Hence, the CIOs in the digital era need to intelligently perform many roles simultaneously. These roles have high organisational context specificity. Therefore, despite the insights from literature, which are tasks that CIOs perform practically in the context of DT and how they do it to be successful are still not unveiled predominantly in literature. Hence, it has become essential to understand and reflect on the pragmatic aspects of the CIOs role.

2.7.3 Digital Transformation Leadership

As noted earlier, DT is not merely about implementing technology and requires a strategic focus. Further, DT requires a change in people's behaviour (Hansen et al., 2011). With increased technology awareness and ubiquity of digital applications and platforms, everyone has become tech-savvy (Capitani, 2018). The present-day customers own their personalised digital gadgets and expect a personal connection for products purchase and services delivery. The suppliers demand integrated information channels for better collaborations. The same is the case with employees. Almost everyone in the workforce expects their workplace applications to be digitally advanced to work efficiently. Managing this requires an altogether different mindset at all organisation levels. To ensure the success of DT efforts, the leadership position specifically calls for an emphasis on innovation, experimentation, and flexibility to digital capabilities. In practice, a variety of elements affect the effectiveness of DT, but one of the most important factors is competent and skilled leadership (El sawy et al., 2016).

The Digital Transformation leadership (DTL) can be defined as “*doing the right things for the strategic success of digitalisation for the enterprise and its business ecosystem* (McCarthy et al., 2021, pp. 2)”. Choosing the organization's directional focus for DT is one of the main goals of DTL (Heavin & Power, 2018). A deep understanding of the organisational core competencies and the operational business models is a must for the DTL to provide an effective strategic contribution. Only then can the digital leader formulate a strong IT vision to complement the business technically and empower them to do their work better.

From the management perspective, DTL involves some specific roles and responsibilities. In literature, these are explained as demand side and supply side aspects. The supply-side responsibilities can be understood as the traditional CIO responsibilities of IT management;

these are the IT support responsibilities that a CIO is supposed to deliver. At the same time, the demand side responsibilities are the innovation-oriented capabilities targeted to bring a positive impact on the organisational outcomes. Chen et al. (2010) emphasise attaining both the supply side and demand side objectives of the CIO's role. To achieve these goals, CIOs must manage competing objectives through IT exploitation and exploration, which means they must realise business value by utilising the capabilities of present IT resources while simultaneously pursuing new opportunities through the innovative applications of IT (Haffke et al., 2016).

Based on an extensive literature review, McCarthy et al. (2021) mention eight DTL characteristics as a digital strategist, digital culturalist, digital architect, customer centrist, organisational agilist, data advocate, business process optimiser, and digital workplace landscaper. These are the core traits that business and IT leaders should possess. Among these, digital strategists and digital architect are considered the foremost characteristics of DTL. Digital Strategist, as the most frequently listed characteristic, suggests that DT leaders need to be strategic in thinking by formulating a strategic vision in the context of DT and ensuring its alignment to top management (Hess et al., 2016). Digital architect characteristic emphasises the need for technical and innovation competency of leaders. Next, the emergent characteristics of organisational agility, digital culturalist and customer centrist elaborate on the alignment of human or physical resources and customised digital offerings to ensure customer-centricity. This is followed by data advocate, business process optimiser and digital workplace landscaper characteristics, focusing on the data-driven leadership approach to redefine the business processes.

Understanding the fundamental duties or responsibilities of the CIO in support of digital transformation is crucial. These roles are conferred to CIO from the top management in anticipation of driving DT in their organisation (Becker et al., 2018). Although there is no fixed list, there are some prominent tasks that can be listed (Webster and Watson, 2002) to portray the overall role of the CIO.

The upcoming section links the aspects discussed so far to a conceptual model for implementation of DT.

2.8 Research Gaps and Research Questions

As illustrated above, the DT phenomenon has been extensively investigated in a variety of industry situations. The prominent domain is strategic (Singh and Hess, 2017), business model innovation (Berman, 2012; Henriette et al., 2015) and organisational impacts (Earley, 2014). Further, DT applications and technologies such as big data, IoT, analytics, social media, cloud computing, artificial intelligence (AI), augmented reality (AR)/virtual reality (VR), 3D printing, Blockchain, Machine learning (ML), robotic process automation (RPA), etc. have also been conceptualised widely (Mishra et al., 2018; Muhuri et al., 2019; Cortés Sánchez & Julián David, 2019; Hausberg et al., 2019; Vial, 2019; Verhoef et al., 2021, Sharma & Sharma, 2022; Nasim & Khan, 2022). Additionally, studies have focused on a variety of industry sectors, including healthcare, retail, manufacturing, fintech, mining, automobiles, telecom, and experiential computing (Agarwal et al., 2010; Lerch et al., 2015; Hagberg et al., 2016; Rachinger et al., 2019). As a result, the body of current knowledge has seen DT literature significantly expand, demonstrating its growing importance.

The prevailing studies demonstrate how DT differs from IT-enabled business automation where it makes the use of real-time information to support business activities (Proctor, 2017). The touchpoints of DT become multifunctional as the business processes arise from all of the business vertices. This multidimensionality makes DT omnipresent throughout the organisation (Kane et al., 2015). As a result, the organisations have to be more astute to establish DT as a strategic advantage. This further entails granular aspects of managing technology, business processes, people and culture across the organisation. Although this notion presents a significant opportunity to integrate organisational functions, it also raises conflicting priorities and leads to inconsistent outcomes (Seth, 2021). Additionally, due to their contextual specificity, these circumstances necessitate a careful assessment of potential strategic options. Not selecting appropriate options results in digital transformation projects failing, putting larger investments in those programmes at risk (Davenport & Westerman, 2018). This becomes even more problematic because of the rapidly market dynamics, which makes businesses fear lagging and, eventually, causes them to become confused about their approach towards DT. Therefore, to drive success in DT, it is foremost critical to understand the underlying forces that prompt the organisations to adopt DT. Only with a clear understanding of driving forces and their organisational context, the organisations can

productively prioritise their efforts towards DT. Therefore, unveiling of the factors that prompt organisations become critical to evaluation of strategic choice and adoption of implementation approach for DT. However, the extant literature has not much deliberated on this aspect of DT. This gap in literature calls for an all-encompassing study to unveil the inherent factors in context of multifaceted dimensionality of DT.

As it is crucial to fully comprehend the underlying factors, and it is also important to manage DT strategically. According to researchers, the top organisations employ technology for business transformation by combining their digital activities with strategic leadership (Yoo et al., 2010; Hess, 2016; Tumbas et al., 2018). DT implementation and management are frequently delegated to the chief information officers (CIOs). The extant research has emphasized the evolution and growth of the CIO functions over the years (Ross and Feeny 1999; Chun and Mooney; 2009; Peppard et al. 2011; Davis and McDonagh 2015; Hütter and Riedl 2017; Hillebrand and Westner 2021). DT and its effects on organisations have also been the subject of study in recent years (Berman, 2012; Fitzgerald et al., 2014). The vital part the CIO plays in DT, however, has not been thoroughly studied by previous IS research. Regarding the fundamentally practical features of the CIOs' contributions to the current DT situation, the literature is still not completely examined. Evidently, the existing literature still lacks clarity regarding the ground-level empirical aspects on the contributions of the CIOs in the contemporary phenomenon of DT. Moreover, DT is an empirical phenomenon and therefore understanding it from practitioner's perspective is important to critically evaluate and understand the ground level aspects. To address this research gap, this study seeks to explore on how do CIOs act as enablers of DT?

As just discussed, two crucial DT dimensions are the drivers and the leadership. However, to be successful DT has to be comprehensive (Vial, 2021). Hence, addressing the practicalities becomes equally critical to success when the organisations embark their digital journey. As a result, it's necessary to manage a variety of organisational aspects, including strategy, business processes, leadership, technology, people management, and culture (Hess et al., 2017). Perhaps most crucially, it requires cohesion in governance. To address and govern this comprehensiveness the organisations must have a structure approach, that they follow holistically implementing DT.

Hence as evident from discussion above, the successful implementation of DT demands a comprehensive understanding of the phenomenon from integrative interlinking of the actual organisational requirements, technology management aspects and a guided approach. In turn, the organisations must have a robust integrated approach to address three major aspects: where to begin, how to utilise leadership effectively and how to attempt it practically. The prevalent studies either do not discuss or present very little details in an integrated manner about the drivers, CIO's contributions, and implementation methodology into very little detail about them. Thus, both from an academic and practitioner's standpoint, a comprehensive understanding addressing the why and how of the digital transition is lacking. Unavailability of such evidence-based evaluation of these dimensions not only impedes the proper implementation of DT but also exposes the risk of resource wastage on schedule, cost and efforts in the organisations. Therefore, this lack of research addressing the three aspects indicates a notable gap in the literature. In turn, this thesis aims to address the phenomena empirically through the below research questions:

RQ1 - What characteristics influence to enable the digital transformation through the organisations?

RQ2- How do chief information officers (CIOs) contribute to digital transformation?

RQ3- How should the organisations attempt a successful digital transformation?

However, to the best of the knowledge of this researcher, there has not been any study available in the literature that provides a comprehensive framework from implementation perspective of digital transformation implementation at the organisations. This provides with a good rationale for evaluating "how" DT can be implemented to drive substantial success at the organisations. The present study makes an effort to solve the aforementioned issues of Why and How of DT using literature followed by empirical studies. The next section presents the conceptual framework designed for this study.

2.9 The conceptual framework of DT at organisations

In the sections above, a large body of literature related to DT, the drivers of DT and the role of the CIO is presented. The chapter started by presenting the evolution and progression of the concept of DT, followed by the emerging research themes under the DT domain.

Subsequently, Digital technologies and market dynamics, drivers, role of CIO and digital transformation leadership with reference to DT were discussed. This has set the context for further exploration through the empirical part of this study. To present a holistic view and to consolidate the understanding, a high level framework is presented in Figure 2.10. This framework formulates a baseline understanding to further examine the empirical part of this study.

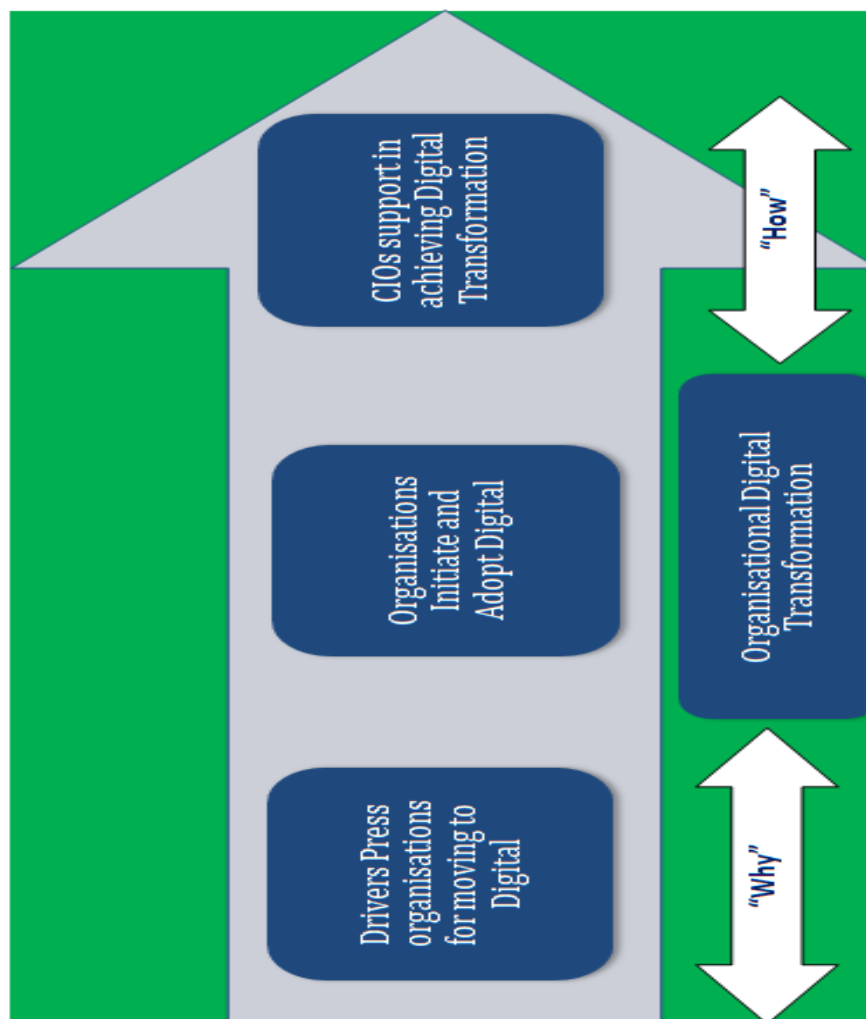


Figure 2.10: Conceptual Model of Digital Transformation at the organisation

The framework depicts three main sections; first, it illustrates that there are drivers that necessitate and push the organisations toward digital transformation. Under the influential force of these factors, the organisations determine their objectives to attain DT through

innovation, adoption and implementation of digital technologies. Evidently, this section investigates “why” organisations attempt for DT. Further, these objectives are complemented by chief information officers (CIOs) who contribute to the attainment of the objectives set by the organisations. Hence left side of "organisational digital transformation" represents the drivers, and the right side presents the role of CIO's.

As digital technologies offer new methods to compete and produce value; they cause digital disruption in the industries. In turn, this disruption becomes the driver of DT in the organisations. This is modelled in the "Why" section. It is clear that there are forces, which press the organisations to go for digital transformation, "what" are those forces, "where" are these forces originating from, "how" should organisations attempt to address these forces are derived as empirical part later in this study. Further, as elaborated above, CIOs play a critical part in a company's digital transformation, which is why their leadership in this area is critical. CIOs are given the responsibility to lead and implement DT. The framework represents this in the "how" section. The framework builds a deeper understanding of why firms are undergoing a digital transformation by studying RQ1. This will support the identification of basic elements of DT and the actions that organisations recognise as the factors of DT. There is limited empirical aspects of CIOs leading digital transformation presented in literature; therefore, studying RQ2 will support to better understand the roles of CIOs in digital transformation. The study further evaluates (chapter 5) on how to align and implement these better to accord success in DT's endeavours. These aspects set the stage for empirical investigation of this phenomenon and our research questions.

2.10 Conclusion

This chapter provides comprehensive review of literature on digital transformation. The evolution and growth of the phenomenon is discussed using the techniques of bibliometric analysis. This is followed by the comprehensive literature review on drivers of DT, role of CIO and digital transformation leadership. Based on extant literature the chapter provides with useful information about the drivers leading to DT at organisations and the contributions of CIOs to DT. Finally, the conceptual model for implementing DT at the organisations is presented. Accordingly, the inferences drawn out of this literature review set the foundation

for subsequent empirical analysis of this study. The next chapter presents the methodology selected for this study.

Chapter 3 – Research Methodology

3.1 Chapter Overview

This chapter presents the methodology adopted address the stated objectives this study. The chapter has five sections. First, research design is presented in section 3.2. Case selection methodology is discussed next in Section 3.3. Subsequently, section 3.4 discusses the profile of case organisations. This is followed by section 3.5 on data collection and section 3.6 on data analysis.

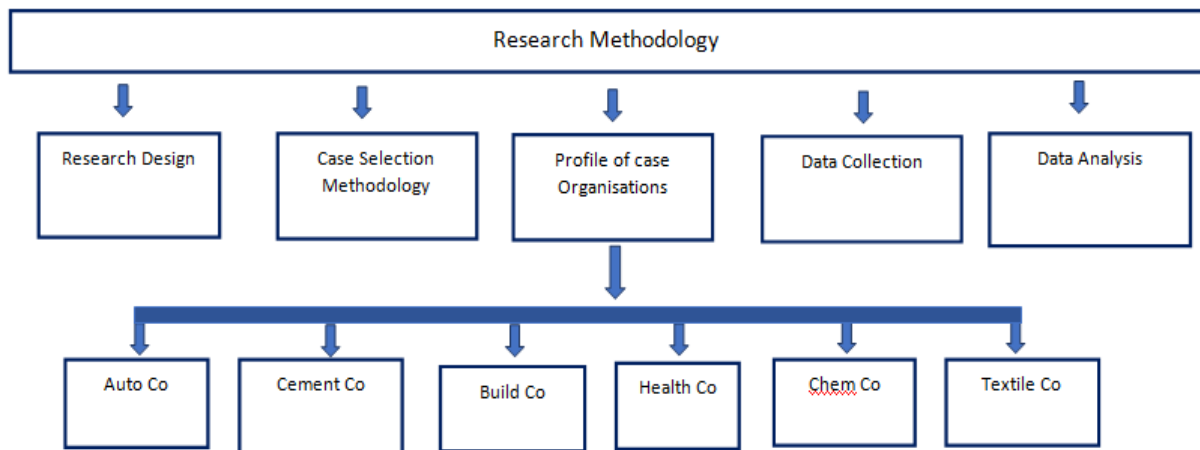


Figure 3.1: Overview of Chapter

3.2 Research Design

The research design represents the approach adopted for addressing the research objectives of the study. That is, the logical sequence of the research that links empirical data to the stated objectives of the study (Yin, 2017). Malhotra and Dash (2010) mention about research design being categorised in to three types exploratory, descriptive and causal. The exploratory research design is recommended when a researcher explores a new area of the study or phenomenon that can be examined (Neuman, 2005). In turn, an exploratory research design addresses “what” questions.

As discussed in section 1.4, the below research questions are adopted for this study:

RQ1 - What characteristics influence to enable the digital transformation through the organisations?

RQ2- How do chief information officers (CIOs) contribute to digital transformation?

RQ3- How should the organisations attempt a successful digital transformation?

Further, as illustrated in Chapter 2, due to its multidimensional nature, DT is becoming the topmost priority for organisations and the CIOs are mostly considered responsible for enabling DT at the organisations (Hess et al., 2017). Also, the phenomenon itself is contextual and field driven. Yet, the academic literature on DT (Chawla and Goyal, 2021), its drivers and on the practicalities of the CIO's contribution to DT is scarce. As DT is a practice-oriented subject that is gaining the interest of many, the objective of this research is to explore the phenomenon in depth from the practitioner's perspective (Strauss and Corbin, 2012) on why and how this is being performed in the organisations. Therefore, the aim was to explore the phenomenon in real-world settings. As Rouse & Daellenbach (2002) deliberate that the fieldwork research is considered an appropriate approach as it can minutely uncover "how" and "what" of practical aspects in the context of organisations. Specifically for this study RQ1 explores on what are the drivers of DT, RQ2 discuss about how the CIOs contribute to DT. Subsequently, RQ3 attempts to address how the organisations should do it effectively.

The *qualitative research* is used to examine the prevailing knowledge as it exists and builds empirical theories on exploration of the phenomenon from the participant's perspective (Ritchie and Lewis (2014); Strauss and Corbin (2012)). Consequently, an *exploratory research methodology with the qualitative method* was adopted (Golafshani, 2003). Further, as DT is a novel phenomenon gaining more attention and to address the practical perspective as they exist in field, the *inductive approach* was selected. As suggested by Saunders, Lewis and Thornhill (2008), following the inductive approach, the data is collected without preconceived theoretical considerations and theory is built from the analysis of data collected from the field. To complement inductive approach, the interview-based data collection methodology was adopted as it enables the participants to share their views flexibly and is customised to present comprehensive data collection for a holistic understanding of the research topic.

3.3 Case selection

Eisenhardt (1989) suggests using the case study as a suitable strategy to build inductive theory. Yin (2017) notes the case study “as an appropriate methodology for investigating the nascent phenomenon where the research is in its early phases, and a little apriori knowledge exists.” The case study, according to the author, is a descriptive research that focuses on a contemporary occurrence in depth inside its actual setting, particularly when the distinctions between phenomenon and context are blurry (Yin, 2009). As these recommendations stand valid for this research boundaries, the case study as a strategy was selected for this research. Also, the case study method is more suitable given that this is a new research area with limited previous research and theory created from empirical events rather than historical aspects. The research aims to elaborate on "Why the organisations adopt DT" and "How are CIOs contributing to DT". Therefore, the primary context of research is based on exploratory aspects, making it suitable for *case study* research (Yin, 2009). Further, as the objective of the study is to derive insight from the practical aspect of organisations, the case study method was adopted.

As mentioned above, the phenomenon of DT is very diversified and highly contextual to the organisations. The drives of DT for one organisation could be way different from the other. Similarly, CIO at one organisation might approach DT from some aspect, while the other CIO might have a different perspective on implementing DT. Hence, limiting the study to one case would have constrained the knowledge of that organisation, thereby presenting the analysis of that organisation only rather than evaluating holistic insights; therefore, *multiple case studies* were chosen for a holistic understanding of the phenomenon. The cases were explicitly selected from the "mixed digital and physical" continuum (Fig 3.2) (Berman & Bell, 2011) as these industry sectors represent a mix of digital and physical elements, presenting more significant opportunities for analysing DT from both perspectives.

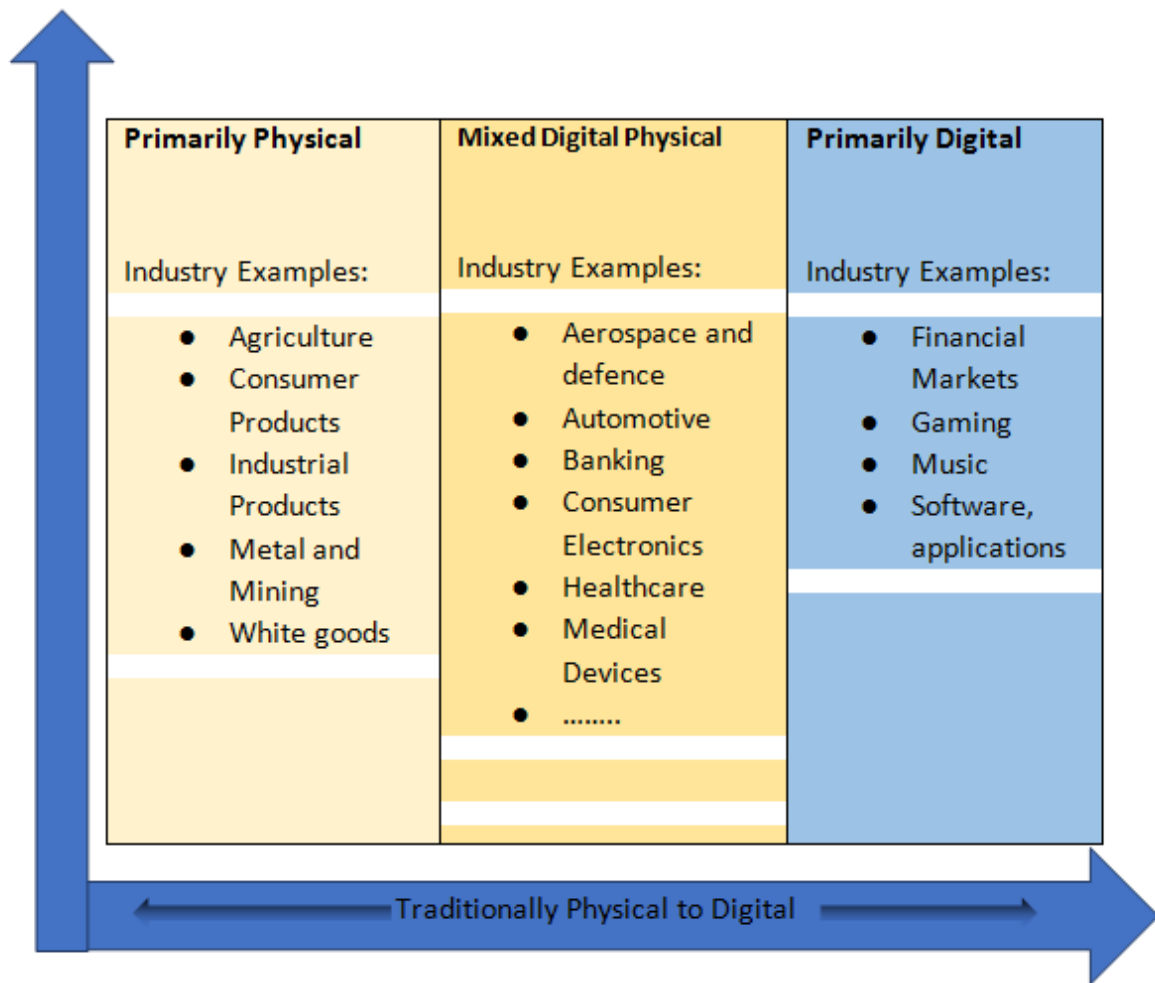


Figure 3.2: Physical-digital continuum (Berman & Bell, 2011)

Further, As Saunders, Lewis and Thornhill (2008) suggested extreme cases from different industry segments were selected to ensure getting maximum information from the small set of sampled organisations. The established (more than ten years of existence) organisations that are large in size (revenue > 10 M INR), have a 500+ workforce, with a history of at least 20 years with the establishment in the market and have made some significant efforts in DT were selected (Zahra Ireland & Hitt, 2000). To screen the sampled organisations, publicly available information was used. The larger organisations were chosen because it is more difficult for them to adapt to environmental changes because of their legacy systems, culture, and more versatile business processes compared to smaller organisations. The organisation's size also impacts the speed of implementation of new initiatives, the versatility of processes determines the external implications, such as legal and regulatory compliances (Diener and Špaček, 2021). Similarly, culture determines how the initiatives are adopted and attempted.

These aspects make a strong foundation for DT and are hence considered influential for this study.

Eisenhardt (1989) suggests that inference from four to ten cases forms a reasonable basis for theory building and generalisation. For the participation, twelve organisations fulfilling the above criteria were approached and six out of those accepted the research participation request approving access to their executives for interviews. This count fell well within the recommended range of Eisenhardt (1989). Here, It is important to mention that the CIOs were heading IT and DT initiatives in all the case organisations; further, there was no other position, such as CDO, to lead DT at the organisations. The experienced interviewees, which were a part of DT initiatives at the organisations were approached, to make data more reliable. Table 3.1 presents the summary of the selected organisations. The names of the organisations are withheld to maintain anonymity, promised to all the organisations and the interviewees.

Table 3.1: Profile of case organisations

S No.	Organisation Pseudo name	Sector/ Industry	Revenue (USD)	Employees (Thousands)	Total Number of interviews conducted
1.	AutoCo	Automobile Ancillary	78 Mn	1-5 K	3
2.	CementCo	Cement Manufacturing	555.2 Mn	1-5 K	3
3.	HealthCo	Hospital	14 Mn	<1 K	3
4.	ChemCo	Chemical Manufacturing	1077 Mn	1-5 K	2
5.	BuildCo	Roofing Solutions	440 Mn	1-5 K	3
6.	TextileCo	Textile Processing	21000 Mn	5-8 K	3

The case organisations are elaborated next in below section.

3.4 Case organisation's Profiles

This section discusses the profile of case organisations. The details about sector, employees and revenue are presented. The names of the organisations are withheld for anonymity and pseudo names are being presented.

3.4.1 Case 1 - AutoCo

The AutoCo is a Tier-1 auto ancillary providing automotive solutions to the Original Equipment Manufacturers (OEMs). Incepted in 1958, the group has grown to a conglomerate with a turnover beyond US\$ 1 Billion (FY2021). For more than sixty years, Autotech Co. has made significant contributions to the automobile industry supply chain with innovative products that are developed for efficiency and comfort. The product line includes Fuel Systems, Brake Hoses, Steering wheels, Combined Braking systems, Infotainment Systems and connected Telematics solutions.

The company has 71 manufacturing plants across ASEAN countries, Europe and USA, complemented by sales offices and 15 research and development centres across the globe. The organisation has a strong workforce. Autotech Co.'s ideology is built on two pillars: technology with innovation. The management's mission is to establish a culture that encourages outstanding ideas that can be used to plan innovative products that are successfully manufactured and give value to the customers. For this, they have built strong partnerships with 18 plus global technology firms. Autotech Co.'s proprietary design studio provides new design solutions, prototypes, and production projects for global automotive customers. Industrial design for automobile clients that support user interface and visual design for display-based goods like instrument clusters and infotainment systems. Autotech Co. recently launched a sophisticated telematics-based software for one of its top commercial vehicle clients to improve vehicle safety. The app is designed to provide remote breakdown support to provide complete engine diagnostics for all BS-IV automobiles. With a focus on big data analytics through their preoperatory technology, Autotech Co. is also working on advanced telematics to provide vehicle insurance insights.

3.4.2 Case 2 - CementCo

CementCo. is a well-known and well-established brand in the cement manufacturing industry, with about Rs 4000 crores annually. The company, founded in 1982, operates modern, fully automated, integrated cement factories in central India with a total capacity of around 15 million metric tonnes per year.

The company has consistently prioritised product quality, client satisfaction, and innovation. And it has a significant foothold in the cement markets, infrastructure, and building sectors of Northern, Western, and Eastern India. Cement Co. has been a consistent performer despite the cement industry's ever-changing problems. Cement Co. holds a premium position because of a robust and dedicated marketing team and an extensive network of over 7000 channel partners. With cement grades including OPC and PPC, Cement Co. has a diverse product portfolio to meet various construction needs. Cement Co. has a diverse line of high-quality products for customers, including ready-mix concrete and gypsum plaster. They have formed strategic collaborations with several top businesses and public sector organisations to contribute to various infrastructure projects. Cement Co. was one of India's earliest ISO:9002 accredited cement factories and a pioneer firm to reach maximum utility by utilising cutting-edge technology through world-class machinery to increase production. Several prizes and accolades have come their way. Cement Co. remains dedicated to achieving the highest levels of product quality and customer service.

3.4.3 Case 3 - HealthCo

HealthCo. is a conglomeration of hospitals that is part of a broad \$2 billion organisation with a history of long-term partnerships with renowned worldwide organisations in technology and automation, housing and building, healthcare and education. The company is known for delivering value for customers, partners, employees, and communities and developing exceptional engineering, technological, and manufacturing capabilities. Management is increasing its attention on personnel and technology to prosper in the twenty-first century. They want to foster a culture that promotes the best performances with world-class technology and partners to fulfil the customers' increasing needs better, targeting both internally and externally.

It expanded to offer the latest, most innovative and comprehensive treatments for individuals with a wide range of medical conditions from the very beginning. The HealthCo. was founded to deliver super-speciality cardiac therapy. One of the HealthCo. hospitals is India's first NABH recognised facility. The hospital has gained the distinction of being a safe location for comprehensive cardiac treatments by being a symbol of ethical practice and confidence. The hospital, centrally located in eastern India and has 210 beds and state-of-the-art equipment, maintains high healthcare and occupational safety standards by employing the best doctors. The hospital's purpose is to provide the most effective medical care to people from all walks of life. As a result, the institution upgraded its facility with new medical equipment and cutting-edge technology. The hospital's primary focus is on patient care and providing high-quality treatment. Various clinical specialisations emerged, including paediatrics, gynaecology's neurology section, and many more.

Many elements of healthcare have been altered by technology that has helped make treatment more economical, risk-free, and quick. To provide the most satisfactory surgical outcomes, HealthcareCo has the most up-to-date technology. They use cutting-edge testing technology to ensure that the results provided to patients are precise and error-free. They use high-quality equipment and advanced technology to ensure that our patients receive the greatest treatment and recover as quickly as possible. To provide the greatest outcomes, HealthCo. management are rapidly incorporating the latest methods in the medical industry. HealthCo. has coordinated a stress-free patient journey using technology-driven processes. The Healthcare group's fundamental values are technology and collaboration.

3.4.4 Case 4 - ChemCo

Specialty Co. is a multi-business corporation with various items for a range of uses. Their extensive line of products and services is sold all over the world. The broad product segment finds its use across tyres, mines, air conditioners, cricket grounds, food packaging, and households to pharmaceuticals as raw materials. The company aspires to provide the best quality of sustainable, industrial, and speciality products that lead to improved life with their varied portfolio. Speciality Co. has risen from a single unit tyre cord producer to a prominent, multidisciplinary chemicals conglomerate since its inception in India in 1974. Speciality Co. currently operates eleven manufacturing sites in Asia and Europe, serving customers in more

than 75 countries, and has been the market leader for the past two decades in the domestic market. Speciality Co., a founder of PVC synthetic coated fabrics in India, offers a diverse range of goods for various applications in a variety of industries, including architectural, sports, defence, mines, advertisement, and automobiles. Fluorochemicals, packaging films, speciality chemicals and Technical textiles are among the items offered by the company. Specialty Company also sells dynamic and static coating solutions. The laminated fabrics utilised in flex hoardings and signage are ideal for high-quality digital printing.

Speciality Co. has a significant emphasis on sustainability, and all the packaging film products follow the preset sustainability standards set up by the company. With ISO 14001:2004 and ISO 50001:2011 energy management certifications, the company is constantly working to reduce GHG emissions across all of our industrial activities. Additionally, the company has deployed innovative energy management systems for efficient cooling using sensors. Speciality Co. services consumers wherever in India through a pan-India network of channel partners. The company's philosophy is "constant progress while pursuing the passion.". The company had a 1000 Mn USD turnover during FY 2020 and employed more than 4K people.

3.4.5 Case 5 - BuildCo

Build Co., founded in 1946, is the leading company of the \$2.4 billion conglomerate group. For more than 70 years, the company has provided complete building materials solutions, achieving market leadership by making the most ecological products that are high-quality and innovative. The company operates 21 cutting-edge production facilities in India and two manufacturing facilities in Europe. It is dedicated to innovation through vibrant R&D centres in India and Europe. Build Co. is diversified into an extensive range of environmentally sustainable and accommodating goods after pioneering renewable technology about a decade earlier, bringing a paradigm change to green construction materials. The company offers a broad outreach into a comprehensive dealer network extended across 80+ countries. Build Co. has over 4500 active dealers and retailer networks with 50 Depots. 3000+ workforce in the company. Build Co. maintains an encouraging culture that makes sure that everyone is treated fairly and respectfully at work. Build Co.'s team members are consistently engaged, allowing them to give their best at work. Build Co.'s typical capacity utilisation rates have been

excellent, with short dispatch times from plant to consumer. Better margins and product prices result from streamlined standard processes and system advancements.

The long-term viability of Build Co.'s business depends on consistently improving the company's present goods and developing new ones. To stay ahead of the competition, Build Co adopts process improvements and conducts research on industry-changing dynamics. Built in 1964, Build Co.'s specialised R&D centre was the first of its kind in the sector. We put in a lot of effort to develop and enhance different raw material compositions in order to enhance current products and develop new ones. Build Co. has constantly invested in R&D and technology upgrades across all of its manufacturing locations, resulting in efficient production. Quality is interwoven into every aspect of the business. As a result, Customer Centricity, Capability Building, and Technological Innovations are prioritised. The organisation has the opportunity to focus on continuous development and after-sales support to work with clients to meet their needs with an experience that is better than expected. Build Co. has a history of technological advancements and their implementation in its production factories to automate operations and move away from human labour entirely. The state-of-the-art factories of Build Co. create defect-free items promptly to meet consumer requests. For more than 70 years, Build co. has placed a strong emphasis on learning and development. Build Co. has produced competent personnel due to this, and they have become a source of innovation for customer-centric services in this rapidly changing digital environment. Build Co has created a culture that encourages employees to take pride in their achievements. The true strengths of Build CO. are its dedicated staff, associated customers, and loyal partners. In addition, a solid feedback structure has been built for continual improvement and innovation. Build also has a solid commitment to environmental health and safety and has taken several measures to adhere to high standards such as waste management, air quality, emissions and water recycling as per regulation compliances.

3.4.6 Case 6 - TextileCo

Textile Co, a family-owned business in 1974, has evolved to become India's largest garment maker and exporter. The company now employs a diversified workforce in 65 world-class manufacturing plants throughout nine States. Textile Co. has established itself as among the

most favoured garment makers in the world with its highly integrated operations, differentiated product assortment, and strong dedication to responsible operational processes. Textile Co.'s highly integrated fabric manufacturing process activities are at the forefront of garment and textile innovation. Textile Co. owns and runs textile factories that manufacture woven fabric materials. The company also makes high-quality cotton, which is then turned into textiles manufacturing for clothing and other things. The Textile Co. has been certified for Global Organic Textile Standards. The textile mills supply approximately 80% of the fabric required for Textile Co.'s 65 factories, which produce clothing for some of the world's most well-known brands. Textile Co.'s in-house design team and laboratory ensure that customers' needs are met seamlessly from fibre to final product. The vertically integrated textile activities of Textile Co. are at the forefront of innovation in the apparel sector. The Textile Company runs mills that make woven and knitted fabrics. High-quality cotton from TextileCo. is delivered, and it is processed into textiles for use in clothing and other things. The Better Cotton Initiative or the Global Organic Textile Standard have both certified a sizeable amount of the cotton used by TextileCo as sustainable. Around 80% of the fabric needed for Textile Co.'s 65 facilities, where TextileCo. creates clothing for some of the top brands in the world, is supplied by Textile Co.'s textile mills. The internal design team and laboratory at Textile Co. guarantee seamless integration of the demands of Textile Co.'s clients from fibre to finished product.

At Textile Co., going digital has become a motto, with a primary focus on three goals: increased growth, experience and productivity. It involves giving Textile Co.'s clients, staff, and other partners excellent service. Textile Co. has been experimenting with unique digitalisation initiatives as part of its objective to provide a consistent and quality experience. Emerging technology can help a company access new opportunities, such as reducing Textile Co.'s environmental effect. Due to reduced employee and customer travel, Textile Co. effectively transformed physical tasks into virtual ones in a short period. These programmes include augmented reality-based virtual tours of Textile Co.'s factories by customers to harness blockchain-based fibre to shop traceability to assure ethical practices. Textile Co. has also prioritised digitalisation through RRP (Repetitive, Rule-based, and Predictable procedures), which were effectively implemented to deliver materials and packing, resulting in supply chain transparency. Textile Co.'s most valuable asset is its human resource, and it

aspires to be a people-first organisation. Textile Co. is India's most extensive clothing exporter and one of the world's most forward-thinking textile producers. The company has built a forward-thinking work culture that encourages individual initiatives. Textile Co. employs excellent talent in various fields and divisions, including operations, sales and advertising, design, industrial engineering, organisational design, business analytics, manufacturing and human resources. TextileCo's team resource is nurtured to take advantage of continuous learning opportunities to enable the building of advanced capabilities in the business.

3.5 Data collection

Gioia et al. (2013) in their seminal paper, recommend a systematic method for building new theoretical concepts using empirical inductive research. The authors suggest a qualitative research analysis methodology demonstrating the connections between the data, emerging insights and theory building based on the empirical investigations. The authors elaborate on the suitability of their method (Gioia Method) for research particularly associated with social attributes where the knowledge is to be built from the understanding of persons ("Knowledgeable agents").

For this study, knowledge building is primarily proposed from the practical perspective of Chief information officers (CIOs) and business executives; hence they were considered primary knowledgeable agents for data collection. A *semi-Structured interview methodology* was selected for primary data collection for this research. Secondary data available on the organisation's website was referenced to build an initial understanding of the organisation. Semi-structured interview methodology was selected as it provides an open opportunity for the respondents to share their thoughts and are considered the most suitable for this type of exploratory research (Saunders et al., 2008). For this research, this approach was more ideal because it presented the opportunity to discuss with the topmost executives providing the details but they had limited access to repetitive discussions (Bernard, 2011).

Before contacting any of the organisations, the interview guideline (Annexure -1) was prepared, as suggested by Eisenhardt (1989), to clearly emphasise the study areas. This also made it easier to structure the interview to cover the necessary topics. The interview questions ranged depending on the job of the executive being interviewed, but the subjects

were the same across all business, IT and partner executives. To better understand the subject and interview process, the pilot interviews of one-hour duration with academic and non-academic (freelancer consultant) participants who were aware of the topic were conducted. The pilot was used to frame questions and data from the pilot was not considered while analysis of the study. These interviews included the discussion on proposed aspects of DT, and their feedback was analysed to relate to field participants both from academic literature and practical perspective.

After the successful pilot, the interviewees were approached for actual data collection. The CIOs, Top-level executives, middle-managers, and consulting partners were approached, and more attention was placed on detailed aspects of firms' digital changes in the interviews. This diversified interviewee mix was selected to eliminate biases and false reports, improving the research's validity (Huber and Power, 1985). The discussion was first done with a partner consultant to understand the development on the DT front. Next, a conversation was conducted with CIOs in order to have a holistic understanding of the subject and finally with business executives to understand their perspective on the phenomenon. This approach was followed across all the cases except one where the consultant was not available for discussion. There, the discussion was done with CIO directly. After the first interview, some questions were clarified. This improved the data's quality. This also minimised the chances of bias in the participants' understanding of the context (Yin, 2017). Through all discussions, the interview guideline document was used as a baseline to conduct interviews with technology partners (consultants), the CIOs and the business executives to have a consistent set of comparable information, but the guidelines were not strictly followed. The interviewees were facilitated to discuss their natural flow in a friendly atmosphere. The objective was to encourage the interviewees to share their experiences from their organisational perspective. This resulted in the unexplored areas emerging in the discussion. Such aspects were discussed in more detail with participants asking the follow-up questions, as the semi-structured interview methodology provides this opportunity for customising the questions during the interview. CIOs were asked to evaluate their job, the overall responsibility of the IT function, DT needs & strategy, undergoing initiatives, achievements, their engagement with the other business executives and critical success factors in digital aspects. Similarly, Business & partner interviewees were questioned on the drivers, methodology of initiative selection, their

engagement in and execution of digital initiatives, overall perceptions of the CIO role and how they saw digital collaboration among business & IT departments. In total, 17 semi-structured interviews were conducted between April 2021 to November 2021. The average duration of the interview was 55 minutes. All the interviews were recorded with the pre permission of the interviewees. The complete discussion was structured in an open-ended way to encourage storytelling.

However, in some cases, where there were deviations, the interviews provided clarification and discussion was brought back to the topic. At the end of every interview, the interviewee was given the contact details if they wanted to add anything to the discussion. In some cases during the interview, it was noticed that the interviewees were not very open (such as budgeting, cultural issues, project failures, etc.). These topics were excluded, and interviewees were not pushed to discuss these to protect their interests (Gioia et al., 2013). After completing every interview, a review note sheet was prepared wherein the main points and unique themes that emerged were noted down.

In addition, to maintain the study's qualitative rigour, multiple data sources, including company websites, press announcements, and social media, were also used to ensure triangulation and credible analysis of data. The next section presents methodology used in data analysis.

3.6 Data Analysis

For the data analysis of this research *Gioia method* was used. Gioia's method assumes that the interviewees possess complete information about their job and about why they are doing it. The researchers are expected to understand and evaluate the patterns of data to present insights. Gioia Method systematically presents the first order researcher analysed concepts known as "informant centric codes", and subsequently second-order researcher analysed concepts known as "researcher derived themes". These second-order themes are finally distilled as the overarching dimensions, and a consolidated data structure is created, finally leading to concept building. Thus, the method represents both researcher and knowledge agent connections in tandem while presenting new theoretical insights. Also, the themes are

created following a consistent methodology and hence build rigorous and transparent insights from the data aiming to create inductive theory (Gioia et al., 2013).

For this research, the data collection and analysis were done simultaneously (Eisenhardt, 1989; Gioia et al., 2013). The evaluation of the cases began after adequate data had been obtained right after the first interview. This approach was consistently followed, and analysis was performed right on the next day after the interview was conducted as the contents were fresh in my memory. At first, all interviews were looked at one at a time, and then cross-case themes analysis was used to look at the data through multiple lenses. After conducting the interviews, the data was transcribed from audio files into text files. Otter.ai was used for the conversion of audio to text. The converted transcripts were saved as text files. Then these interview transcripts were analysed line by line, and data coding was performed in MS excel following methodological guidelines by Gioia et al. (2013). The analysis was first started with building the first level constructs, which were direct individual's (interviewee's) quotes. These common concepts were then segregated broadly into two categories, "Drivers" and "CIO role". The nomenclature for the statements was done accordingly, such as DC1 representing "driver case 1" in combination with serial numbers prepared case to case. Similarly, RC1 represented "CIO role case 1". Then, the quotes presenting similar contexts were clubbed and sorted together to present common concepts. More elaboratively, for example, the CIO of Autotech mentioned, *"we sensed the need of removing Inefficiencies in operations, supply chain and quality control through new-age technologies"* and was listed as DC1 representing the driver of case1. Similarly, Cement Co. business executive commented, *".....tried to remove intermediaries"* was termed DC2 representing the driver of case2. On the other side, the CIO of HealthCo. Mentioned *"We started evaluating on Infrastructure advancements and cloud-based model adoptions"* was listed as RC3 representing the role of CIO case3. After completing the coding, all the codes were thoroughly reviewed, and within the case, duplicate statements were removed. These statements originated because, in some interviews, the interviewee discussed the same topic more than once during the interview. Hence duplicates were removed, and only the most relevant reference to the statement was kept. This activity was first performed case by case and then replicated across all the cases. Because of the intent to build theory inductively, no explicit theoretical framework was applied (Braun &

Clarke, 2006). Finally, the first-order concepts were consolidated across all the cases and segregated for drivers and roles separately.

After the first level concepts were comprehensively derived from the interview statements from the data transcription and coding, these were further analysed to formulate second level constructs. Both the categories (Drivers and CIO role) were separately analysed and clubbed in distinctive themes where each theme represented a common concept. These were termed second-level constructs. For example, the first level concept "*we sensed the need of removing Inefficiencies in operations, supply chain and quality control through new-age technologies*" was included in "*Internal business process optimisation*" as a second-level construct. Similarly, "*.....tried to remove intermediaries*" was clubbed under the "*Innovation & Proactive utilisation of technology for strategic business aspects*" construct. In the same manner, themes were derived for the CIO role. As an elaboration, "*We started evaluating on Infrastructure advancements and cloud-based model adoptions*" was clubbed under "*Digital Infra & Platform enabler*" in the second-level construct. Through this analysis, distinctive first-level concepts and second-order constructs were formulated. Fig. 3.3 presents the first and second level constructs for the drives of digital transformation.

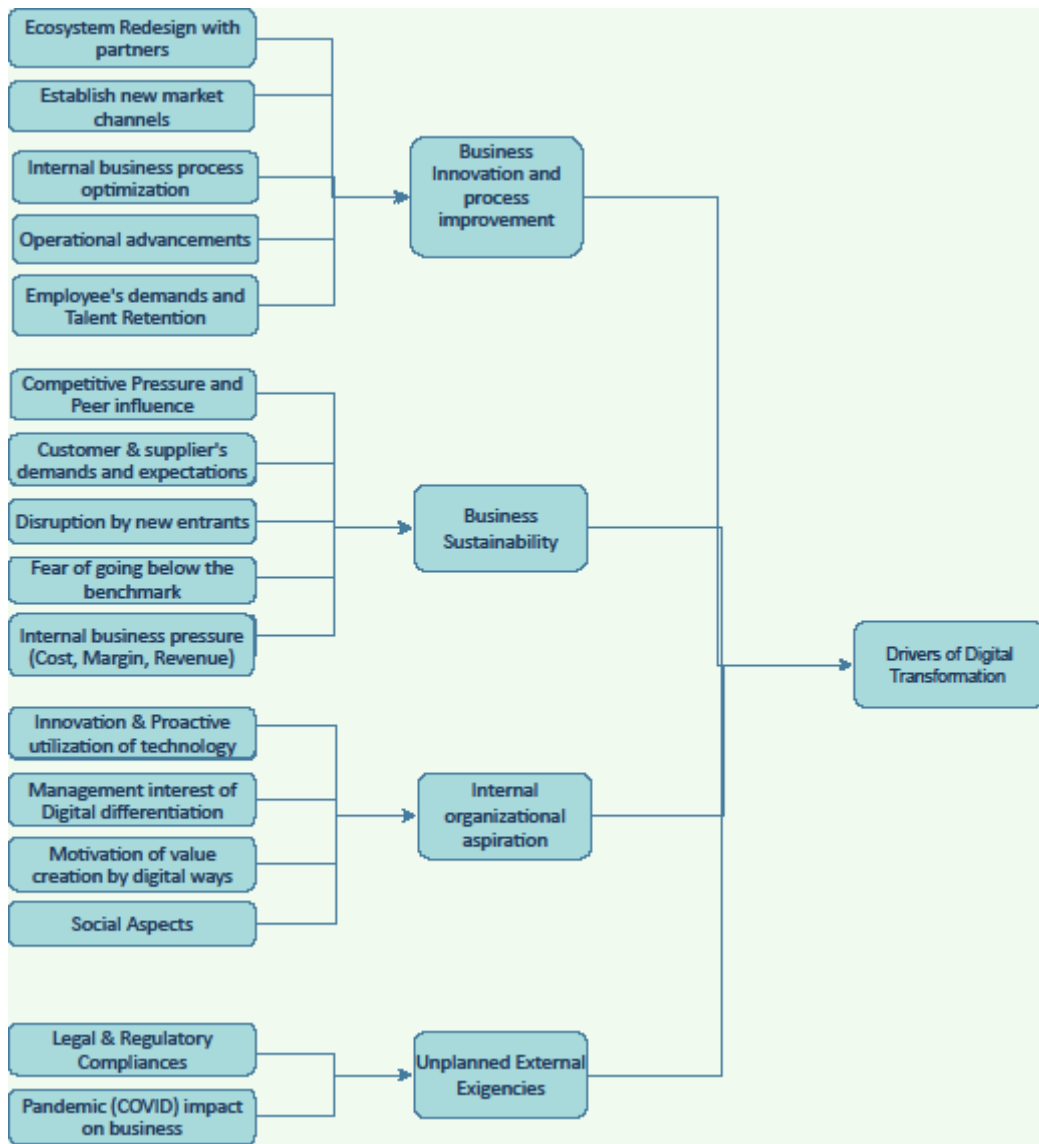


Figure 3.3: Drivers of DT (First and Second Level constructs)

Similarly, Fig. 3.4 presents these first and second level constructs for the role of CIOs.

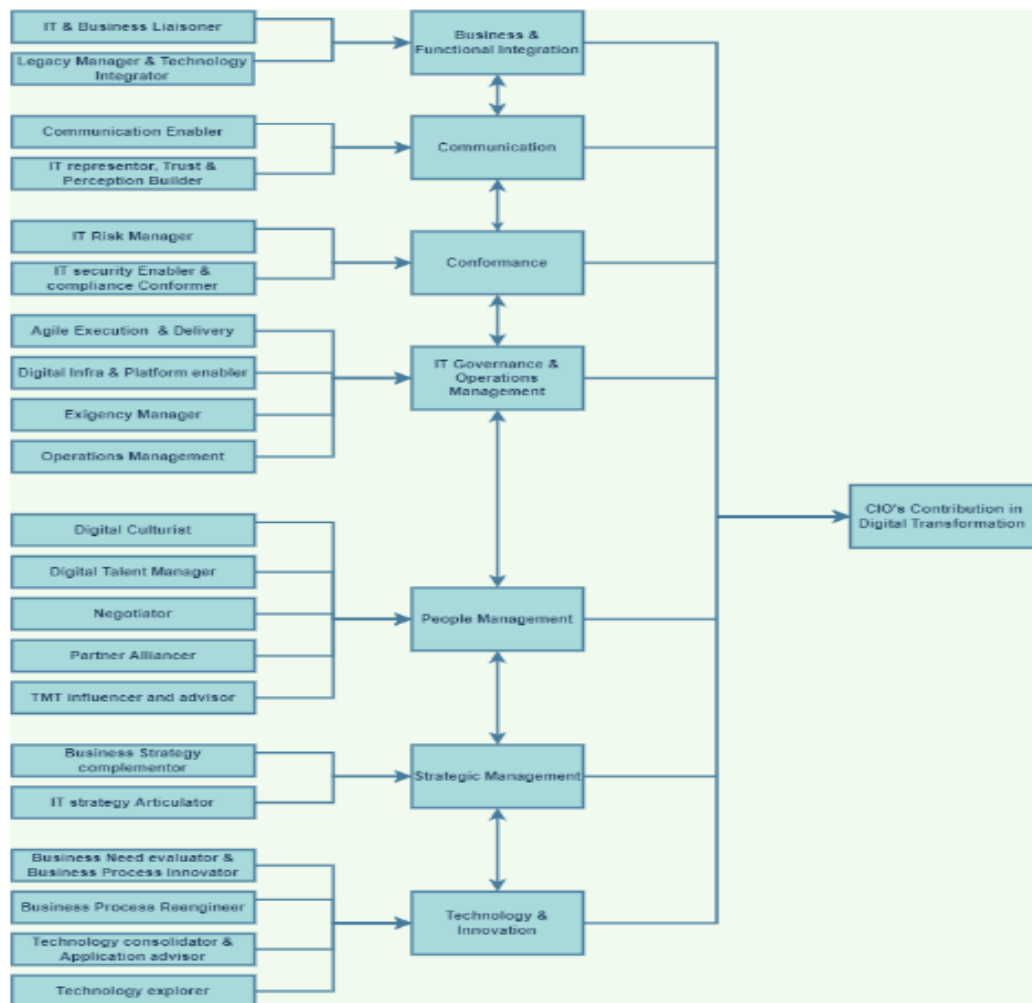


Figure 3.4: Role of CIO in DT (First and Second Level constructs)

In the next iteration, the second-order constructs were fine-tuned and grouped under more manageable and meaningful constructs. The constructed so formulated were termed as overarching dimensions for this study. This activity was again carried out separately for both "Drivers" and "CIO role" categories. The aggregated measurements presented the broader themes prevailing in the organisations. Finally, the data were aggregated to formulate a data structure. The complete coding structure was iteratively reviewed and improved to make the findings sharper. The derived overarching dimensions and second-order themes for the drivers of Digital Transformation and role of CIOs in digital transformation are being presented in Chapter 4 – findings.

3.7 Conclusion

This chapter presented the research methodology adopted for the study. The aim of the research was to present the insights by understanding the phenomenon of DT in real-world settings. Therefore, the extensive rigour of exploratory research with qualitative inductive methodology was followed to conduct the research. For interacting with knowledge agents, semi-structured interviews were conducted, and the data were analysed as per the recommendations of Gioia et al. (2012). Accordingly, the themes and the data structure model were prepared. The derived themes will be presented in the upcoming findings section. Accordingly, the data structure model is presented in the discussion section.

Chapter 4 – Findings

4.1 Chapter Overview

This chapter presents the findings of this research. Section 4.1 presents the evaluated drivers of digital transformation. Section 4.2 elaborates the contributions of CIOs and derived roles in the context of DT. These insights are primarily derived from the discussion with interview participants and hence present the practical aspects of organisational drivers and the CIO's contribution. The overarching dimensions are presented as titles in sections 4.1 and 4.2, their corresponding themes are further presented under the subheadings. The investigation yields some intriguing findings about case organisations' digital transformation approaches.



Figure 4.1: Overview of Chapter

4.2 Drivers of Digital Transformation

This section elaborates on the drivers of DT. The derived drivers are placed primarily in four categories. The Table 4.1 summarises the evaluated drivers of DT in the case companies. The further discussion on themes is presented under the corresponding heading in the subsections below. Table 4.1 consolidates the overarching dimensions with the drivers of DT. First the consolidated table is presented which is followed by the detailed explanation of evaluated concepts.

Table 4.1: Drivers of Digital Transformation

Overarching Dimensions	Drivers of DT
Business Innovation and process improvement	Ecosystem Redesign with partners
	Establish new market channels
	Internal business process optimisation
	Operational advancements
	Employee's demands and Talent Retention
Business Sustainability	Competitive Pressure and Peer influence
	Customer & supplier's demands and expectations
	Disruption by new entrants
	Fear of going below the benchmark
	Internal business pressure (Cost, Margin, Revenue)
Internal organisational aspiration	Innovation & Proactive utilisation of technology
	Management interest in Digital differentiation
	The motivation of value creation through digital ways
	Social Aspects
Unplanned External Exigencies	Legal & Regulatory Compliances
	Pandemic (COVID) impact on business

4.2.1 Business Innovation and process improvement

Under this dimension, the business instinct of innovation and process improvement is presented. The fundamental attempt of the organisations was introducing improve business process innovations in order to perform the business activities better and more efficiently. The business processes were not confined to any business vertical, but it was observed to be holistic across verticals such as operations, human resources, marketing, finance etc. The detailed observations from this dimension are presented below.

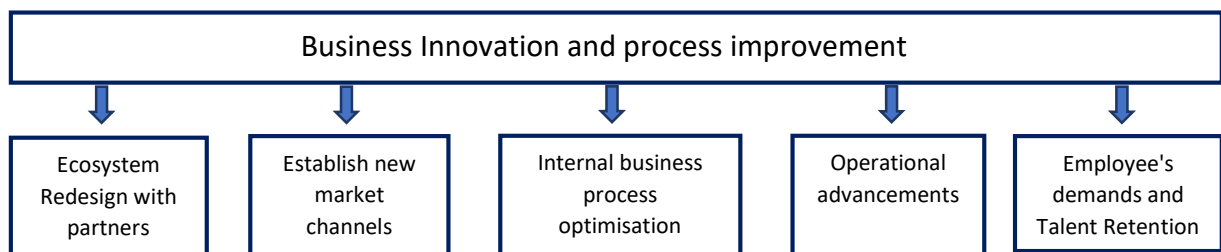


Figure 4.2: Business Innovation and process improvement (second order themes)

4.2.1.1 Ecosystem Redesign with partners

DT entails experimentation with technology. This characteristic of DT influenced all case organisations. They also seem to understand that it can not be done in isolation. Therefore, the organisations collaborated with partners to leverage the collective synergies. As the AutoCo executive mentions, "we wanted to do collaborative efforts...[.].. connecting your suppliers in a very efficient way, on the same digital platform, this would save a lot of coordination effort... everyone will be benefitted". Similarly, the HealthCo executive comments, "We wanted to quickly scale our business at the same our focus was to expand our reach to provide the healthcare to more people. We designed the app and onboarded fellow clinics and hospitals as channel partners." On the same lines, CementCo CIO mentions, " We've tried both for integrating forward and integrating backward or on spinning off something....".

Hence, it is evident that technology was a driving force for the organisations to build innovative partnerships to design new ways of doing business altogether. The organisations saw digital technologies as a critical enabler of their business.

4.2.1.2 Establish new market channels

The organisations were strongly motivated to create new digital ways to reach their customers. The major reason behind this was that the digital distribution channels were cost effective and easily scalable. This motivation was also influenced by the customer's affinity and shift towards digital channels from traditional business channels or because the existing business channels turned inviable due to internal or external reasons. A strong need was observed in the CementCo, where sales executives were not able to efficiently manage the market due to reduced interactions with customers. Therefore, CementCo attempted to establish a new online channel to connect their dealers. As the CIO of CementCo mentions, *“we established a secured virtual communication channel with our dealers. Using this each salesperson now covers 10 to 12 dealers per day against 3 to 4 dealers earlier. Additionally, they don't have to travel amid COVID restrictions”*. Similarly, in the AutoCo, launched the digital loyalty schemes to incentivise their customers for the aftermarket sales. At TextileCo, the CIO, deployed new social media channel to engage the customers and analyse their feedback through a data analytics application for the marketing team. Similarly, BuildCo designed a new app where customers could customise their own product mix and choose the delivery times. Hence, it was noted that businesses developed novel strategies for connecting with their clients digitally.

4.2.1.3 Internal business process optimisation

It was observed that the organisations relied on technology to improve their internal business processes. This optimisation of processes was being attempted across all the business verticals, and all the organisational departments were keen to effectively leverage digital. As the ChemCo executive comments, *“We are looking at technology for removing Inefficiencies in operations, supply chain and quality control..[.]. I know that it can be done very effectively and efficiently”*. Similarly, the AutoCo CIO mentions. *“It was difficult to monitor & maintain*

various legacy applications, now we have a single digital connector, universally applicable." Further, the business executive of HealthCo elaborates, *"I understand that Our existing system does not capture most of the details of patients, so we do not have adequate historical information to offer him better next time he comes in. We need to digitalise these records, better patient's experience is our priority."* On the same lines, the consultant of HealthCo mentioned the difficulty in maintaining and communicating the department team rosters manually due to increased workload during the Covid time. As he narrates, *"The team is working with full efficiency, the shift timings have increased and often need realignment of nursing staff. Maintaining these manually and communicating to everyone is a challenge for the HealthCo. We are designing a digital app where everyone can see their assigned shifts online and request changes if required. The workflow goes to his or her supervisor for approval."*

Hence, it was observed that the organisations were very actively adopting technology to improve their internal business processes.

4.2.1.4 Operational advancements

It seems like the organisations realised that their traditional ways of operations were rendered non-competitive in digital times. Therefore for the manufacturing organisations, operations redesign had become a priority. As the BuildCo executive comments, *"Our business ten years from now will be completely different. We are moving from prebuild products to customised assemblies. Operational processes must be set up keeping that in view. We need a high level of precision; therefore operational processes must be digitally supported."*

Similarly, the AutoCo executive narrated, *"The B2B sector is embracing digital transformation to stay competitive. The Internet of Things (IoT) and Machine learning technologies are gaining momentum, these will be used everywhere in the near future to enable predictive ordering or automation."* The TextileCo consultant mentions, *"They were looking at reducing their wastage on textile yarn. We have advised AI-based utility, that screens the material and dimensions. The cutting is done after these two steps. This has reduced the wastage to a good extent and also has improved quality as there is no dependence of persons, everything is*

controlled by sensors". HealthCo's business model was transitioning from reactive to preventive healthcare, and for TextileCo, it was being transformed through predictive modelling for customer demand sales through mobiles.

To summarise, It was observed that organisations were placing high importance on revamping their operational process through technological advancements. These advancements were to increase the operational efficiency, quality control, new product designs and building of connected systems that are more analytics oriented and provide better control over the processes.

4.2.1.5 Employee demands and Talent Retention

Employees in the digital age have become tech-savvy. They expect digital gadgets and workplace applications for their increased efficiency and are unwilling to wait. Interestingly the interviewees also noticed that the employee's expectations at the workplace have prominently risen due to their digital interaction on tools like youtube, Facebook and Twitter. Further, their expectations also increased because of the state of the personal art devices. As the business executive of CementCo comments, *"The employees now want to work for the digital employer, they are cautious of every gadget that impacts their workplace efficiency, the overtime practice at our R&D units is doing away with"*. Similarly, the consultant in the Textile co comments, *"We have multiple units, employees specifically at HO have to interact with all offices for design approvals, production planning and marketing. They now demand digital tools and online platforms to quickly share their communications and simultaneous discussion"*. On the same lines, ChemicalCO CIO comments, *"the employees are digitally savvy, they sometimes drive technicalities with my team on their demands."*

Further, the organisations were planning for digitalisation for talent retention. As the CementCo CIO mentions, *"We want to make it a place to retain our talent."* And on similar lines, AutoCo executive shares, *"...at the same time, we want to focus on employee Connect, better employee engagement and better employee experience."*

4.2.2 Business Sustainability

The business sustainability emerged as a strong driver of DT. The case organisations were concerned about the future of the organisation. The business sustainability was observed to be emerging prominently from *competitive pressures and peer influence, customer's and suppliers demands, business threats by the new entrants, the organisational fear of lagging behind peers and internal business pressures of cost, margins, or revenue*. Details about these dimensions are presented below.

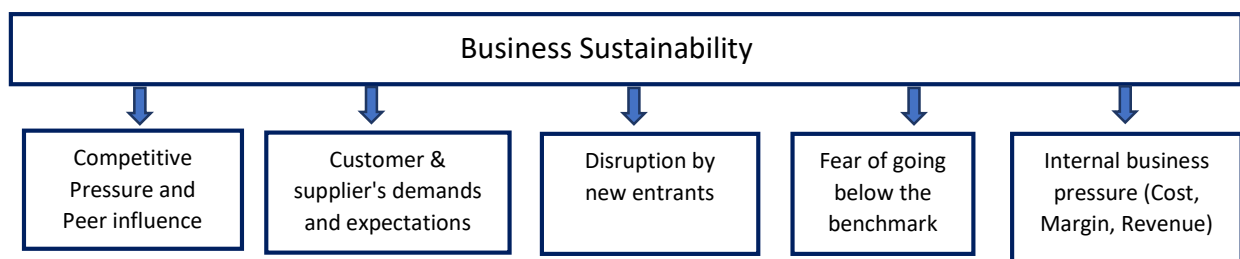


Figure 4.3: Business Sustainability (second order themes)

4.2.2.1 Competitive Pressure and Peer influence

In all the cases, interviewees mentioned the changes in the competitive landscape that put pressure on all organisations to change. For TextileCo, for example, the pressure was created by the emerging small players offering real-time designing and printing to customers through digital printing techniques. For HealthCo, it was emerging from the new labs getting established in the market, which we're offering more competitive healthcare check packages. In the CementCo case, the industry, as a whole, was adopting digitalisation to be more customer-centric, and hence all major competitors were implementing digital initiatives. As the TextileCo executive mentions, *"When it comes to competition from digital, it's all or nothing. We all know that businesses are under pressure from a rising number of internet enterprises competing in new markets. We now expect they will offer all of their products online in the future, widening the market for further online competitors."*

Similarly, the BuildCo executive mentions, *"All our major competitors are considering customer collaboration-oriented models. They are building digital platforms for customers to co-create designs and then deliver the builds as per the exact specifications demanded. We are also setting up a new business division for prebuilds on the same lines"*. On the same lines,

AutoCo executive explained, *"Our OEMs have stated that in the future, they will sell directly. This could indicate how digital rivalry will evolve in the future. We must prepare ourselves in this manner."*

Overall, the organisations believed that their failure to complete through digital technologies would give an advantage to their competitors. This resulted in active cautiousness, and organisations were keeping a close look at the players in the industry. Further, we observed that the CIOs were the primary source of this competitive information for the business executives, which was in turn mutually addressed.

4.2.2.2 Customer & suppliers' demands and expectations

The organisations noticed the change in customer demands. When clients are exposed to superior digital offerings, their expectations for digital offerings improve and adaptability increases. This was specifically visible in CementCo and HealthCo. As the business executive of CementCo comments, *"we are radically thinking of complying to customer demands, which is moving towards prebuild assemblies, and this expectation is rising globally. It is important to know what is being demanded and use technology to be more customer centric."* Also, customers' expectations are also driven by other prevailing companies' offerings in the same segment. And hence it becomes imperative for the organisations to live up to the customer's expectations. As the HealthCo executive comments, *"Customers do not want to visit hospitals as the risk of Covid is perceived more in premise, instead they prefer to digitally connect with doctors. The other hospitals already started E-consultations and hence we too had to take it up this swiftly"*.

Just like customers, suppliers also have digital demands that create organisational pressure for digitalisation. As the AutoCo executive comments, *"we are auto ancillary and inturn our business get driven by OEM's. They are creating a common supplier portal. We have to accordingly build our capability and buy application licences"*. Sometimes, the digital initiatives are taken for collaborations, such as synergising the supply chains by the consortium of industries. CementCo executive mentioned one such collaboration portal that was being used for setting up prices in different geographical markets. In the textile case, the consultant mentions, *"TextileCo has lot of suppliers, their on time payment is their priority as*

many of the suppliers are MSME and they are legally binded for payment with in agreed timelines, we are working on to set up the new payment clearance utility which will automatically clear the pendency of supplier invoices."

4.2.2.3 Disruption by new entrants

Digital technologies, through innovation, cause disruption, enable agility and reduce entry barriers. These new entrants further disrupt the market with their unique and cost-effective market offerings. This was most visible in the HealthCo case. As it operated in the healthcare sector, it allowed the entrance of new healthcare labs that were offering low rates on the healthcare packages. As the Healthco executive elaborates, *"we have a strong competition emerging from the start-up labs. They set up their labs cost effectively sourcing machines from China...[unlike hospitals who invest heavily for end to end healthcare solutions].. and start targeting customers through SMS or Whatsapp. We too have to find a technology-oriented =solution for this, we are digitalising the records of patients and starting more engagement oriented communications"*. Similarly, the disruption in the market by start-ups was also visible in TextileCo also. The TextileCo executive illustrated, *"There are companies that are providing on-demand designs to our consumers by purchasing fabric from us, but our printing business is suffering as a result. We need to offer customised printing as soon as possible, or we will lose that part of our business."* So we see that the new entrants have the capabilities to radically impact the established organisations and create disruption in the competitive landscape.

4.2.2.4 Fear of going below the benchmark

Unlike the positive side of DT, the organisations considered the lack of digital as the negative motivator. This was evident in the CementCo case as the CementCo executive mentions, *"...because already people are there, which means that their processes have been digitally transformed. We may lose customers.... margin may go down....struggle and cope up."* Similarly, the BuildCo executive quotes his instance at one of the board meetings, *"The entire management understood that, without this digital aspect, your survival will be at stake."* Further, as the BuildCo executive comments, *"Due to the technology supported*

advanced digital products from competitors, there was under a lot of pressure to respond to the competition by building their own digital offering." The healthcare executive mentioned, "The trends are changing in healthcare, from in-hospital care we are moving to personalised patient services. Smaller labs are capturing markets, and we have to transform the model and revamp better customer connections. We can stand against the trends."

Hence, it was evident that the fear of underperformance was pushing the organisations to adopt digital and mitigate the risk of underperformance. In addition to revenue, the risk was also observed in other dimensions such as product positioning, losing market share, and market position.

4.2.2.5 Internal business pressure (Cost, Margin, Revenue)

Internal business pressure was observed to be quite an influential factor in all the cases. The business executives, CIOs and consultants, collectively emphasised the internal organisational pressures emerging from the Cost, margin and revenue. As the CementCo executive comments, *"A pressing need for survival is there..Cost Pressure, Price pressure.. We are operating on EBITDA of 8-7/8 percent, which is less than industry average. We need something radical and technology is one of the important dimension for that."* Further, the TextileCo consultant elaborates, *" During Pandemic their revenues came drastically down almost to the XX to YY% year on year. That has pressed them to take up Cost effective initiatives to reduce the Cost.... Our project is on waste minimisation through AI application."* In the aspect of digital infrastructure investment, the ChemCo executive explains, *" you get tax savings out of it"*. Therefore, the digital technology investment was also observed to be related to cost savings in innovative ways for the organisations. The HealthConsultant elaborates, *"Cost of printed reports is high, we are making them digital which apart from being easily accessible is Cost effective also. They too are promoting digital to their patients."* Hence it was evident that internal pressures were driving the organisational push to digital technologies.

4.2.3 Internal organisational aspiration

Under this dimension, the internal business aspiration to innovate or create value through digital means is presented. It was observed that the organisations were internally motivated

to innovate and adopt digital technologies. The internal aspiration was prominently being driven by *innovation & proactive utilisation of technology, management’s interest in making digital a priority, creating value using digital technologies* and though the *social aspects*. The detailed observations from this dimension are presented below.

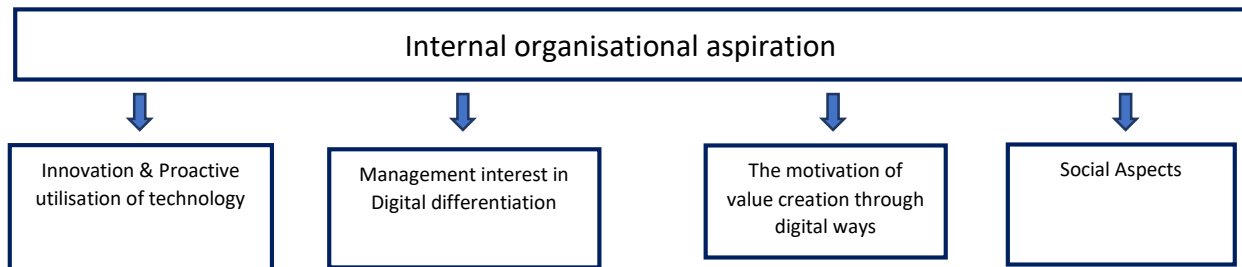


Figure 4.4: Internal organisational aspiration (second order themes)

4.2.3.1 Innovation & Proactive utilisation of technology

The organisations also seem to be oriented toward novel use of technology. They had a unique instinct for leading digital and demonstrated their actions proactively to use the digital technologies. As the BuildCo executive mentions, *“We have institutional customers which are renown builders in market. Our sales model so far is through distributors to institutional customers. With technology making it feasible, we are planning build direct ties with major account customers.”* Similarly, The TextileCo recalls, *“The company is an early adopter of technology. I can say this as the company is trying to lead by exploring technology in many dimensions.”*

Further, elaborating on the context of innovation and upbeat utilisation of technology, the AutoCo executive mentions that the organisational workforce stated suggesting new digital innovations to make their work efficient. As he elaborates, *“People People started working from home and they had a lot of time spent on the projects, digital got focused. That has in a way inherited innovation to our culture.”* In a similar way, the ChemCo executive mentioned the organisational instinct of innovation holistically across all the business verticals. As he discusses, *“we want to use technology effectively with new applications for our landscape. Hence we want to see it holistically.”*

Hence, it was clear that the organisations were continuously thinking on many dimensions to effectively innovate with technology.

4.2.3.2 Management interest in Digital differentiation

In all the cases, except HealthCo, it was observed that the TMT had a sound inclination towards leveraging digital technologies. This inclination was being cascaded down the line by the TMT as strategic initiatives. However, in the HealthCo, the push was not very much for digital adoption; this may be because overall, the Healthcare sector is laggard in DT, and it was observed that they too were picking up fast for the adoption of DT.

The TextileCo executive elaborates on the management's focus on more and more digitalisation. As he mentions, *"We wanted to induce digital as DNA into the organisation.."* Further, the CementCo consultant shared his experience with the directive that came from the Board to ensure appropriate governance for keeping the project and delivery on time. As he mentions, *"It was a push rather than a pull from the Board. We had to quickly scale up to deliver the project for them."* Further, the ChemCo executive explains the management's vision about digital business models. As he narrates, *"Also digital being the new model of doing business, new ways of business, management understood this very well and hence they want to promote digital."*

4.2.3.3 Motivation of value creation by digital ways

In addition to the above factor, It was also observed that the organisations had a strong urge to create value using digital technologies. This urge motivated the management and employees of the organisations to continuous innovation with digital technologies. As the executive of CementCO mentions about the internal organisational motivation to innovate through digital technologies, *"There is something prompting the organisation to offer big ideas faster.... towards addressing a business need, or solving a business problem....suggestion of a method, say bank reconciliation."* Similarly, the ChemCo executive elaborates it as a spirit to find a solution to pertinent problems digitally. As he puts it, In his words, *".....digitally solving a problem, the problem of either convenience or you can say value creation."* Similarly, the HealthConsultant mentions that the hospital working ways always

demand faster processing. He emphasises the responsiveness to reduce the time of patients to the healthcare professional. As he mentions, *"Then... because at hospitals every time they're firefighting, so for agility they need to go digital."* Similarly, the AutoCo executive elaborates about the operations department's inclination toward AI and ML functionality exploration. As he mentions, *"So we've found that there are so many areas where AI ML can enable our operations to handle in a better manner. we walked through how we are going to build capability on analytics."*

Therefore invariably, it was observed that organisations were internally sensitised about innovating with DT, and it was becoming a feedback loop wherein they were assessing the benefits that could be derived from digital initiatives.

4.2.3.4 Social Aspects

Specifically, in the Healthcare case, it was observed that the organisation had a social aspect to adopting digital. This was during the COVID times, the pressure on healthcare was more, and the hospital was focused on providing healthcare at maximum capacity to patients. As the executive of HealthCo narrates it, *" The doctor to patient ratio is wide. Unless we use technology effectively, we will not be able to reach out to a maximum number of patients that need healthcare."* The HealthCo quickly responded to this need and launched the digital app where the patients could then connect with doctors without coming to the hospital. Further, as the HealthCo CIO mentions, *" being a small city, a lot of the patients came from nearby district areas, And during the lockdown, it was very difficult to reach out to the patients. Our health care app was an initiative to facilitate this to the masses. We had initial hiccups such as gateway connections and speed, but they were sorted out soon after."*

Similarly, The AutoCo got the collaboration with an online health advisor and launched an app for all its employees that enabled online consultation with partner doctors on call. As the executive of Autoco mentions, *" In this need of hour, we want to facilitate everyone of our employee to consult the doctor which is readily available online. We encourage all to use the app for their families. The use of the app is completely free and all the expenses will be billed to the organisation."*

Further, in the BuildCo case, it was observed that the organisation started a telecom line where the s employee could call and discuss any health-related issue with the company's doctor to seek his advice or ask for any support for them.

Hence, as observed, contribution to society also was a prime driver of digital transformation.

4.2.4 Unplanned External Exigencies

The unplanned external exigencies were the external environmental factors which were unplanned, and organisations had to abide by the rules, which emerged as mandatory organisational compliances out of consequences. This study observed these to be emerging primarily from legal and regulatory compliances and the Covid pandemic. The below section presents both of these traits.

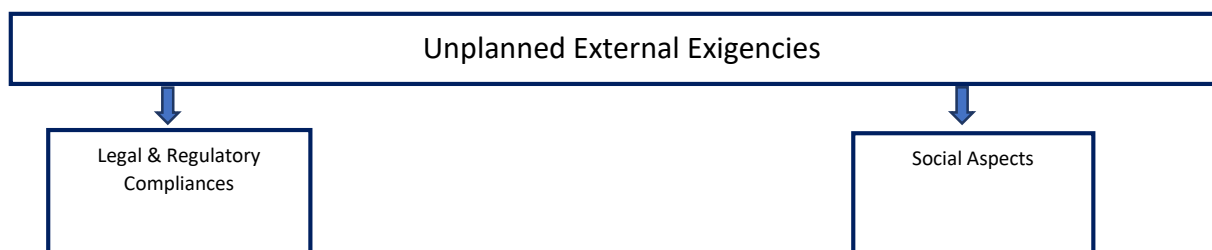


Figure 4.5: Unplanned External Exigencies (second order themes)

4.2.4.1 Legal & Regulatory Compliances

In all the cases, both business and IT interviewees mentioned the need for digitalisation emerging from regulatory compliances mandated by the government, legal or environmental agencies. Since these primarily emerged from the external agencies, these were regulatory compliances. Therefore the case organisations had to conform to these by adopting the corresponding digital measures as suggested by the regulatory agencies. In the CementCo and AutoCo, the business mentioned compliance to implementation of goods and service tax (GST) which was a complete change to the prevailing tax structure, and therefore complete revamping of IT solution was performed through their ERP systems. While in the HealthCo, Chemical Co and TextileCo, this factor was prevalent in multiple steps from buying their raw material to disposal of wastes. For example, the handling of the chemical is regulated in a specific way of management and Healthcare wastes are disposed to follow a guided

regulatory methodology. The organisations were using customised digital applications to keep a track of necessary parameters which were submitted to authorities or were being recorded for anticipated audit purposes. As the HealthCo executive comments, *"we have stringent regulations for waste disposal, and we follow those strictly. We have to keep a record of waste generated and disposal. There are agencies that regulate these and assess the environmental impact. We have to ensure the compliance, and our systems are designed keep a record of these up to six years."* Similarly, the Chemco executive mentions, *"We have some chemicals used in production process that fall under the category of hazardous goods. We have to handle them with care and follow regulations right from their purchase to finished goods manufacturing. We have developed our IT systems to keep track of their batches, shelf life, consumption and regeneration. We have to prepare and submit that information to authorities."*

4.2.4.2 Pandemic impact on business

All case participants unanimously acknowledged that the pandemic brought forward many unique challenges that were completely unforeseen to business before. The challenges quoted were shut down of plants, reduction of manpower and enabling the workforce to work remotely. This posed several challenges, in one way, scaling down physical operations quickly while scaling up the digital applications and infrastructure for business. As the organisations had to reduce the physical interaction among the business, they had to scale up the digital collaboration. This unplanned situation left no choice but to push the organisations beyond limits to move on to technological backing to continue their business models. Gradually with the offerings, the customers also switched to the adoption of digital ways of business. Though the change was radical and short term, it supported the organisations to realise the importance and adopting the digital transformation quickly. The pandemic pressurised the organisations to innovate the novel ways of their business, wherein they discovered and adopted the newer ways of doing business. This was reflected in HealthCo, where the business executive comments, *"we have increased our digital budget by five times"*. Similarly, as the TextileCo comments, *"working from home was a very different aspect for us. But we quickly adopted to this. Almost in 2 weeks we were able to completely doing daily meetings online just as earlier business practices."* Further, Cement Co mentions,

“We had a lot of ancillaries and collaboration platform was the need of hour, digital helped in maintaining the close collaboration not only within but with our customers also.”

In conclusion, it was observed that there are diversified reasons that promote digital transformation in the organisations. These reasons were found to be emerging from internal and external to the organisations. As a result of responding to these, the organisations were adopting DT. After illustrating the driving forces of digital transformation, upcoming section (4.3) will now deliberate on the role of the CIO in digital transformation at the organisations.

4.3 Role of CIO in DT

This section presents the contributions of the chief information officer (CIO) in the digital transformation. Prominently it was observed that CIOs contribute their organisations in multiple ways, they perform the business and function integration, communicate with business on digital, establish and conform digital practices, govern IT and perform IT operations management, orient themselves towards the digital workforce as people managers, support organisation on strategy to complement business strategy with digital strategy, and oversee the technology and innovation in the organisation.

Table 4.2: Role of CIOs in Digital Transformation

Overarching Dimensions	Role of CIO in DT
Business & Functional Integration	IT & Business Liaison
	Legacy Manager & Technology Integrator
Communication	Communication Enabler
	IT representor, Trust & Perception Builder
Conformance	IT Risk manager
	IT security Enabler & compliance Conformer
IT Governance & Operations Management	Agile Execution & Delivery
	Digital Infra & Platform enabler
	Exigency Manager
	Operations Management
People Management	Digital Culturist
	Digital Talent Manager
	Negotiator
	Partner Alliancer
	TMT influencer and advisor
Strategic Management	Business Strategy complementor
	IT strategy Articulator
Technology & Innovation	Business Need evaluator & Business Process Innovator
	Business Process Reengineer
	Technology consolidator & Application advisor
	Technology explorer

4.3.1 Business & Functional Integration

Digital opens many new dimensions for the organisations. But these can only be effectively utilized if the business and technology are closely interbond. Similarly, managing the legacy applications is equally of not less important as to enhance capabilities through digital applications. The CIOs were observed to be acting as strong business and functional integrators, bringing this interlinking of IT and business. The CIOs bring this integration by contributing *as IT & business liaison* and *Legacy manager & technology integrator*. The detailed observations from this dimension are presented below.

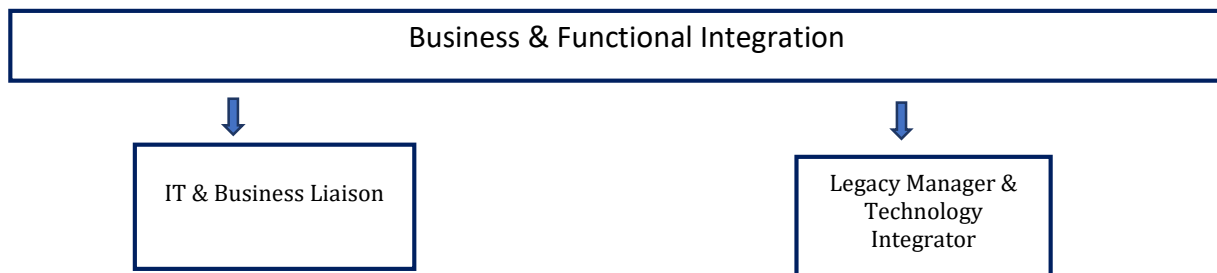


Figure 4.6: Business & Functional Integration (second order themes)

4.3.1.1 IT & Business Liaison

DT is an organisation-wide phenomenon that strategically covers everyone in the organisation. Therefore, unlike traditional IT management, DT demands close integration of IT with business. As the functional head of IT, the CIO looks at the big picture, holistically analyses the business demands, and ensures the collaborative interactions of business functions. To this end, CIO needs to be aware not only of organisational structure and processes but also of political forces. The CementCo CIO notes, "*For DT to be successful, we have to understand all the nuances, the business impacts, its feasibility and its execution perspective [..]. All have to be understood.*"

Further from our interactions with both business and IT teams, it emerges that while the business often thinks in terms of the outcomes, IT mostly thinks of technology. This results in

a divergent view of DT. Moreover, business teams might not be aware of the technology potential and/or corresponding limitations. The CIOs act as the functional integrator and educators to businesses to institute the IT solutions for the business goals. Through continuous interaction with business, the CIOs evaluate what information is essential, assess its urgency and delivery plan and hence they bring greater alignment between business and IT to foster productivity for the organisations.

As the AutoCo CIO comments, *"Every department approached us individually with its requirements without any holistic organisational view. [..], I discussed with the executive Board and proposed forming a digital council. Now we have an organisation-wide standardised methodology to prioritise our initiatives strategically."*

4.3.1.2 Legacy Manager & Technology Integrator

The business operations run on a technology backbone with custom-designed legacy applications. These legacy applications must be kept functional to keep the business operations on. The CIOs stand as a custodian of legacy systems to support the smooth running of business operations. As the CementCo CIO mentions, *"My first task for the day is to ensure everything is up and running."* Further, digital technologies depend on the data generated by these legacy applications to perform their functions. Therefore, with greater adoption of new digital applications in the business domains, legacy applications' integration with digital technologies has become inevitable. The TextileCo CIO explains, *"For enabling technology and bringing digital processes in practice, the legacy was required to be integrated to the cloud."*

The digital applications have a very high level of interdependence. With different departments having different digital requirements, CIOs consolidate their needs to keep the count of applications to a minimum. Yet, the data from many applications must be simultaneously analysed to present decision-making insights. CIOs carefully orchestrate the entire IT architecture regarding design compatibility and how these applications talk to each other. The AutoCo CIO recalls, *"We developed 50 to 60 applications on a common digital platform and extended insights of our working applications."* To this aspect, CIOs contribute as the integrator of IT applications by suggesting suitable technology connectors and their mechanism of use.

4.3.2 Communication

The success of initiatives for digital transformation significantly depends on effective communication. CIOs act as *communication enablers*, through which they enable the clear and transparent communication throughout the organisation and *IT representor & Trust builders* to foster trust and responsive relationship with stakeholders. The details of this dimension are presented below:

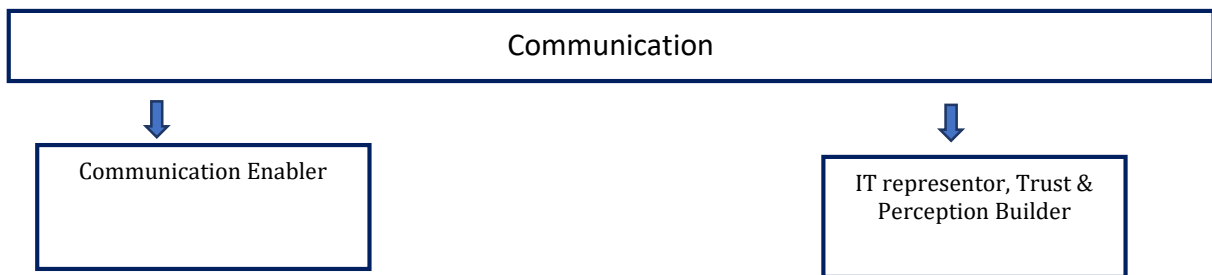


Figure 4.7: Communication (second order themes)

4.3.2.1 Communication Enabler

DT demands a high level of transparency & collaboration among business functions. Vibrant and authentic communication is the foremost requirement to foster both of these. The CIOs communicate up, down and across his levels. In the upward communication with TMT, CIOs prominently focus on project updates and support requested. They appraise the TMT about the digital reforms in the organisation and the status of various such initiatives. In terms of peer to peer communication, the CIOs focus on bringing more coordination with business teams, bringing innovative ideas and communicating efforts to increase productivity. Communicating down the line, CIOs communicate with multiple business users to understand their requirements to appraise them on the digital trends and offerings and ongoing initiatives. For this purpose, the Case CIOs use media such as JAM pages, emails, newsletters, or social media channels. As the BuildCo CIO narrates, *“It is important to involve everyone in the organisation when it comes to digital projects, people must be aware of what is happening on the digital front and how can they get involved in to initiatives. We use a lot of tools to connect with every type of stakeholder.”*

CIOs act with a forward-thinking approach for various business communications, sending proper communication at the designated time. They design the communication to resonate with the business requirements. One AutoCo business executive comments, "*the CIO ensures that everyone is enabled to use the tools while working from home; he created a JAM page on the internal social media platform to enable collaborative communication*". In TextileCo, the CIO deployed a new social media channel to engage the customers and developed the dashboard to analyse their feedback for the marketing team. Similarly, in the CementCo, the CIO listened effectively to the sales team and catered to their request for designing a common e-meeting platform for dealer discussions to bring collaboration among the field sales force, dealers and customers.

Further, The IT systems are used by a whole gamut of users across business domains; it is vital to keep them updated about various information technology risks associated with their actions and, more importantly, on steps to prevent these risks. They must also be educated about raising a red flag or reporting the security issues for any suspicious activity. The CIOs mitigate these risks by regularly sending the advisories across business teams to enforce compliant processes and user practices. The internal chain strengthened against the possible breaches. As the TextileCo CIO mentions, "*We have to make people aware of IT security in a way that it becomes a part of their day-to-day operation. It should get noticed in everything they do on systems. We have made it a practice to circulate the IT security guidelines every week to ensure people know what is permitted and how they have to act while using IT assets.*"

4.3.2.2 IT representor, Trust & Perception Builder

The business generally has a perception that IT does not understand their business; on the other hand, IT perceives that the business does not understand the technology. Often this leads to gaps and mistrust between IT and business. Because of these differences in mutual understanding, the IT department confines the failures to themselves rather than sharing and updating the business for the root cause and improvisation. The CIOs keep a consistent check that the IT team realistically commits the business deliverables and timelines are adhered to; breach of timelines may violate trust among groups. Once the trust is built up, the CIOs extend this layer of trust down their hierarchy to get the same trustworthy relationships across the business and IT. This is further synergised by formulating cross-functional teams, bringing IT

and functions closer to foster better cross competency contributions. As BuildCo CIO mentions, "*When we do these cross-functional collaborations, my team members come back with lots of understanding on what business is suffering from and with a lot of empathy, these initiatives ease to bring results*".

With increased digitalisation, the users have also become tech-savvy. In many aspects, rather than asking, they prefer to guide the IT department about what technology will suit their requirement. For such discussions, CIOs orchestrate the culture of trust among the users and IT to enable bidirectional communication. As the CementCo CIO mentions, "*I guide my team members to be more receptive to business and putting their thoughts on how to complement business better?*"

The CIOs represent themselves as the face of IT in various business meetings. They attempt to build a cordial perception of IT by presenting facts and convincing their business peers on how digital technologies can bring business success. Once a positive perception is built, it helps the CIO and the IT team in drawing support from the business. As the CementCo CIOs mention about TMT having trust and approving his projects, "*Most of the time they approve because it is coming from me[.] they know if it is coming from me, it must be trustworthy*".

4.3.3 Conformance

The digital technologies come with a hidden risk of IT security. The compliance to the mitigation of these risk is important. Not managing these risks may lead to potential consequences apart from loss of reputation for the organisations. The CIOs act as *IT risk managers* and *IT security enablers* to act as conformers. This dimension discusses these roles.

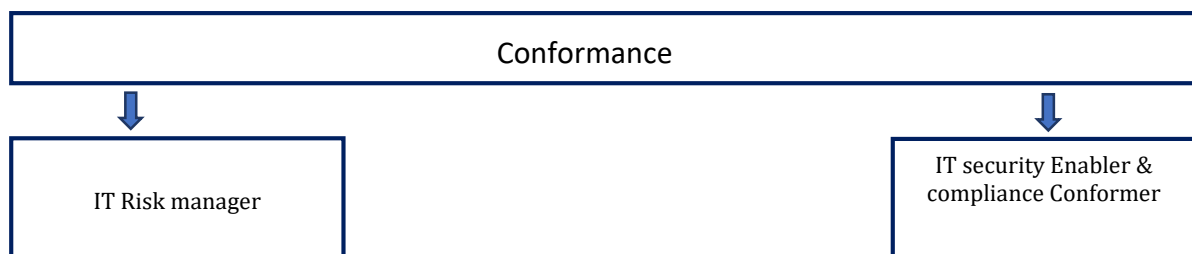


Figure 4.8: Conformance (second order themes)

4.3.3.1 IT Risk Manager

As organisations embrace DT, their interactions with multiple vendors and reliance on multiple infrastructure models have increased manifolds. This rapid digitalisation of business poses a wide variety of critical IT risks, which emerge from IT but have an organisation-wide impact. As head of IT CIOs are considered accountable for mitigating these critical risks that otherwise may result in hefty penalties and loss of the organisation's reputation. CIOs formulate policies and procedures to mitigate the risk of regulatory compliances such as application licences, mode of deployment and secured connectivity requirements. Further, as multiple digital applications function simultaneously, it is tough to manage the compliances manually. So the CIOs prefer to deploy automated tools for monitoring, detecting and controlling these risks and sending alerts to reduce the risk of compliance and system outages. As AutoCo CIO mentions, *"I have exclusively deployed one of my team member for licensing and risk management. He dedicatedly takes care of timely renewals and compliances. It is important Keeping tight controls over the systems"*.

Along with the risk mitigation, keeping the digital applications up and running is equally critical. The CIOs formulate business continuity plans and set up disaster recovery (DR) sites for business continuity. The HealthCo CIO elaborates, *"we have just set up a new DR site for all critical applications with a target RTO (recovery time objective) of four hours"*.

The ageing infrastructure may become non-compatible with next-generation applications and gets prone to system outages resulting in loss of business. CIOs mitigate this risk by planning the infrastructure refresh and upgrades from time to time. Specifically, in the context of DT, to keep the infrastructure agile and flexible, they direct their teams to virtualise infrastructure and keep the operating system up to date on servers. Since the cloud infrastructure offers unique capabilities, the CIOs astutely evaluate them for their organisational fitment. To critically assess and track the risks, the CIOs establish the practice of maintaining a risk register. This risk register acts as a repository for all possible risks and their mitigation plans. Thus, in the context of DT, the CIOs act as qualified risk managers to manage the risks originating from IT. As the BuildCo CIO mentions, *"Digital Technologies change, and they change at a breakneck pace. We have to ensure both forward and reverse compatibility of the systems, and it's crucial.[..]. Systems should be operational seamlessly and securely, today and tomorrow."*

4.3.3.2 IT security Enabler & compliance Conformer

DT enables the organisations to operate beyond the organisational boundaries, adding more and more exposed points, resulting in an increased risk of compromising data. Therefore, keeping the data secured and access management becomes paramount after the digital applications are designed. As each business process is unique, finding system vulnerabilities demands in-depth knowledge of entire business operations. With their thorough understanding of business applications, technologies, and IT infrastructure, CIOs are best placed to holistically assess security threats and keep the systems secured. As CementCo. CIO mentions, *"I keep auditing the network to expose vulnerabilities to ensure applications are secure and the possible intrusion points are appropriately monitored."*

Further, the CIO is the foremost who is held accountable if there are any security breaches. Hence for CIOs, IT security and compliance take top priority. They set the appropriate IT security standards such as ITGC (IT General Controls) and Serbenese Oxley (SOX) in consultation with relevant authorities. For instance, the CIO of AutoCo mentions mandatory compliance to e-filing of challans on the government portal, uploading vehicle manufacturing details for registration to authorities, creating a digitally compliant invoice, road permits information and auto reconciliations of the financial data. Many of these IT compliance requirements further become a part of the integrated organisational compliance. For example, In the HealthCo, the CIO mentioned adherence to the guidelines issued by the government for the healthcare sector, which mandates keeping the patients' data secure.

To address this, the CIOs minutely analyse the end-to-end process and devise internal processes to counter the threats and ensure the functions are not vulnerable to any security lapses. They critically review the application design architecture and application access from a security perspective. To ensure that compliance and integrity are maintained, the CIOs first fix the compliance standard for the organisation.

To ensure conformance to these set standards, CIOs establish and govern internal IT processes such as controlling super users and administrator accesses, formulating password policies, setting up rules for data backups, and cross-application segregation of duties (SODs) and conducting process audits. As CementCo CIO notes, *"We have set up demilitarised zones*

for secure operations, handshaking and data transfers, with our external partners, wherever data sharing has to happen on day to day basis." The CIOs further involved the external audit agencies for detective and automatic control audits to close the potential gaps before the applications were launched for business use.

While the management of security and compliance is most important, the CIOs face challenges with the budgetary approvals for security initiatives. As the ChemCo CIO notes, *"He (CFO) often asks, what data do we have which is not secure? why do you need a budget for this[..]? what is the expected ROI?"*. In such cases, the CIOs appraise the CFO and other TMT members of the risks and get their buy-in on compliance initiatives. As comments by a HealthCo executive, *"what happens to the medical legal case if we are not compliant?"*. Similarly, the AutoCo CIO mentioned the implementation of SAP GRC (governance risk and compliance) for authorisation management and SOD (segregation of duties) control.

Hence, it was observed that the role of the CIO, which earlier was limited to securing hardware and setting up software firewalls, with the aspect of DT, has become quite significant to govern and ensure compliance of each and every business application. With increased cloud adoption and resulting security concerns, the role of CIOs as security enablers and compliance builders will be even more crucial as they progress more in digital application management.

4.3.4 IT Governance & Operations Management

This section discusses the contributions of CIOs from IT governance and operations management perspective. The CIOs own the entire IT, that need to be managed appropriately to run the operations effectively and efficiently. The digital can be build only on if the traditional IT works efficiently. Therefore the CIOs have to astutely manage the IT operations at the same time replicate some of the principles of IT governance and operations management to digital initiatives. The CIOs focus on *agile execution, setting up digital infra, manage exigencies and operations* to foster effective IT governance. These are further explained in below.

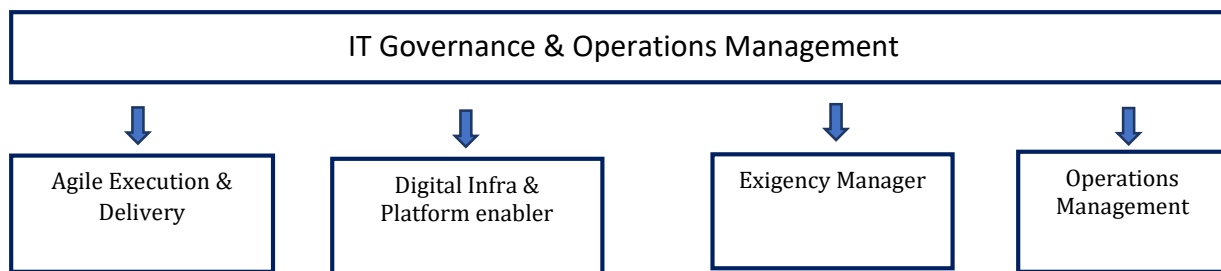


Figure 4.9: IT Governance & Operations Management (second order themes)

4.3.4.1 Agile Execution & Delivery

Digitalisation has made business cycles shorter, enabling the quicker launch of new products and offerings. The same is true for business competition too. Therefore, the new norm to compete is acting fast. Delay in project deliveries might lead to competitors taking away the digital advantage and loss of interest of the stakeholders on top of it. Consequently, "*thinking current*" becomes the essential consideration for CIOs when it comes to the DT. This is also because digital technologies are most effective when used as a competitive advantage; hence agility is the key to success. Digital agility has impacted the prevailing practices, and organisations now Strategise product development iteratively and frequently. This has two significant impacts on CIOs, one on technological selection and the other on development methodology. CIOs select scalable technology to cater to very many business needs under different domains. The second aspect, development methodology, is equally important; the CIOs promote agile-based solutions to develop products incrementally. To keep the agile pace of implementation, CIOs set up the IT functional processes in a way that best suits the business pace of development. They direct their teams with actionable insights and set up a mechanism to get early warnings to address these before becoming a showstopper. As ChemCo CIO observes, "*we followed methodology which is not exactly agile, but a mix of agile and waterfall. We do daily scrums and build iteratively but at the same time we take care of business pace of adoption and adjust our development pace accordingly*".

CIOs enforce the IT management processes to connect with vendors and businesses simultaneously to start faster and cut down rework time. Factually, all our case CIOs were increasingly adopting flexible and scalable resourcing models with co-located vendor teams that can be rapidly scaled up and down. The AutoCo CIO elaborates, "*We have SLA (service level agreement) based resourcing models with our technology partners; this has helped us*

overcome resourcing issues significantly. Our partners, too, get the advantage of this because of resource sharing and scalability with their other clients.”. Further, it was noticed that specifically for external support, the case CIOs experimented a lot with start-ups as they believed that the start-ups were much more agile than their established vendors and brought more innovation possibilities. One of the technology partner consultants of CementCo observes, *"Their intent is to involve more and more start-ups [...] as they expect them to bring fresh ideas and agility alongside cost effectiveness."*

As DT involves experimenting with technology, not every initiative is expected to be successful. CIOs encourage piloting practices to promote innovations in business. They look at past failures, improvise on them and redevelop. This brings synergies in both Cost and schedule. As TextileCo CIO notes, *"Failing fast and scale rapidly is our mantra"*. Hence, agility has to be considered all over the digital IT roadmap.

4.3.4.2 Digital Infrastructure & Platform enabler

The success of DT depends heavily on the organisation's infrastructure capabilities. Digital technologies demand infrastructure that is easily accessible and rapidly scalable to offer deployment of new components. The CIOs are tasked with setting up the appropriate infrastructures, including the data centre and disaster recovery backup. Since DT demands a high number of applications, the task of planning and managing infrastructure has become extraordinarily complex. As AutoCo CIO elaborates, *"The basic core of DT is data....ever growing enormous data. We have to incisively design infra considering sizing, costing, uptime and our landscape's compatibility for integration, whether on cloud or on-premise."*. Usually, it was observed that the case CIOs start with building the infrastructural architecture for setting up the essential environment for establishing DT. This network environment then acts as an enabler to host and design the DT applications and user access management.

Moreover, setting up the infrastructure is a long term decision that involves high costs. Any wrong decision would result in unplanned business downtime and outages. The incompatible and non-scalable infrastructure setups result in hefty expenses of ripping out the entire infrastructure setup and rebuilding the compatible infrastructure. Therefore, considering the digital business needs, CIOs plan the infra from a long-term perspective. Further, In all the

cases, the CIOs invariably advised that since digital technologies can be fully exploited only if they are agile, application deployment on cloud or on-premise data centres becomes a key strategic decision for the CIOs. As HealthCo CIO notes, “[..] *This (digital records) needed a lot of infra focus as the digital pictures occupy a lot of infra space, so I have decided to move them to cloud.*”

Also, digital applications produce a significant chunk of data, and the size of the database increases very rapidly, resulting in more risk of the database getting corrupted. The CIOs keep the databases up to date and articulate the data backup policies to ensure that the databases are appropriately backed up post-deployment of rightly specified infrastructure. As BuildCo CIO observes, “*Infrastructure advancements and cloud-based model adoptions were our priority for all digital applications developments and their backups.*” The CIOs responsibly consider the aspects of infra, such as where the data would be stored, what platforms would be required, and how the applications will be managed and hosted.

In addition to scalability, compatibility also becomes a core concern. The devices deployed should be completely compatible with each other. Consequently, another critical aspect for CIOs is to standardise the assets or gadgets such as mobility, audio and video conference devices, handheld terminals for warehousing operations, and wireless access points for communication setup, which forms the part of DT enabled processes operations.

Moreover, organisations are now moving to a data-driven business model relying upon analytics, which requires them to define a clear digital strategy centred around analytics and business intelligence. DT applications are designed using various applications such as AI, ML, RPA and IoT applications are built on different platforms. The CIOs are responsible for making these application platforms accessible in the workplace to foster innovation. As CementCo CIO mentions, “[....] *the voice processing, image processing, you name it and we do have platform to execute it*”. *Though DT entails multiple applications, however, insights from these applications need to be cohesive. Such consolidation must happen at the infrastructure level to enable the interlinking and data sharing among these applications.* The BuildCo. CIO mentions, “*The exec’s (executives) demand a consolidated dashboard. Applications, empowered by robust and reliable infra, must speak to each other.*”

4.3.4.3 Exigency Manager

The uncertain business environment many times presents situations where a quick response is required. These exigencies mostly emerge from the external environment. If not managed, such exigencies would otherwise result in the loss of business opportunities or bring another kind of disruption to the business. The CIOs are tasked to equip the business teams with the right technological solutions to cater to these business exigencies. Many times, these exigencies are beyond just technology. Hence, these demand the close collaboration of business teams with IT and need to be managed almost immediately. With their business know-how, personal relations, and technological acumen, the CIOs manage these situations with dexterity. They support businesses with building strategy, robust planning, effective delivery, and quick adoption to counter these situations. As the AutoCo CIO recalls, *"...Suddenly, the shortage of semiconductor chips impacted our production schedules; raw material supplies had to be replanned. We had to quickly build an app for collaborative planning and faster communications."*

Almost all the CIOs who were interviewed mentioned that the COVID pandemic brought high turbulence to businesses that demanded establishing remote working practices immediately. The CIOs very actively managed that situation with innovative solutions. However, it seemed to impact the HealthCo CIO the most, wherein the CIO transformed this business necessity into a profitable revenue model for the organisation by digitalising the processes with agile and innovative applications. HealthCo CIO recalls, *"We digitised the prints, reports, Xrays films [...] and launched tele consulting app with doctors, it was critical as our objective was to reduce the hospital visits of patients and at the same time providing healthcare to every patient"*.

Similarly, in the other case, the AutoCo CIO mentioned the government regulatory requirement of starting a new tax regime for goods and services tax. This was a mammoth change for both business and IT, requiring all the legacy processes in their enterprise system to be customised as per the new regulatory norms. The CIO engaged with an external consulting partner, involved the business teams, assessed the scope, formulated revised business processes, and then got those mapped in ERP. AutoCo CIO recalls another exigency, *"The management decided for another joint venture, usually this is disclosed after all the*

formalities are done, but we had to do technology integration, understand their systems, processes, resources., but time was a constraint."

In summary, business exigencies keep emerging from time to time, and CIOs are responsible for managing these exigencies with limited resources in very stringent timelines. Hence, CIOs in this role mostly act as firefighters to business.

4.3.4.4 Operations Management

Digital Operations Management is the pivot to digital business operations. The digital business strategies can only be implemented if the existing IT operations are running reliably. Therefore, IT applications must be reliably operational for the business to operate sustainably. CIOs are considered responsible for the IT applications to be up and running smoothly in the entire organisation. It becomes crucial to oversee the IT operations across all functional domains and to ensure that users get consistent IT support. All the case CIOs established a central IT service desk to address IT support for the user, which was mostly governed by predefined service level agreements. As one of the business users in ChemCo comments, *"With IT issues, the business users were not sure whom to get in touch with for which application, the support was person specific [...] but now they (IT) have set up a central helpline, it is convenient for us (users) to get the issues logged and trace the status"*. In the same case, the CIO comments, *"We have set up and outsourced a 24 by 7 IT service desk as single central contact for any IT related support. it becomes a critical touchpoint. Alongside the timely operational support, we now get all issues listed with analytical insights of how many of them are repetitive."*

As the DT technologies are new, their deployment is also unique in many technical aspects. CIOs designate their teams to monitor critical parameters. As digital applications prominently need the internet to work, bandwidth management becomes a critical operational concern. The CIOs advise their network team to reassess the bandwidth frequently. As AutoCo CIO observes, *"seamless connectivity is important for the uniform experience of users and even for the office visitors. With more digital applications on board, we have upgraded our bandwidth at regional offices"*. Further, the CIOs address their teams to plan the maintenance and drill schedule in close synchronisation with business. TextileCo CIO explains, *"We have to ensure*

that the business is not impacted because of downtime; we have to plan accordingly with business consent".

4.3.5 People Management

Talent and organisational culture makes a very important aspect when it comes to implementation and support of digital initiatives. The CIOs astutely manage multiple stakeholders across their internal teams, business executives and technology partners to bring success to DT initiatives. Further, enabling conducive culture across the organisation is a prerequisite to success of DT. CIOs acting as people managers manage the *organisational talent, foster digital culture, negotiate resources, build partner alliances* for resource acquisition and *influence TMT* to foster success in DT initiatives. These dimensions are discussed below.

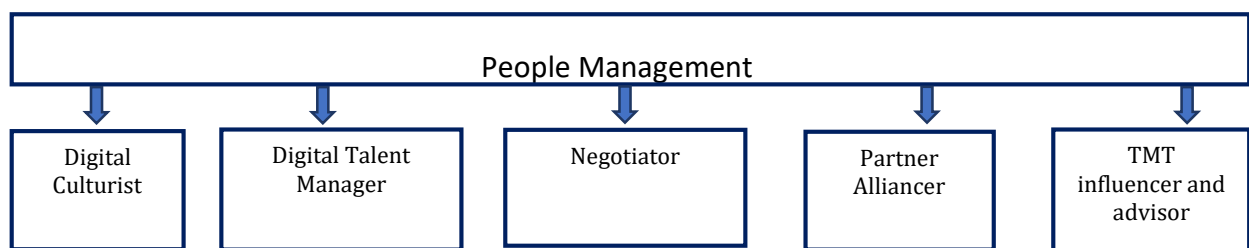


Figure 4.10: People Management (second order themes)

4.3.5.1 Digital Culturist

One of the prerequisites for DT to be successful is that the organisations have to adopt new novel ways of working. They have to reinvent themselves continuously. Most importantly, the employees need to be ready intellectually and skilfully to embrace DT. However, organisations cannot build this capability overnight. To achieve this, the CIOs invest strategically to transform the culture of the organisation. For instance, the HealthCo CIO notes, "*We brought in the concept of digital prescription, the doctors were not ready to adopt it as they were used to pen and paper, they sought excuses such as time constraints, but ultimately we convinced them*". CIOs enable faster adoption of new initiatives by presenting the big picture of how the changes will add value to the organisation and employees. Further,

they facilitate adoption through novel ways such as conducting e-trainings, setting up self-service Kiosks, and online facilities. They further innovate new technology-oriented ways of employee engagement and monitoring employee activities, measuring them digitally and appropriately setting up feedback mechanisms. As the BuildCo CIO discusses, *“We have a diversified workforce and many diversified work profiles. But we want everyone to adopt, learn and contribute the digital way; we need to foster digital learning innovatively to make it mainstream thinking”*.

CIOs conduct focused discussions with their teams to inculcate DT as the culture of continuous organisational learning. Next, they formulate the cross-functional teams as ambassadors to get DT on the ground. This orients the team's thinking on digital technologies' business perspectives that gradually becomes the digitally enabled business-oriented thinking philosophy. Hence, CIOs shape the behaviours of their team members to align their efforts toward the organisation's digital goals and make their team members change agents. The CementCo CIO mentioned formulating a cross-functional team including IT and all vertical business representatives for bringing synergies and holistic inputs to digital transformation projects. This team also acted as a practical floor change manager under team members' influence among their respective departments.

Since DT is an organisation-wide phenomenon, it is vital to keep trailing with new digital technologies that best fit the organisational requirements. CIOs build a culture of continuous experimentation and learning. They foster collaborations with new technology partners, especially start-ups, to bring innovative thinking. AutoCo CIO observes, *“It is important to continue learning, learn what is new, how that can fit in our context and each of my team member must explore on that [...] we fail fast and we learn from it”*.

4.3.5.2 Talent Manager

The requirements for DT emerge from many business functions, requiring working with many new technologies such as AI, ML, cloud, RPA etc. Working on these new-age digital technologies demands special technical and functional skills. Hence, talent management decisions become crucial. Since digital technologies are always in demand, making talent is scarce, and talent retention is a pertinent issue. Talent management entails assessing talent

demand, deciding how to fill talent gaps, recruiting the right talent, channelling them in the right direction, and training them from time to time. In all the cases, it was observed that the CIOs innovatively managed the talent for DT as per their organisational fitment. ChemCo CIO recalls, *“We recruited two technical consultants for big data dashboards, they started picking up but then suddenly moved on. We had similar experience with other technology resources also.. Stability of workforce is important”*. Similarly, the CementCo CIO came up with the innovative idea of training the business users as the core team rather than recruiting full-time technology consultants. He explains the rationale, *“The new digital skill to the business users will be an add on to complement their routine business activities, they can better think of more value additions with the same technology, they will train others and at the same time their chances of retention would be more”*. In the HealthCo, the CIO kept the IT team members as the core team responsible for DT while complementing them with a remote handholding team from a technology partner to interact on a need basis. In contrast, BuildCo's CIO chose to recruit new talent to build internal digital competency for designing the dashboards.

To recruit and retain digital talent, the traditional HR function also is required to be agile. It was observed that the CIOs digitalise the HR practices by implementing technology-oriented solutions such as digital hire to retire solutions and automating the other HR functions. In the AutoCo, for better talent retention, the CIO implemented an internal social media platform, termed 'JAM', which was used as a bridge between the HR executives and employees to share communication, feedback and suggestions.

CIOs rely on talent to execute their digital vision; therefore, they give utmost importance to talent retention. For this, CIOs build strong connections with their teams to understand and address the ground-level issues, which otherwise would result in high attritions and low morale. CIO ensures that the IT workforce and project managers are happy with their work and contribute productively to projects. Acting empathetically, CIOs listens to teams' voices to give them confidence that their voice is being heard. They inspire the team members to innovate and deliver. As the TextileCo CIO reveals, *“I keep myself always available for my team; A friendly environment brings better synergies to the workplace.”* To bridge the talent gap, the CIOs engage with start-ups and established partners for talent support.

4.3.5.3 Negotiator

An essential aspect of DT is to have the right technology with the proper budget. With increased focus on digital, CIOs need funds to cater to business digital technology demands. To achieve this, they need to convince a lot of stakeholders, including the top management team (TMT) and the Board. The CIOs thoroughly analyse to choose digital projects with better ROI. After that, they plan the budget accordingly with a one or two-year horizon. Sometimes the top management executives are not able to comprehend the budgetary needs. Such as while the management of security and compliance is most important, the CIOs face challenges with the budgetary approvals for security initiatives as the Chief Financial Officer (CFO) sees it as an expense without any return. HealthCo CIO recalls, *“My boss asked - ‘What unsecured data do we have?’”*. In such cases, the CIO appraises the TMT of the risks and gets their buy-in on compliance initiatives. Apart from budget, CIOs negotiate to get maximum value from stakeholders, team members and vendors. As the AutoCo CIO narrates, *“I have to deal with many internal and external stakeholders and mould the things in favour, be it promoting new initiatives, delivery timelines, budget or resources.”*

Unlike the usual business negotiations, the technology product and service purchases require a higher level of information. Also, there is always a risk of assets rendering useless if they do not fulfil the business purpose due to a lack of functional understanding. With their technological background, CIOs best understand the technical requirements and negotiate deals with technology providers. The CIOs apply empathy and active listening skills to negotiate effectively. HealthCo CIO explains, *“we open new relationships by listening to them (vendors) carefully and mentioning the big collaborative opportunities they are looking for”*. CIOs analyse the big picture well before negotiation. This means that they holistically analyse and consolidate costs for all digital business requirements such as infrastructure, deployment, development, and training. They then negotiate in totality to get an advantage of economies of scale. They formulate specific proposals and finalise contracts with clear deliverables, timelines, and pricing along with solid contingency plans. CIOs offer their organisational collaborations to vendors for technology pilots and act as their customer reference to make it a mutual advantage. TextileCo CIO mentions, *“Without being anxious, I discuss the big picture, evaluate how the relationship can be sustainably benefiting both parties”*.

Within the organisations, CIOs negotiate with employees for digital adoption. Digital Technologies have synergised functions, but at the same time, these have caused a shift in

people's behaviour. The close functional collaborations demand higher mutual acceptance and flexibility. The job roles have changed to digitally-enabled supervisions. With a more digital-savvy workforce, the CIOs negotiate the accepted solutions that fit budgetary constraints. As the ChemCo CIO comments, *"The digital-savvy workforce has high-end technological workplace expectations while the old gen has adaptability challenges; I have to keep a balanced approach to cater to both"*.

4.3.5.4 Partner Alliances

For DT, success depends on the synergies generated from the collaboration. Hence, the CIO establish strategic relationships with partners to build innovative business solutions. More importantly, they act as partner alliances to accomplish the tasks that his organisation alone cannot do. In this context, customers and technology service providers become two prominent stakeholders for CIOs.

Digital technologies demand a specific skill set, and having all skill sets in-house is not practically possible. Therefore, CIOs build alliances with reliable partners with whom they can collaborate strategically on the technological aspects, bringing fresh ideas and innovations. As the AutoCo CIO mentions, *"We have strong collaborations with technology partners who keep us updated on their offerings and vice versa. Their technical teams are aware of our landscape."* They also leverage their associations with partners and governing bodies to develop their understanding of technological advancements. HealthCo CIO notes, *"I keep attending the conferences organised by the technology partners from time to time. These give me a fairly good inclination of what is being offered and what others are doing in the ecosystem"*. Moreover, the trusted partners provide cost estimates to CIOs, which CIOs use in planning the technology budgets for new implementations. Partners also support CIOs as an extended resourcing arm which fulfils the organisational knowledge gap. Further, it was observed that CIOs rely on partners for risk management also. The technology partners advise CIOs on early warnings and possible technological disruptions. The CIOs plan failure drills and formulate contingency and business continuity plans with the technology partners.

Working with external partners entails altogether different skills as they don't fall under the CIO's span of direct control. The CIOs use their persuasion skills to win the partner alliances.

The CIOs possess in-depth knowledge of alliances, such as the financials and the partner's capabilities, to astutely leverage them for the organisation. The CIO maintain mutually benefitted relationships with their technology partners & customers. CIOs promote customer collaborations for new digital product designs and offerings, effective delivery of services and sustainable relationships. Further, leveraging these relationships, CIOs engage with both customers and vendors on pricing aspects. On the customer side, they evaluate the customer's acceptance and effectiveness of the offered digital solutions, which ultimately supports the marketing team in the price and position of the new products. As the HealthCo CIO mentions, *"I round the floor, meet patients and understand their expectations from the technology perspective; I get real-time feedback."* On the vendor side, they devise mutually win-win situations such as time and material contracts, ticketing based support, offering digital platforms as trials, and deployment of new products. These relationships indirectly support organisations in knowledgeable bargaining resources and competitive bids from vendors.

4.3.5.5 TMT influencer and advisor

The CIOs know technology much better than anyone else on the Board. So, the CIOs act as trusted technology advisors to the TMT. They bring awareness to TMT members about which areas are critical for the organisation to pursue DT to take maximum benefit and how that should be structured. In various communications to the Board, the CIOs present competitive insights on which digital technologies the competitors are working on. CIO advises them on what to expect from technology and how that can be achieved. HealthCo CIO notes, *"I keep TMT members updated on the recent digital technological trends with the intent that they may find them of some novel use at our business"*.

The CIOs, in their discussion with TMT, formulate an understanding of TMT's requirements. They functionally narrate this requirement to their teams for developing insightful dashboards to present real-time insights to TMT. This way, they bridge the knowledge gap and empower the TMT to make data-driven decisions with agility. The CIOs also inform the TMT of the status of projects they approved. The CIOs present an accurate picture of the ongoing issues and concerns at ground level to TMT to take timely initiatives, which otherwise would result in low organisational productivity. At the same time, they receive feedback and

suggestions on TMT improvements for passing that on to his team to keep them updated about the TMT's vision. Further, it was observed that CIOs also advise TMT about IT security aspects. With increased digital adoption, IT security has become a key responsibility area. Any violation of this can bring unwarranted legal action even to board members. The CIOs advise the TMT about their responsibilities related to IT security acts and compliances. As the ChemCo CIO comments, *“The technological awareness to senior executives is not very high; sustained discussions are important to keep them apprised of digital trends.”*

4.3.6 Strategic Management

Strategy is the core of digital transformation. A robust digital strategy paves the way to success for the organisations. The CIOs astutely craft the digital strategy in a way that it complements the business strategies and increases the effectiveness of business. They articulate the IT strategy and at the same time design digital strategy in a way that it complements the business strategy. This dimension discusses the CIOs role in strategic management.



Figure 4.11: Strategic Management (second order themes)

4.3.6.1 Business Strategy complement

Businesses are increasingly embracing digital technologies and looking at technology as a distinctive competency in the marketplace. The most prominent task of CIOs in the context of DT is to complement the business strategy from a digital perspective. In doing so, CIOs usually participate in the strategic business planning meetings to understand the organisational vision and to formulate their understanding of how the business plans to

operate in the next couple of years. Cement CIO comments, *"Once a year, we have a strategic meet, wherein we collectively discuss the business vision and set the yearly objectives. Then we have quarterly meet to assess our performance and plan for subsequent quarters"*.

After discussing with the CEO, CFO, and other top management team members, the CIOs design the digital roadmap. AutoCo CIO explains, *"TMT members are mostly aware of business trends, they are quite brainy. I deliberate and plan the digital strategy with them"*. They clearly articulate the business touchpoints where digital technologies can add business value in saving and earning money. More specifically, the CIOs suggest the business function-wise value additions such as streamlining the supply chains, collaborations with partners, digitally-enabled customer-oriented features for product development, digitally oriented new service models, business process reengineering and robotic process automation of internal business processes.

4.3.6.2 Digital strategy Articulator

CIOs put in their leadership insights to plan the future of digitally enabled businesses. With their techno-functional expertise, they articulate how IT will functionally achieve the business objective through digital technologies. They formulate the digital vision and digital roadmap with designated timelines to set the agenda for translating the digital strategy into attainable goals down the hierarchy. Next, along with setting the objectives for their teams, they plan the support mechanisms such as training and expert guidance to facilitate their teams achieving these goals. As the TextileCo CIO mentions, *"I have to aggregate the bits and pieces, shape them, and bring them to ground level attainable tasks that follow the team's planning for delivery."*

At the same time, CIOs perform strategic decisions such as make vs buy, delivery from internal teams or partners engagement, cloud vs on-premise deployment, infrastructure refreshes and IT security aspects. Another critical factor is to achieve the digital goals and optimise the digital solutions within the allocated budgetary boundaries. The CIOs strategically plan the technology budgets judiciously, evaluating the total Cost of ownership. They critically rationalise the spending year on year and carefully plan the IT spending within the allocated

budget. HealthCo CIO notes, “We purchased infra last year to set up our new data centre; we now have to capitalise that and increase spending on digital applications development”. Similarly, the CementCo CIO signed the first in the country strategic collaboration with one of the topmost technology partners for the business's big data analytics application development.

4.3.7 Technology & Innovation

Technology platform decisions play a major role in bringing consistency in terms of technical digital architecture. This specifically becomes significant in context of DT because the digital technologies expand themselves very fast because of their nature of innovation through collaboration of technologies. Therefore, CIOs have to lead the digital transformation keeping under consideration from the technological perspective alongside fostering innovation. To this they act as *business need evaluators, business process reengineers, technology consolidators* and *technology explorers*. The section presents details on this aspect.

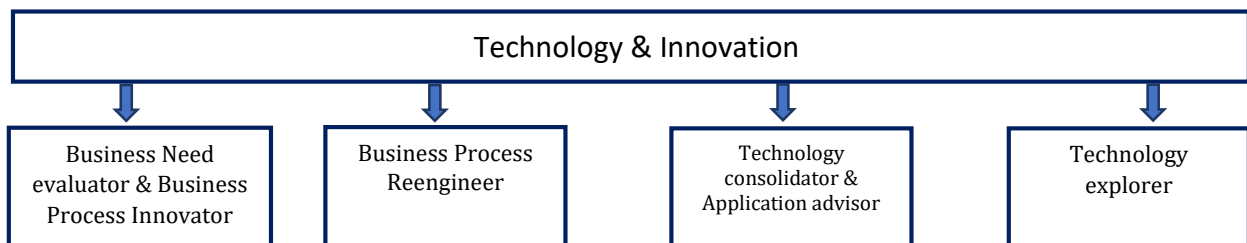


Figure 4.12: Technology & Innovation (second order themes)

4.3.7.1 Business Need evaluator & Business Process Innovator

The CIOs aim to empower every process and person at the organisation to work efficiently with technological tools. They evaluate the pain points of business to find out what areas need improvement and how digital technologies can bring change across them. All the case CIOs resonated with the importance of innovation using digital technologies. CementCo CIO mentions, “I always focus on what new can be done with technology, how do I simplify the business, bring revenue to business”. Similarly, the AutoCo CIO mentioned the

implementation of success factors for human resource process innovation. He recalls, *“We wanted to bring innovation to HR function [...] with Integrated data in Success Factors, we can get educational qualification, experience and interest areas of our employees. Using this innovative tool, we place them in relevant roles”*. HealthCo CIO mentioned automating the IT support with the implementation of a new AI ML-based ticket automation tool, to which the HealthCo executive comments, *“It is easier to get first-line support now, the chatbot suggests the resolution, logs the ticket also and proposes which team to get in touch along with their contact details.”*

The CIOs facilitate business on-demand with technological innovations. They focus on incremental advancements in existing business processes by bringing digital components to them. To foster performance and growth in established business processes, the CIOs innovatively selected technologies to digitalise them, such as mobile technologies for operations, cloud collaborations, social media for better employee engagements, and optimisation of supply chain processes through partner engagements. In the case of organisations, all CIOs proactively ensured the setting up of the necessary infrastructure to enable their teams to innovate with disruptive technologies. As the TextileCo. CIO suggests, *“[...] Target DT initiatives in two steps, first and foremost critically assess the business requirement and next complement it with the right technology.”*

In summary, it was observed that contrary to the traditional responsibility of managing IT, the CIOs now focus on innovation. They are considered responsible for creating value for the business. They evangelise the organisational innovation capability using novel ways and drive the change alongside building innovation capabilities. They leverage digital technologies for innovative designs and faster deployments to bring agility to business processes creating competitive advantages. CIOs determine how the technology partners and businesses together can collaborate for ambitious business process innovation.

4.3.7.2 Business Process Reengineer

CIOs look at the opportunities to transform business processes from start to end. To this end, the first minutely analyses the business process workflows and then reimagine the business processes with technological advancements to advance the operations to new digital norms.

Thereafter, they assemble and govern the teams to reengineer the business processes, in close collaboration with business executives, to bring radical improvements in productivity and efficiency to the business processes. TextileCo CIO recalls, "The financial reconciliation of invoices was a key concern of finance department at the month ends; we implemented an RPA tool to completely automate the reconciliation process. It processes invoices every day after business hours. Any errors are mailed automatically to business executives". Similarly, the CementCo CIO received a concern about salespeople not being able to physically meet with sales dealers due to pandemic restrictions. The CIO customised a new mobility app for virtually connecting with dealers. As he puts it, "*Earlier sales managers could do 4 to 5 dealers a day, now with customer connect app they do 12 meetings per day. The solution has brought synergies across sales process*". However, As the business process of reengineering initiatives focuses too much on technology, cultural adoption is equally important. The business process reengineering initiatives might prove to be costly if they do not get adopted. As discussed earlier, the CIOs give due consideration to cultural adoptions also.

4.3.7.3 Technology consolidator & Application advisor

As noted earlier, business functions usually tend to work in silos. This siloed structure gradually results in functions getting trapped in bounded rationality. Moreover, this phenomenon is not just limited to business processes; technology also becomes a part of it. In all the cases, while discussing with business users and consultants, it was observed that the silos also existed across the technology domain. This means that working in silos, the business departments also choose niche technologies for their department functions. This results in multiple technologies and applications being used at the same time, posing practical difficulties such as tracking, annual maintenance contract renewals, increased costs, and difficulties in managing diverse solutions. Therefore, CIOs put questions on new technology proposals. They critically analyse the need for onboarding any new technology. CementCo's CIO mentions, "*we cannot manage too many things; we need to consolidate our technological landscape*". The CIOs attempt to replace these redundant applications with universally applicable digital technologies to bring uniformity across the organisation. AutoCo CIO recalls, "*we rationalised the business requirements, consolidated applications and migrated them on a new single digital platform; we eliminated some thirty to forty redundant applications*".

Further, as an extension to the application consolidator role, it was observed another phenomenon where the business users often encounter the functional issues for which they are either not aware of technological solutions or unable to decide on suitable technology. This is specifically true with the DT as digital technologies emerge quickly, and it is usually tricky for business users to comprehend or anticipate these solutions beforehand. In such cases, the CIOs, acting as application advisors, critically analyse the business requirement and suggest the technology feasibility, fitment, and solutions. They formulate the technological design architecture and make sure that appropriate technologies should be in place. As the TextileCo CIO comments, *"We have to be cautious of application architecture; otherwise, we will end up having multiple solutions for similar business needs; cohesiveness is important."*

4.3.7.4 Technology explorer

To keep abreast of technological developments and to bring new technological solutions to their organisations, the CIOs explore the technology landscape continuously. Their professional network, technology partners and customers become the critical source of information for them. The CIOs build strategic partnerships with the governing bodies, take professional memberships, and build relationships with reputed academic institutions to keep themselves abreast with the recent developments. TextileCo CIO shares, *"I keep attending various events organised by the technology partners. I met other CIOs there. This keeps me updated on what is happening around"*. Further, the CIOs spend time with customers to build an understanding of their expectations from the product. This gives CIOs an inclination about which digital technology and application can be used to keep customers engaged better. HealthCo CIO informs, *"I roam around the floor and meet patients to understand their key concerns and suggestions. This gives me a real-time feedback to bring them a better experience next time."* In all the cases, we observed that the CIOs spend significant time exploring the external technological environment.

In summary, It was observed that every case organisation adopted their own approach to DT, and there were no approach commonalities. This was possible because DT is context-specific, and therefore no generalisation of the approach was observed on the ground. A meaningful inference that can be drawn from the discussion above is CIOs have very differentiated responsibilities in the digital era. They are now looked upon as strategic partners rather than

support function managers. As digital technologies progress, CIOs will be expected to take up more strategic contributions through diversified IT streams to build technology as a competitive advantage. Having presented the above information, next section will discuss the detailed observations of the study.

4.4 Conclusion

This chapter provided with the findings of empirical discussions. The overarching dimension and key themes related to them were evaluated and presented. The themes and dimensions were evaluated following Gioia(2013) method following the techniques of semi structured interviews conducted. The next section presents the discussions on the derived themes.

5.1 Chapter Overview

This chapter comprehensively discusses the analysis and results in light of the literature on the drivers and role of CIOs in digital transformation. As discussed in section 1.4, the study investigated three research questions about the drivers, role of CIO and how to of Digital Transformation. This chapter elaborates the inferences in respective sections. First, in section 5.2, the discussion related to the identified drivers (see Chapter 4) of digital transformation in the organisations is presented. Subsequently, in section 5.3, the discussion related to the role of CIOs in enabling DT is presented. Finally, section 5.3 addresses how can organisations attempt for successful DT. A pictorial representation of this chapter is provided in Figure 5.1.

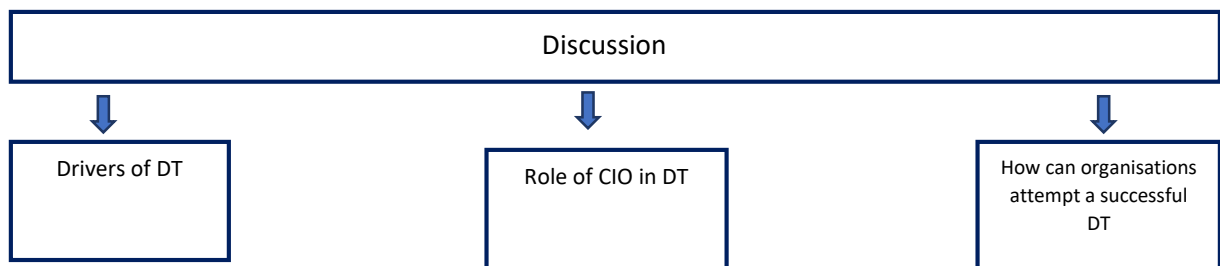


Figure 5.1: Overview of Chapter

Due to its distinct characteristics, the goal of implementing DT in the business, too, seems to be becoming multi-sided. It encompasses but not limited to reach customers and external partners effectively, to widen their business and organisational magnitude, integrate processes, improve services, disrupt markets, and fundamentally change industries, rather than being limiting to improvement in their internal processes. These objectives are addressed through integrated products, services, channels, and operational procedures. Therefore, it is not the distinct technological strategy anymore, but a combination of unique digital strategies that enable the organisations to use the opportunities presented by digital technologies (Spremic, 2017; Ross et al., 2016).

The analysis reveals that digital transformation is a broad domain amalgamating various individual digital applications, fields and capabilities; therefore, digital transformation

research is multidisciplinary. The evaluated research under Digital Transformation domain as a part of this study was categorised in 4 key research areas. These are *organisational effects*, *applied applications and Insights*, *operational processes* and *social aspects*, which are further attributed to 18 research streams and their corresponding research domains respectively. The derived research streams focus on several research aspects of DT, such as its role in different industry types; its organisational impacts on business model transformation, Innovation, leadership, Infrastructure; its technological applications, such as industry 4.0, blockchain, RPA, artificial intelligence, AR/VR, RPA, big data analytics and their practicalities; its impact on the operational process, such as on, manufacturing, marketing, supply chain, finance, strategy and human resource and finally its social aspects.

The rest of this chapter presents the inferential part of this study emerging from the empirical investigations. The answers to research questions are presented first, followed by the recommendations to attempt DT successfully. The contextual framework for the study was presented in Chapter 2. This framework guided the empirical part of the study. RQ1 directed the "Why" part of the study, which attempted to detail the driving factors for adopting digital transformation. While the RQ2 guided the contributions from CIOs to drive the DT in the organisations. The empirical perspectives were analysed and are presented in Fig. 5.2

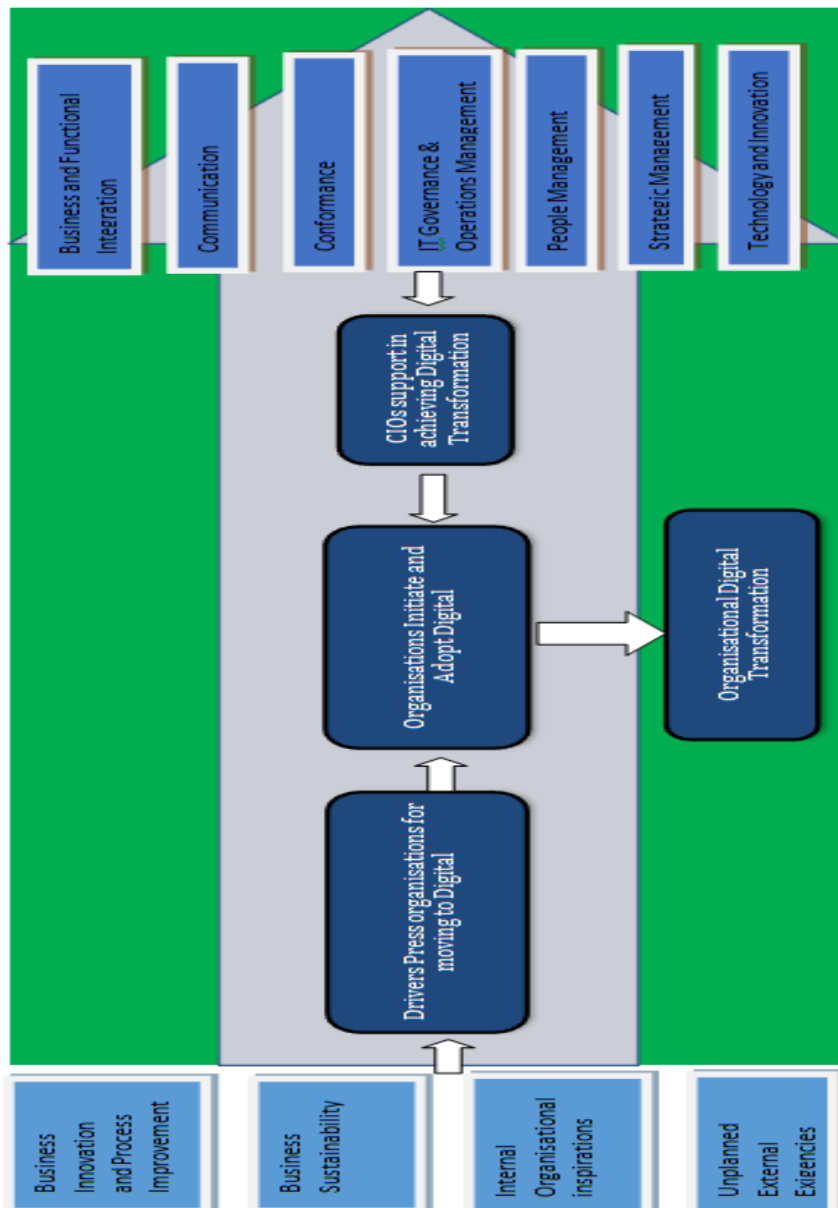


Figure 5.2: Conceptualised Model for DT and CIO role in organisations

After establishing the context of research questions through the conceptualised model above, the next section elaborates upon the individual research questions set initially.

5.2 Divers of Digital Transformation

As discussed in Section 2.6, The drivers are described as “the perceived organisational expectations that motivate and influence the organisations to innovate, orient and adopt the digital technologies”. As discussed in Chapter 3 and Section 4.1, these drivers were evaluated empirically. The organisations are motivated and influenced by many factors, broadly categorised into four categories: *business innovation and process improvement*, *business sustainability*, *internal organisational aspirations*, and *unplanned external exigencies*. Figure 5.3 presents the evaluated drivers which are further discussed in this section. The findings strengthen the elementary understanding that there are external or internal factors for why organisations engage in digital transformation (Netheler et al., 2018).

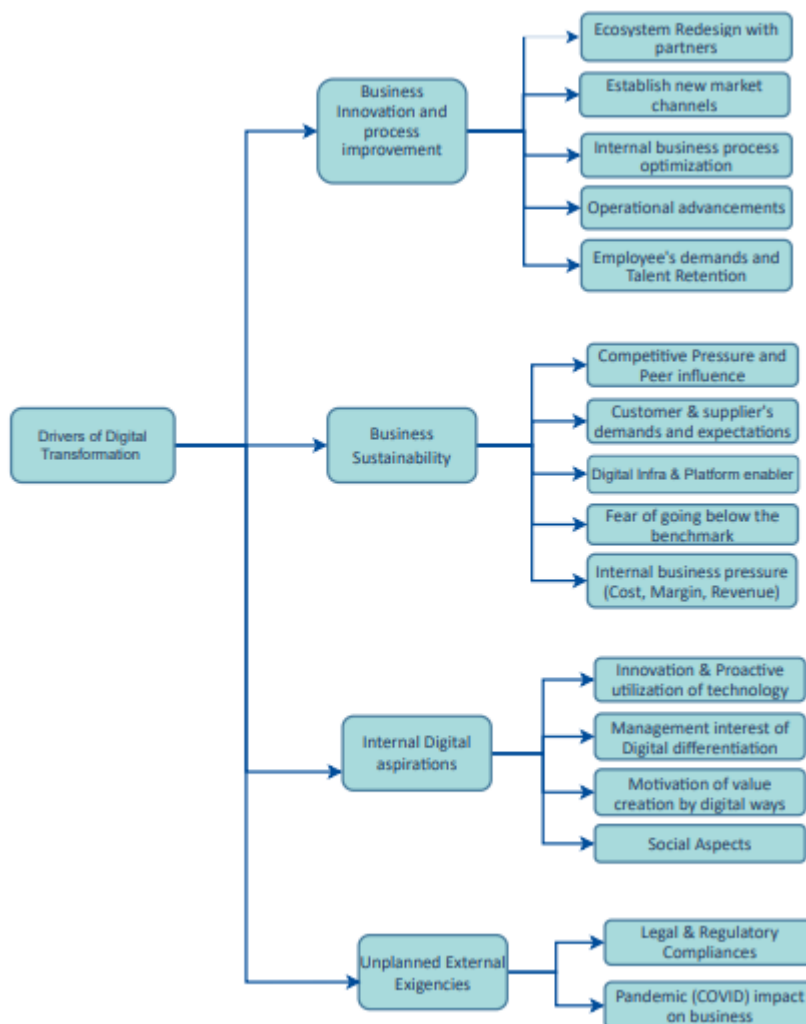


Figure 5.3: Derived drivers of Digital Transformation

Business innovation and process improvement emerged as prominent themes pushing organisations for digital transformation. The motivation was to innovate, adapt and improve on existing business processes. This motivation was complemented by various factors such as *zeal to establish new market channels, innovating a unique ecosystem of collaboration with partners, optimisation and improvement of internal business processes, efficiency improvement and operational advancement, and the demands from employees for a digital workplace*. As discussed by Pandey (2021), Nambisan et al. (2017) and Yoo et al. (2010), the case organisations were centric on new offerings to their customers and employees. The CementCo enabled a new communication channel with their dealers to aid better and faster communication. The HealthCo enabled a new “digital connect” mobile app to provide the direct connectivity of patients (customers for HealthCo) with doctors. Similarly, AutoCo created a new web portal to connect with OEMs (their customers) for better and foster collaboration. As Haffke et al. (2017) mention about the changing customer demands and behaviours enable initiation of DT, it was observed that alongside proactively providing the new offerings, the customer's demands also influenced the organisations to initiate the digital transformation (Leischnig et al., 2017; Ramasundaram et al., 2023). AutoCo’s customers (OEMs) demanded implementing supplier portal, HealthCo’s customers demanded E-consultations. Along the same lines, ChemCo was attempting to build a digital app for customers to derive real-time analytics. This observation aligns with Vial (2019), who mentions that data analytics are becoming drivers of DT for customers' needs. As, Bockschecker et al. (2018) and Roy & Mukherjee (2018) mention that organisations promote servitization through digital technologies for better customer retention and satisfaction. This aspect was specifically observed in the BuildCo and CementCo, where the focus of the organisations was increasing on post-sales support to customers to have greater lifetime value and retention of their customers. Both the organisations addressed their field teams for building better customer connect and addressing the customer complaints with agility.

Huang et al. (2014) and Wang et al. (2018) suggest about organisations inventing networked supply chains with partners and adopting smarter operational processes. The eagerness of organisations for *internal business process improvement and ecosystem redesign with partners* was visible in the case organisations. Alongside customers and employees, the case organisations attempted for generating digitally supported collaborative synergies with other

channel partners also. The CementCo established a new digital portal to forward and reverse integrate both their customers and suppliers. AutoCo designed a new supplier portal where all the suppliers could be combined on a single portal to bring complete visibility across the entire supply chain. Similarly, as Kumar & Bardhan (2020) suggest, effective utilisation of healthcare facilities is important, HealthCo collaborated with local clinics as their channel partners. Hence, it was witnessed that the organisations went out of traditional ways to establish collaborative partnerships to leverage network synergies. Also, the organisations intended to use digital technologies for linking multiple dimensions of information generation, collection, and processing (Bharadwaj et al., 2013; Kane et al., 2015) to increase interactions with the stakeholders. This is the empirical evidence that DT is more than just technology; it is about the synergies generated by the connected systems for strategic business initiatives. This is in sync with Bilgeri et al. (2017), who mention that greater collaboration among the business units and external alliances is important to success through digital initiatives.

Further, the organisations were observed to be oriented towards *operational improvement or advancements* through the applications of digital technologies (Holmström, 2022). This was attempted by identifying the perineal problems of their prevailing business operations, which could be better addressed through newer digital technologies. And then digital technologies were evaluated as a possible solution to these issues. The CementCo was working for quality control of raw meal and clinker (both semi-finished materials for cement manufacturing) by AI based track and trace application through online analyser. The AutoCo implemented IoT-based MES (manufacturing execution system) at their new facility for advanced manufacturing. The HealthCo decided to implement a patient information system to maintain and retain integrated patient's information. Similarly, ChemCo replaced its manual hazardous material tracking process with a digitally advanced application to automate record keeping and reporting to authorities. Pragmatically the organisations looked upon digital technologies to complement and enhance the capability of their business practices with novel technological offerings (Barrett et al., 2015). In line with Proctor (2017), who suggests that organisations utilise digital technologies to acquire real-time data from digital technologies to restructure their business models, CementCo improved efficiency and control over their transportation management through real-time tracking and tracing of vehicles in the field.

Similarly, HealthCo integrated multiple legacy applications through a common digital connector and created a data lake for building their analytical capability. This confirms the understanding by Yoo et al. (2010) and Vial (2019), who mentions that digital technologies can be used as a common platform for hosting multiple digital applications to simultaneously cater to strategic business needs through reprogramability and data analytics.

Developing employee competency is the core aspect of DT (Blanka et al., 2022). In all the case organisations, the employee centricity was observed as a potential driver to adopt DT (Brynjolfsson & McAfee, 2014). The employee-centric push emerged prominently from two directions – first, from employees themselves, who demanded a digital workplace and second, internally within organisations for employee retention and as an attempt to make the workplace efficient. These observations support Davenport (1993) and Netheler et al. (2018) who argue that workplace digitalisation brings organisational efficiencies through better coordination among the workforce and employees look for newer digital ways for better efficiency, accuracy and time saving. Employees also sought the digital tools for innovation at their workplace to contribute better to their organisations (Mueller & Renken, 2017). On the other side, the organisations, too were keen building digital competency to favour employees' demands (Wan & Cheng, 2019). Their main interest was to retain, groom and utilize the internal talent to support their future business model and build a digital-centric organisational culture (Mihailescu & Mihailescu, 2017). Specifically, in the CementCo case, the organisation focused on making it a digital place to retain its talent. Similarly, AutoCo leveraged digital for better employee connection, engagement, and experience. TextileCo facilitated a better employee workplace by setting up self-service kiosks; HealthCo automated the shift rosters and its communication through mobile SMS service to save their employee's coordination time to take rest during pandemic extended working hours.

Business sustainability was observed to be one of the critical considerations for businesses to adopt digital. Sustainability here refers to a strong pressing need for survival and sustenance. The business sustainability was influenced by *competitive pressure and peer influence, customer's and supplier's demands and expectations, disruption by new entrants, fear of going below the benchmark and internal business pressures of cost, margin and revenue*. *Competitive pressure and peer influence* emerged as a strong influencer of DT in all the cases (Faro et al., 2019; Morakanyane, 2017). The organisations were concerned about

competitor's moves toward digitalisation, and they were concerned about being lagging with respect to their peers. As a countermeasure to this, the case organisations categorically took up digital initiatives. The BuildCo executive spoke about established players in the business who had already done significant digitalisation, and raised concern about the BuildCo's processes that had gone below the benchmark, resulting cut in revenues. Similarly, the ChemCo executive mentioned about management's sensitisation about adoption of digital else their survival would be at stake otherwise. On the same lines, the CementCo executive mentioned so many developments happening in the external environment. The executive also mentioned that they were getting inputs from industries on what kind of digitalisation was happening to their competitive space. Similarly, the AutoCo executive mentioned concern about staying competitive because of global players. So this kind of struggle was observed to push organisations to adopt digital for their survival.

Like the competitive pressure, the anticipated *disruption by new entrants* also stressed the case organisations' adoption of DT. As Berghaus and Back (2017) mentioned, a shift in the competitive landscape forces the adoption of new digital technologies for innovation to compete with new entrants and established market rivals (Jha et al., 2022). Most case organisations were concerned about future competitive pressure emerging from new digital entrants. Specifically, in the HealthCo case, the new entrants were small health testing laboratories operating in digital ways, thereby collaborating digitally with hospitals and patients. Therefore, HealthcareCo also had to stand by the market standards and scale up themselves for digital. Also, a substantial shift emerged in the business model itself, which was being transformed from therapeutic to preventive analysis. The new laboratories were connecting to customers more proactively and using the digital means. Consequently, their operational costs were less than with respect to HealthCo, which in turn was using the traditional methods (phone calls, follow-ups) to connect with their patients. This market dynamics posed a bigger threat to the established business model of HealthcareCo and therefore put indirect pressure on HealthcareCo to the adoption of digitally enabled business models. As a countermeasure HealthCo revamped itself digitally through what's app, emails, and SMS from traditional phone call follow-ups to respond to pressure from startup labs. Similarly, TextileCo was concerned about the new printers who were performing both designing and cutting activities on customers' designs. To counter this, TextileCo purchased

high precision machines to counter pressure from low cost & budget start-up printers. This evidence supports inference from Haffke et al. (2016), who mentioned that the digitalisation pressure coming from competitors' adoption and demonstration of new digital capabilities brings disruption to established business models, consequently influencing the move toward DT.

Further, Davenport (1993) mentions complying with customer requirements versus controlling costs as two conflicting aspects organisations attempt to attain through technology. It was observed that the organisations had *internal business pressures* (of cost, revenue, margins) and digital was seen as a remedial countermeasure to that. The BuildCo executive mentions the internal pressure to improve EBIDTA. Similarly, TextileCo and ChemCo encountered a significant reduction in their revenues due to the pandemic (from XX% to YY%); they were looking at the technology innovatively as a remedial measure for the reduction of costs. This is in line with Roumani (2016), who mentions that digital transformation brings cost efficiencies to organisations. Along similar lines, the HealthcareCo focused on operational process improvement by bringing transparency in the operations with the understanding that many stakeholders will like a transparent system for numerous reasons. Similarly, HealthcareCo had a lesser footfall of patients in specific healthcare categories due to lockdown during the pandemic regulations. Because of this, the patients could not travel to the hospitals. As a remedial action to this, HealthcareCo attempted to create a new patient connect app (Barrett et al., 2015) to enable remote connectivity of patients with doctors and enable sustained revenue through their operations. On the other side, the patients, too, were impacted by a collection of test reports because HealthcareCo had printed as a prevailing methodology for patient reports. This posed competitive challenges, too, as the newer healthcare labs were offering online reports. For mitigation to this, HealthcareCo opted to digitise its imaging system completely to provide reports and images digitally to patients.

As mentioned by Nambisan et al. (2017) and Yoo et al. (2010), it was observed that the organisations had their *internal aspiration* to move towards and perform activities digitally. This internal instinct was for orienting innovation through digital technologies for proactive utilisation of technology for strategic business purposes. This was evident in terms of the use of digital technologies for experimenting with new offerings or automating existing business practices (Proctor, 2017). As Mocker and Fonstad (2017) mention, it was evident that the

organisations had the aspiration to explore what technology could bring to them towards digitally enhancing their products, services, or building new digital offerings. The organisations continuously evaluated what technologies were available in the ecosystem and how they could benefit from them. Also, how they could use prevailing technologies to effectively address the perennial business problems. This proactive utilisation of technology was simultaneously being planned to complement the business strategy (Kane et al., 2015). For example, CementCo attempted to remove the intermediaries from transportation planning, through new supplier portal. For AutoCo, the motivation was to be an early adopter of technology. Similarly, in ChemCo, this motivation was instigating the organisation to offer bigger ideas toward business needs. One another driver of the internal motivation of digital transformation was work from home culture, a new concept to all the case organisations. As the TextileCo executive mentions, working from home aided people with more time; hence, digital got focused on many dimensions.

The **internal organisational inspiration** for digitalisation was also motivated by *management's interest in digital differentiation*, who were themselves oriented to make their organisation digital. Almost in all the cases, the top management team demonstrated a strong interest in digital differentiation; hence, digital got importance. The AutoCo executive mentioned management's vision to introduce digital to the "DNA" of the organisation. Similarly, TextileCo, the consultant discussed digital as a push rather than a pull from the board. The CementCo executives articulated that management understood well that being digital was about new ways of doing business. As the management demonstrated an interest in digital differentiation, this resulted in more digital options evaluation at the organisations. The management's push in DT is a novel observation of this study which is not mentioned in academic literature yet. Further, not only limited to the executive management, the affinity towards digital was observed at lower organisational levels also. As Hofstede et al. (2010), organisational culture is the collective mental programming that distinguishes members of one organisation from others. Overall, the culture of the organisations was getting adopted where employees were motivated to solve their business problems using digital technologies. The CementCo executive mentions about employees' motivation for digitally solving a problem. HealthCo executive mentioned digital as demand from people. Similarly, at AutoCo production engineers' utilised AI and ML at different workstations to bring accuracy,

efficiency and flexibility to their production processes (Porter, 2014; Netheler et al., 2018). These observations are in line with Piccinini et al., 2015, who emphasise on digital technologies' use for personalised and contextual offerings.

As Berghaus and Back (2017) mention, the key aspect of adopting DT is enabling organisations to be digitally ready for quick adoption of environmental changes. **The unplanned external exigencies** had a significant impact on promoting the DT across organisations. Organisations facing regulatory changes are pushed to modify their business models through the adoption of digital technology. These are the forces that compel organisations to act in the areas of innovation, customer focus, and supplier collaboration to meet a variety of needs. The external exigency was prominently observed in all the case organisations where the organisations facing regulatory changes were pushed to modify their business practices through the adoption of digital technology (Wessel et al., 2020). The legal and regulatory guidelines pushed the adoption of digital tools for organisational compliances (Feroz et al., 2021). For example, the case organisations had to conform to changing compliances of digital invoicing and reconciliations as a part of goods and service tax (GST). For which they adapted to application programming interface (API) based systems for real time integration with GST portal. This was clear evidence that organisations reorient and enhance their dynamic capabilities (Karimi & Walter, 2015). One of the most important factors noted further was the Covid 19 pandemic, because of which the organisations had to radically change their mode of working (Xiong et al., 2021). Consequently, there was a sudden emergence of a strong need for online collaboration platforms and digital infrastructure. Further, with the increased digital presence in their own and external space, the organisations had concerns over data exposure and application security. As a preventive measure, case organisations were rolling out compliance with information security and data sharing policies (Kagermann et al., 2013) to safeguard their organisations against perceived risks.

The social contribution was another aspect that motivated organisations to adopt digital. This was most evident in the HealthcareCo, where the doctor to patient ratio was quite high. As the HealthcareCo executive mentioned that they would not be able to reach the masses until they use the technology efficiently. Hence, they were looking ahead at digital to enable their reach to a maximum number of patients. Similarly, it was observed that the organisations also had social initiatives running as a part of their corporate social responsibilities (CSR) for their

social sustainability (. For these initiatives also, the digital technologies are aimed at conducting the programs more effectively. One novel observation emerged from HealthCo where the executive mentioned about tax savings on the purchase of Digital Assets. Therefore to avail of this benefit, HealthCo decided to invest in digital infrastructure. This implementation of DT and inspiration of tax-saving by investing in digital infrastructure was a new observation as the driver of digital transformation, which is not listed in academic literature yet.

To summarise, it was observed that to go digital, organisations were under immense pressure emerging from a wide variety of factors, such as collaborating with customers and external partners effectively, widening the business magnitude, integrating operational processes, enhancing and improving products and services, concerns from market disruptions and fundamental shifts in the business models. The organisations attempted to address these multidimensional enquires through digital technologies. This phenomenon was not just limited to distinct technology strategies but the much broader combination of unique business strategies to effectively exploit the opportunities presented by digital technologies (Hai et al., 2021). Consequently, the drivers for the digital transformation traversed from a lot of organisational perspectives such as making better customers connect, operational process automation, efficiency improvement through advanced manufacturing processes, establishing real-time partnerships, enabling analytics-based decision making, improving product quality, making the workplace employee-oriented, reduce costs, improving margins and regulatory compliances.

The organisations realised that the interactions with customers have changed from linear to multichannel in the digital era. Consequently, their focus changed to identifying the newer ways to lure customers and to distribute consistent offerings and experience throughout the customer's journey. To achieve this, they relied upon digital technologies as the platform enabler and integrator for multilevel interactions. Similarly, value was attempted to generated through real time interaction of suppliers through digital portals. In all the cases, the organisations relied upon digital technologies to improve their core competencies & scale, while in one case (HealthCo) the organisations also went ahead to complement their existing revenue streams with new digital initiatives (Verhoef et al., 2021). Further, as digital technologies are known for their interlinking architecture, the organisations focus on

targeting multiple uses from the same set of digital applications. This interlinking flexibility aided the organisations for customising & scaling the achieved benefits across multiple departments, simultaneously, with very low marginal cost of implementation. This way, the organisations successfully integrated siloed functions using digital technologies. An interesting fact observed was that unlike traditional times when the organisations were relying on labor and resources only, the synergies now are being attempted via the exchange of information through connected digital networks. This aspect further aggravated the need to adopt digital. Further, the organisations attempted to improve their decision-making capabilities by reliable and resilient analytical systems. This is practical evidence that DT is a multidimensional phenomenon that extends beyond just the enterprise information systems (Zhu et al., 2006) and impacts business strategy. In addition to above, the organisational quest for inventing something radical or scaling up was observed and they considered redesigning their business models digitally to leverage minimal investments, operational cost effectivity and agility offered by digital technologies. The organisations were cautious of their social feedback and internal talent retention. They were motivated to foster digital-oriented culture, which was important for employee behaviour and to achieve their digital transformation goals (Leischnig et al., 2017). In addition, management's support and push were also observed to be one of the most important factors driving DT initiatives (Delone & McLean, 2003). This was instrumental in terms of providing the guidance, strategic direction and necessary budgetary resources for implementing DT. More specifically, it was observed that by gathering, integrating, and commercialising complementary and heterogeneous technological expertise, the organisations were becoming better prepared to master the digital transformation of their businesses (Hildebrandt et al., 2015).

Another interesting observation of the study is that there was a consistency observed in the presence of the same drivers across all case organisations. However, the intensity of the driver varied across case organisations. More specifically, the driver's importance varied across the organisations, but they were present in some form or the other. For example, for HealthcareCo major driver of digitalisation was external exigency due to covid pandemic; however, for CementCo and AutoCo major driver was their internal aspiration; at the same time, for TextileCo and BuildCo, it was more towards business innovation and process improvement.

The next section presents the role of the chief information officer in DT. The section deliberates upon the empirical analysis of how the CIOs contributed to DT initiatives.

5.3 Role of CIO in Digital Transformation

The next research question was to explore the role of the CIO in DT. This research question had the objective of building an understanding of the practical aspect of the role of the chief information officer in digital transformation.

El Sawy et al. (2016) mention that many factors may impact the successful implementation of the DT programme, but the skilled and competent leadership is most influential. As the operational and strategic reliance of business on IT has increased, the IT Leader has been increasingly accepted as a part of the executive team (Capitani, 2018). As the applications portfolio of an organisation reflects the strategic priorities of the organisation, similarly, how the organisation has chosen to position itself on IT's strategy is determined by executive attitudes toward IT investment and the role of the CIO (Ross, 1999). As gradually, DT takes over a considerable part of organisational IT, this understanding from Ross (1999) holds equally true in context of DT. To delineate it further, this section discusses the empirical observations on the role of CIOs to DT.

In the case organisations, firstly, it was observed that all the case organisations realised the importance of DT and have made DT initiatives their strategic priority. Right from competitive pressure, customer demands, employee push, and legal compliances to pandemic push, many factors were emulating the need for digital transformation for the case organisations. Leveraging digital technologies, the organisations intended to innovate better ways of doing business. Next, the CIOs were being relied upon to bring his digital-oriented transformations into the business. Here it is imperative to mention that all the case organisations had CIO's as formally responsible for leading DT and there were no CDO positions at the case organisations. The increased organisational orientation to implement DT confirms the general academic understanding that DT is getting significant attention in industries, and organisations are transforming their business models across digitally oriented processes (Schallmo et al, 2020; Chawla and Goyal, 2021). In the simplest form, CIO being the head of IT is considered responsible for implementing DT. To understand how CIOs contribute to DT, the empirical investigations were conducted as a part of this research. The CIOs were

observed to be contributing to DT through seven key roles, *Business & Functional Integration*, *Communication*, *Conformance*, *IT Governance & Operations management*, *People Management*, *Strategic Management* and *Technology & Innovation*. These were further delineated to their respective subcategories, representing the granular level contributions. The findings are presented in Fig. 5.4, that elaborates the role of CIOs in the context of DT.

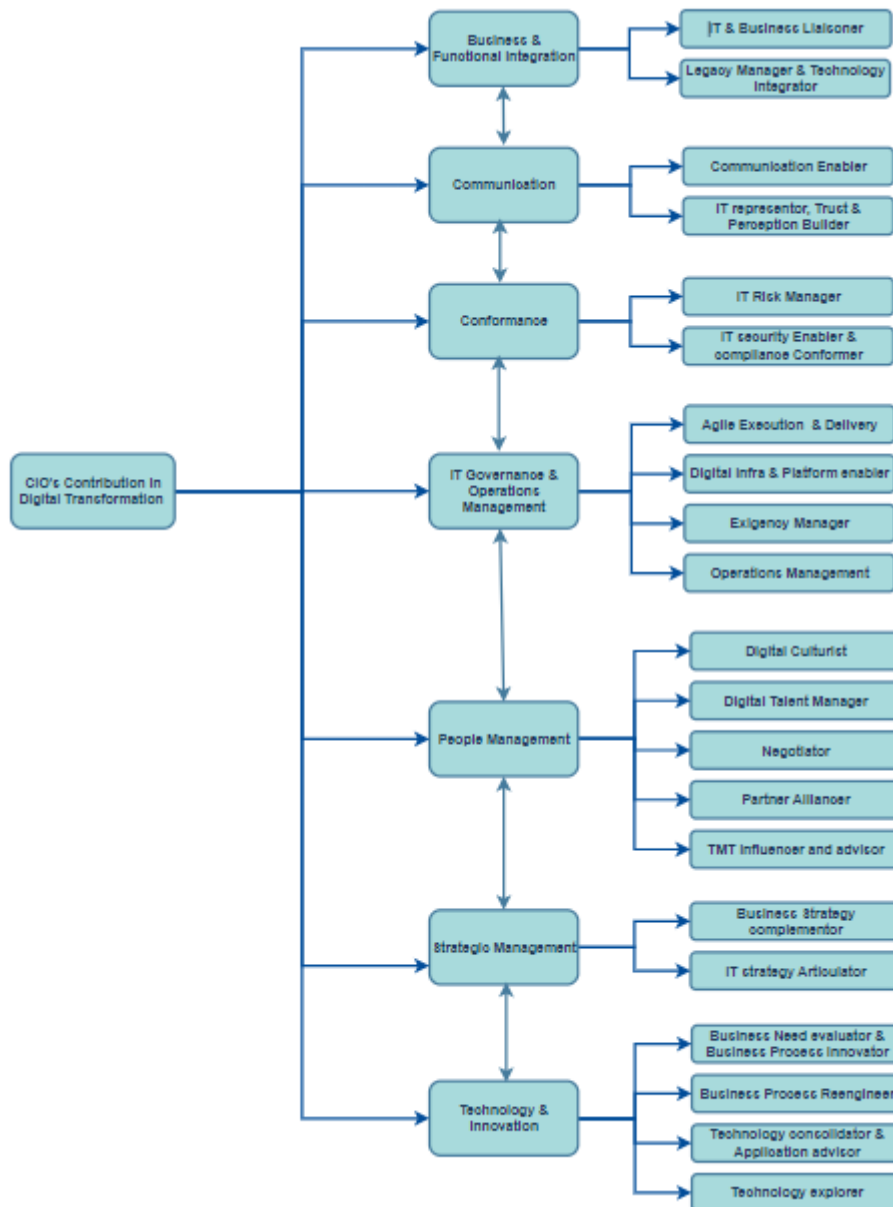


Figure 5.4: Derived roles of Chief Information Officer

Acting as **business and functional integrators**, the CIOs came out of departmental boundaries to break the organisational silos, connected closely with the C suite peers and set up cross-

functional teams to connect directly with business users (Smaltz et al., 2006) to make decision making and delivery agile for digital initiatives. That way CIOs acted as *IT & Business Liaisoners*. Since DT is a collaborative initiative, trust among business functions becomes a significant factor in accomplishing success. Greater collaborations between IT and business are required to bring better synergies among these functions (Tan and Gallupe, 2006). To build trust and to ensure commitment at all levels, CIOs need to win the confidence of the stakeholders, which demands the CIO's political activeness.

As Peppard et al. (2011) discuss that in the organisations where the business leaders own the strategic exploitation of IT, the CIOs plan suitable technology for IT's compliance with corporate strategy. This becomes important specifically in the context of DT. Managing multiple legacy applications becomes cumbersome at the later point as with time the legacy applications become complex. Managing these applications pose functional challenges (Dhasarathy et al., 2020). However, digital applications have to rely on legacy applications for valuable historical data. At the same time, management of new applications platforms becomes critical for future. Therefore, the application consolidation becomes a prerequisite for implementing DT. Acting as *legacy manager and technology integrator*, the CIOs have to architecture the digital applications to ensure the reverse compatibility. The automobile CIO mentioned that his team designed different applications to address various business needs on a single digital platform. That way, these applications on a single platform were much more manageable. The CIOs were also observed to be centric on the deployment of applications. Moreover, as the business avails plenty of IT applications, these legacy applications become the base for running core business operations over time (Thoomkuzhy and Thangiah, 2020). But these applications were originally designed to support structured business processes that cannot handle the large quantity of data generated by digital technologies. Moreover, the legacy applications cannot meet the real-time analytical requirements to act fast to suit modern-day customers' needs (Seth, 2021). Therefore, the new digital applications need to be integrated with the legacy applications to churn out historical data to present insightful information. Consequently, successful DT demands CIO's IT management capability to *integrate the legacy resources* using multiple connectors. But practically, Traditional IT infrastructure-based processes are unable to meet the demands of digital technologies. So it is important to upgrade and integrate the legacy systems with digital technologies. All the

case CIOs acknowledged keeping the design compatibility aspect as an essential consideration while the selection of DT applications and evaluating synergies that these integrated applications will bring to the business. This was also because of the fact that legacy applications formed the base for the longitudinal data for digital applications to generate insightful information. Further, it was observed that many business processes were reengineered by adding digital components to baselined legacy applications. In summary, CIOs strongly acted as *legacy integrators* and promoted cloud-native architectures to ensure the synergies among legacy and digital applications in the most effective way for business. This aspect of the CIOs role is the novel observation of this research which is not much discussed in the prevailing literature on DT.

Communicating and engaging plays an instrumental role in implementing DT (Chen and Wu, 2011), therefore CIOs leverage **communication** in establishing DT. Establishing the effective *communication* channels across the organisation is CIO's primary responsibility. It was observed that all the case CIOs leveraged their communication skills to foster faith in IT's abilities. Hunter (2010) mentions that CIOs establish robust governance mechanisms and win necessary business support by captivating the backing of CEOs (*strategic IT partnerships*); it was observed that the textile, cement and automobile CIOs structured communications through the top executives (managing director) to make it more influential. The CIOs innovatively established new communication channels to bring agility and establish efficient connecting mechanisms within and outside the organisation. The cement CIO established a unique platform to conduct sales meetings remotely; the healthcare CIO established a new mobile app for patients to connect with doctors; the automobile CIO created a new supplier portal for advance shipping notifications and demands to vendors.

Acting as trust & perception builders, the case CIOs were explicitly oriented to build trust with peers by setting up department level weekly meetings where they represented ongoing digital initiatives, addressing the operational issues, and discussing the new initiatives. For the successful implementation of DT, it was observed that the CIOs fostered organisation-wide collaborations to build inter-unit relationships (Li et al., 2018).

Attaining strategic importance entails variety of aspects for CIOs as many factors integrated contribute to the success in strategic measures.

Further, ensuring **Conformance** to IT security standards is a vital responsibility of CIOs for implementing DT. The insecure digital applications can lead to potential IT security and data privacy issues causing monetary and reputational damages to the organisations (Jain & Shanbhag, 2012). Therefore *risk management* becomes critical to CIOs implementing DT. The digital applications generate and share a lot of data within and outside the organisation. This aspect of DT makes it prone to potential IT security vulnerabilities, making it a core attention point for CIOs (Feng and Wang, 2019). All the case organisations had an IT security manager positioned under the CIO, responsible for ensuring the *IT security compliances* and to ensure application security, information confidentiality and integrity (Solomon and Chapple 2005). Further, the case CIOs regularly directed their teams to ensure compliance through updating the latest patch level, updating firewall settings, user access management. Additionally, the HealthCo CIO engaged external consultant's audits for the new applications before deployed on production environment for real time business use. The CIO of the automobile case implemented governance risk and compliance tools to start tool based authorisation controls. Similarly, HealthCo CIO also implemented secured application access and two-factor authentication systems to ensure authorised access to digital applications and further was planning to implement ISO 27001 to comply with system standards. ChemCo CIO communicated the compliance requirements through a periodic mailer to all the employees to make them aware of Do's and Don'ts. Similarly, BuildCo CIO created and implemented password sharing and data protection policy to restrict data sharing on company's devices. In summary, it was observed that all the case CIOs were proactively involved in IT security and they were giving priority attention to IT security and compliances.

Governing the digital projects and operations is equally if not more critical to the success of digital transformation endeavours. CIOs are accountable for establishing effective **IT governance and operations management** practices. While on one side, digital technologies continuously challenge the prevailing business practices, but at the same time, the digital technologies carry the risk of faster obsolescence. Therefore, acting with agility becomes essential to respond back to the market turbulence. Acting as *agile project executors and delivery managers*, CIOs observe the technology pace astutely and adjust the implementation pace to ensure that anticipated business benefits are achieved within stipulated timelines. In another aspect to bring business flexibility through technology, Earl & Feeny (1994) suggest

that the technology must be flexible to support the business to act quickly to the market disruptions. From both perspectives, the CIOs in the case organisations were observed to be promoting agility in multiple ways. They designed the flexible IT infrastructure by selecting virtualised methods and promoted the cloud-based deployments for faster infrastructural availability and scalability (Morton et al., 2018). Furthermore, they (automobile & healthcare CIOs) adopted agile & DevOps practices in application design and project management. In the cement case, the methodology adopted was not exactly agile, yet the emphasis of the CIO was on application agility. As the CIO narrated that they were using a methodology that was not exactly agile, but custom built to suit their situation. In most of the scenarios, the digital applications being developed were new to the business domains itself. Therefore, application failure *risk mitigation* was another perspective of the CIOs to choose implementation in sprints by adopting agile practices.

A robust infrastructure is pivotal for hosting both legacy and digital applications. Pervan (1998) mentioned the criticality of IT infrastructure as a management issue. Duncan (1995) elaborated on IT infrastructure flexibility as an important consideration for planning technology architecture and human resources. While flexible IT infrastructure is considered more valuable but planning and budgeting for this infrastructure becomes contextual because of its organisational specificity. The CIOs are yet regarded as responsible for planning and monitoring the IT infrastructure for the organisations to enable DT. Hence acting as *digital Infra and platform manager* they have critical responsibility of establishing and managing infrastructure for DT. Further, since DT applications are necessary to be made *agile* (Sambamurthy, Bharadwaj & Grover, 2003), CIOs promptly consider other aspects such as scalability and schedule to plan the digital infra cost-effectively. Peppard et al. (2011) suggest that CIOs are responsible for establishing IT capabilities to enable organisations to leverage IT effectively. Further, Smith (2003) mentions CIO's responsibilities shift more towards IT Infrastructure and architecture with more organisational adoption of IT in strategic aspects. However, On the contrary, in this research, it was observed that though the CIOs were concerned about managing their existing infrastructure and data centres, they were focusing more on strategic aspects of DT than IT Infrastructure. This might be because of the fact that DT demands agility and scalability. The cloud deployment of digital applications offers both of these and additionally better uptime, resulting in eases on infrastructural aspects for CIOs.

Accordingly, all the case CIOs were considering the deployment of the digital application on the cloud in some way or the other. Interestingly, in two cases (automobile and cement), it was learnt that CIOs migrated the legacy applications to the cloud to get away from the ageing infrastructure.

Next, it was observed that acting as *IT operational managers*, CIOs established robust *governance* mechanisms to support business as usual (BAU) operations and took complete ownership of technological aspects of operations (Weill and Woerner, 2013). With digital upgrades, business cycles are becoming more agile (Peppard, 2010). The CIOs emphasised decentralised IT governance with business teams to turn IT projects into business projects. For this, they made IT a part of business units (Weill, 2004). Specifically, the newly implemented digital applications demanded extended support from business users; the CIOs set up mechanisms to quickly and effectively address their concerns to make DT efforts more user oriented (Dery et al., 2017). The cement CIO mentioned, "*We need to effectively govern our operations so as to ensure that it takes least of our efforts and cost so that the team gets bandwidth to focus on new initiatives*". Further, in line with Kohli & Johnson (2011), it was observed that in the healthcare case, the CIO restricted the IT organisational structure to effectively govern the digital initiatives where the task level accountability was allocated to team members. An insightful inference of the discussion so far is that the CIOs, by virtue of their business understanding and robust technology orientation, CIOs build a shared vision to complement the digital business strategy and enforce *robust governance mechanisms* for the execution of the strategic initiatives (Grover et al., 1993).

In terms of application design capability too, digital applications entail high risk due to numerous reasons such as scope creep, design compatibility issues, shifting business demands, infrastructural issues, and high cost of development and maintenance (Westfall, 2020). Contributing towards *IT governance and operations management*, the case CIOs innovatively devised governance mechanisms across application design and deployment that best fit the organisational environment to mitigate these risks. They adopted novel ways such as promoting engagements with start-ups (being cost-effective and agile), arranging technology partner's visits to demonstrate the digital offerings to functional heads, and prototyping of functionality with low threshold costs (Capitani, 2018). Also, the CIOs devised innovative contracting models (such as the percentage of saved cost-sharing) and negotiated

extended post-implementation support with their technology partners (Mazumder & Garg, 2021). Further, the automobile case CIO mentioned adopting a multi-cloud strategy to ensure seamless application availability to business. The cement CIO mentioned adopting complete redundancy of network devices and bandwidth providers to ensure uptime through automatic switching. Some of the cement plants and sales offices were in remote locations with frequent connectivity issues. Similarly, the healthcare CIO had set up a complete disaster recovery (DR) plan and a DR remote site.

The culture of the organisation is a powerful influence in the adoption of DT (Kabra et al., 2017). Building learning oriented culture for adoption demands astute **people management** skills of CIOs. Organisations have to adjust their structures and values to inculcate and adapt to digital-savvy culture (Kane et al., 2017). However, while exercising this, organisations encounter practical difficulties because the culture is complex. The cultural changes take time and cannot be done overnight. Acting as *digital culturists*, CIOs create a culture of learning to continuously improve the proprietary knowledge of the organisation (Burchardt and Maisch, 2019). For this, they foster open learning culture by providing access to digital platforms where the employees can learn through experimentation with digital technologies (Urbinati et al., 2020). The case CIOs were well acquainted with their organisational culture, the prevailing practices, working environment and pace of technology adoption. They mentored their teams and inspired the employees to experiment with technology. Further, they promoted fail fast and learn thinking to encourage risk-taking and innovation for the organisations. The cement CIO organised an innovation hackathon to build the digital culture where organisation-wide ideas for business innovation were invited. Other CIOs, too, carefully orchestrated the change management practices encouraging the adoption of digital processes. Since the employees form a strong base for cultural adoption (Berman & Marshall, 2014) the CIOs focused on their cultural adoption by organising training on new technologies, sending targeted communications to motivate employees to participate in DT initiatives and setting up self-service kiosks for the business users. Automobile CIOs implemented the internal social media platform "JAM" to encourage design thinking and innovation. Mostly, it was observed that, that CIOs considered technical and behavioural issues in change management by using impulsive communication to persuade the users to adapt to new digital ways of working slowly and firmly.

Further, it was noticed that considering organisational factors, CIOs innovated novel ways to improve the technical competencies of the corporate workforce (Dery et al., 2017) acting as *talent managers*. The CIOs encouraged the organisational workforce to experiment with digital technologies for bringing increased adoption and success of DT initiatives. To achieve this, they maintained connections with the functional and operational workforce. In two cases (cement and automobile), the CIOs also set up cross-functional teams to induct their team members into business teams to understand the business issues to build a better perception of IT. In all cases, in order to build a trustworthy and reliable perception of IT, the CIOs ensure that a good connection is established between business and IT and that the digital projects are delivered on committed timelines.

As discussed above, DT requires significant inputs from business users, therefore negotiating the best resources is essential. Enns et al. (2003) mention that leveraging trustworthy relationships eases resource negotiations within the company. The CIOs leveraged their networks to *negotiate* competent resources. Interestingly, it was observed that the business executives were also keen to be a part of IT's governance as they too realised that strategic IT opportunities could not be availed in isolation without business collaborations (Hunter, 2010). However, the healthcare CIO mentioned having concerns in negotiating the business resources, and consequently, this resulted in challenges in delivering digital projects.

Further, DT demands niche skills that are not readily available in the marketplace. The CIOs depend on partner support to bridge the skill gap. Further, to stay abreast of technology trends CIOs build social relationships with technology partners (Chen & Wu, 2011), suppliers and customers. They act as *Partner Alliancer* to build close alliance with partners to bring synergies across DT initiatives. Moreover, many times, the DT initiatives themselves demand extended collaborations with customers and suppliers (such as customer relationship management and supplier relationship management collaborations); hence the relationships become crucial for CIOs to implement these initiatives (Wu, Chen & Lin, 2004).

Broadly covering organisational strategy, procedures, processes and talent, DT must be end-to-end. This means that the entire process, from ideation, and board approval to execution, should be agile. Consequently, the **Strategic Management** for both IT and business becomes critical for CIOs. CIOs build a radical and transformative digital vision that influences the business strategy. The case CIOs leveraged the insights from TMT to orchestrate and align the

digital strategy (Banker et al., 2011). To contribute strategically, CIO's access to TMT is essential. In all the research cases, it was observed the bidirectional and closely synchronised relationships between CIOs and TMT members. The relationship with TMT brought tactical business information to CIOs, leveraging which the CIOs planned the digital business strategy. Attaining strategic importance entails variety of aspects for CIOs as many factors integrated contribute to the success in strategic measures. It was observed that CIOs accorded success in their strategic initiatives leveraging many of the above discussed aspects. For instance, the CIOs were educating and influencing the TMT on various DT aspects such as technological advancements, solution proposals, competitors' insights on technology, and the operational status of ongoing digital initiatives in the organisations (Smaltz et al., 2016). By virtue of this the CIOs were acting as *TMT influencer and advisors*. All the CIOs were part of strategic business planning and executive steering committee meetings where acting as *communicators* they shared the digital vision with other executives. They leveraged these meetings as *negotiators* to accord the buy-in and support of executives to achieve success in the DT initiatives. This research's observation in this context is in line with Grover et al. (1993) and Preston et al. (2008), who argue that CIOs attain structural power from TMT interactions, and these interactions influence the strategic contribution of CIOs across organisations. This was quite evident in the automobile and cement case, where these CIOs attained more importance from TMT as compared to another case CIOs and successfully delivered many digital initiatives. At the same time CIOs acting as *TMT educators* share the upcoming technology trends and advancements with TMT members to keep them up to date (Preston et al., 2008). Although the TMT's awareness about digital transformation is foremost required, this precondition is sometimes not met. The healthcare CIO had a relatively low level of TMT involvement, and leading DT initiatives posed more challenges to the CIO. Further, in the same case, it was observed that senior executives considered IT just as a business utility to provide cost-effective IT services, and hence CIO had relatively low strategic contributions. This is in line with observations of Weill & Woerner (2013) and might be due to TMT's unawareness of the benefits of digitalisation.

Preston et al. (2003) propose that CIOs should have a foundational knowledge of business processes to enable organisational innovation through technology. Further, Smaltz et al. (2006) argued the need for CIOs to possess particular industry-specific skills. All the case CIOs

attained a strong understanding of business processes much ahead of foundational level knowledge. The CIOs got accustomed closely to the business practices to understand the minute aspects of the business. This was primarily because to promote digitalisation, the CIOs need to have an in-depth understanding of processes and prevailing practices to accurately pinpoint where digitalisation would be most effective for business (Chen & Wu, 2011). This, in practice, might sometimes be challenging for the CIOs and sometimes results in ego clashes and conflicting priorities. As observed that the HealthCo CIO had to prominently collaborate and coordinate with peers (primarily doctors) to attain functional knowledge, who, being the organisation's core competency, possessed more structural powers than the CIO. Hence, it posed practical difficulties for business collaborations to the HealthCo CIO. On the contrary, in all other cases, CIOs had close business peer collaborations, which might be because the business had already gotten accustomed to digital business practices and the associated benefits. Learning from these peer collaborations, CIOs *communicate* in the business language to astutely bridge the understanding gap and negotiate budget and resources more effectively for the business (Gerth and Peppard, 2020). At the same time, CIOs possess solid technical competencies and lead and govern digital initiatives possessing this. Hence, with the combination of business and IT skills, CIOs innovate with digital technologies to frame organisational strategy and tap the market opportunities (Singh and Hess, 2017). To contribute effectively in the digital era, CIOs need to raise technology from an enabler to a core competency (Sebastian et al., 2017). They must think boldly and creatively but iteratively implement their ideas. They must be diligent and creative in order to disassemble and reassemble their own ideas in order to alter the organisation's offers through digital innovation.

Further, As Valentine et al. (2014) mention about the board's attention is changing in the digital economy from being largely on financial and legal issues to IT governance becoming a crucial component of corporate governance. However, achieving this, in practice, is not easy as the business executives may not correctly assess the benefits that can be derived from the technology. In the absence of adequate information, the business executives may not pinpoint the focus areas where technology can add value to the business. Failing to do so, technology becomes an expense for them (Reich & Benbasat, 1996). The other extreme is when the business expectations are too high from DT, which are not feasible to be

accomplished in practice (Kettinger et al., 2011), leading to mistrust between IT and business. The CIOs act as *IT strategy articulators* for setting up right understanding, expectations and delivery from IT for business functions. The ChemCo CIO moderated to set the expectations of board for selection and reporting for regulatory requirements. Similarly, AutoCo CIO consolidated ancillaries' data on the same platform by building mutual trust and a common understanding of data sharing on transport portal.

Building competitive advantage from DT is the core focus area of business (Chun & Mooney, 2009). Therefore, responsibilities towards **Technology and innovation** make an integral part of CIOs role to DT. CIOs foster innovations through IT to make DT an integral factor in an organisation's growth. To complement this, they act in multiple roles such as *business need evaluator and business process innovator, business process reengineer, technology consolidator and application advisor and technology explorer*. The health care CIO innovated a solution to digitalise the patients' records and enabled its access to doctors remotely during Covid pandemic. Also, the cement CIO evaluated the business need and in accordance set up a new communication channel for enabling online meetings between sales managers to dealers. Similarly, the automobile CIO reengineered existing process to a new supplier portal to foster collaborations among the partners for just in time (JIT) deliveries of materials. Evidently, for all these cases, the CIOs innovated new business processes (Chen & Wu, 2011) or reengineered prevailing business processes (Ross & Feeny, 1999) using digital technologies to achieve process efficiency, customer connections or operational improvements.

As Xie et al. (2021) argue, digital technologies have brought significant advancements in increasing productivity in manufacturing. Therefore, *technology consolidation* has become a critical part of the CIO's role under DT. Masuda & Viswanathan (2019) discuss the need for different enterprise IT architectures to align digital technologies such as big data, IoT cloud, and mobile with business. The CIOs are responsible for building the enterprise IT architecture (EITA) to bring technological advantages through DT (Gong and Janssen, 2021). The application selection becomes quite a crucial aspect of EITA. Acting as *application advisors*, CIOs had clearly defined guidelines and formulated policies on the technological landscape permitted for their organisations. These policies acted as a ready reckoner for the purchasing team, technical team and associated technology partners. It was observed that the CIOs acting as *technology explorers* were personally involved in technology selection for the

emerging digital business needs. Further, they selected the digital technologies based on strategic fitment to EITA rather than conserving themselves on cost benefits only (Singh and Hess, 2017).

To explore collaborative partnership opportunities, CIOs should analyse the entire value chain (Seth, 2021). In the case organisations, the CIOs maintained strong relationships with technology partners, customers and suppliers and leveraged these relationships to build their knowledge about technological advancements and trends. This tacit knowledge was then utilized by the CIOs for evaluating and baselining the technological trends at their organisations. Hence, this aspect also enabled the CIO's contribution as *application advisors*. The CIOs also aimed at strengthening their professional network by attending to various technical events organised by the technology partners. As the healthcare CIO mentioned, these events present insightful information and sectoral trends. In the same context, the cement CIO initiated technology collaborations, which was the first in-country, with one of the very reputed international vendors for designing the analytical dashboards. Most importantly, as Earl & Feeny (1994) suggest, it was observed that CIOs learned about others' success and shared these success stories with their business to instigate management's interest in digital technologies.

To summarise the discussion above, the current day CIO role has transformed itself historically from being viewed as an IT manager to the functional head and strategic partner by establishing credibility among C suite leaders (Haffke (2017); Ross and Feeny, (2003). The strategic power of IT is becoming increasingly critical in the digital era (Bharadwaj et al., 2013), adding additional dimensions to the role of the CIO. Chun and Mooney (2009) argue that these dimensions are competing and conflicting, indicating that the CIOs role is versatile. The CIOs continue to focus on maintaining IT Infrastructure and optimisation of IT costs as their traditional responsibilities while concentrating prominently on strategic business aspects in collaboration with other business leaders (Roscher, 2021). This cross-functional collaboration has extended the role of CIOs from department managers of a nonvalue-adding function to business-level strategists (Bharadwaj et al., 2013). Consequently, this strategic contribution has also raised business expectations from CIOs. Therefore, CIOs, in the digital era, need to master both supply and demand-side leadership aspects (Chen et al., 2010). In the context of DT specifically, the immediate attention is shifting to the development of digital business

strategy and its execution to derive better business value. With the incessant shift of organisations to digital business models, the CIOs role is expected to be more business-oriented and will significantly orchestrate more strategic aspects. This was quite visible in all the case organisations where the CIOs were leveraging the digital technologies for innovating and transforming the business processes and simultaneously formulating the forward-looking digital business strategy.

Ives and Olson (1981) argue that CIOs have differentiated responsibilities that need a focused and distinguished study compared to the general manager. In the present study's opinion, this holds equally true in DT's context of the CIO's contribution. This study investigated the dominant aspects of the CIO's contributions to DT at the organisations. Although the performance of the CIO is highly contextual to many factors (Hütter & Riedl, 2017), there are some most essential tasks required to be performed by CIOs while implementing DT successfully. The seven traits as the amalgamation of roles and core responsibilities that CIOs contribute to foster DT at their workplace were evaluated and presented. It was observed that there is no single role that CIOs can perform to accord the success in DT; rather, to be effective, the CIOs have to wear different hats and act in multiple roles simultaneously.

After presenting the drivers and CIOs contributions, the next section presents the understanding on addressing the practicalities of implementing DT.

5.4 How can the organisation attempt a successful digital transformation?

As discussed in the literature review (section 2), DT is an organisation specific contextual phenomenon. This was evident in this research also. The case organisations used their own unique techniques to try DT, and there was no commonality in their approaches to implementing DT. This was also because they had their own unique motivations to drive DT, and hence the intensity of drivers acting on them to attempt digital transformation was different.

Whilst acknowledging the specificity of the phenomenon (Fletcher and Griffiths, 2020), the attempt of this study is to draw a general framework that can be utilised by the organisations as an approach to attempt DT successfully (Research question 3, Section 1.2). The below-presented approach is based upon the empirical observations (as a part of this study)

complemented with literature guidelines from academic and consulting publications. As just stated, the framework completely comprehends the fact that the DT has to be organisation specific and therefore presents a generalised approach that, irrespective of industry or organisation type, can be fitted invariably into the organisation specific context. Therefore, it is suggested that the organisations should deliberate upon their specific details in this model for a better insightful approach towards DT.

As discussed in section 5.3, when the organisation embarks on a digital transformation journey, it must maintain daily operations such as client service, product delivery, order processing, and logistics (Bowersox et al., 2005). As a result, it is critical to ensure that digital transformation does not interrupt prevailing processes (Fitzgerald et al., 2014). For this, CIOs acting as operations managers ensure that the business applications are up and running for business-as-usual continuity and at the same time new platforms are integrated with operational processes for enabling handshaking for DT (section 5.2). Withstanding the two aspects, first the legacy applications and second the digital initiatives, comprehensively, this model conceptualises bimodal IT (Mingay and Scott, 2017) for implementing of DT. The model suggests a strong mechanism established for managing prevailing IT (Mode 1) practices that are traditional and predictable (Kähkipuro, 2018) at the organisations. The innovation & Business Integration Oriented initiatives intended for DT are recommended to be implemented following Mode 2 (elaborated further in this section). As Spremic (2017) mentions that organisations with more developed IT governance are better prepared to tackle digital transformation and determine which strategies are most effective. The author further argues that whereas IT governance initiatives are more internally focused, primarily with the goal of aligning with current business processes, the Digital technologies are externally oriented, enabling outstanding digital services and heightened customer experience while disrupting the entire business model and changing organisational culture. Hence, to be implemented successfully, the digital transformation necessitates strong IT governance to facilitate business activities (Hafeld et al., 2022). Therefore, as noted in section 5.3, a matured internal IT governance makes the organisations a stronger candidate, and better prepares them for initiating and attempting DT successfully.

Having established the context for a stronger IT governance mechanism (Mode 1) as a prerequisite for the implementation of DT, the discussion from hereon will focus on

granularities within Mode 2. The framework elaborates the approach to accomplish DT in four consecutive and iterative phases assessing *digital maturity*, *determining digital ambition*, *strategising digital* and *governing digital*. These are elaborated further. The consolidated approach is presented in Fig. 5.5)

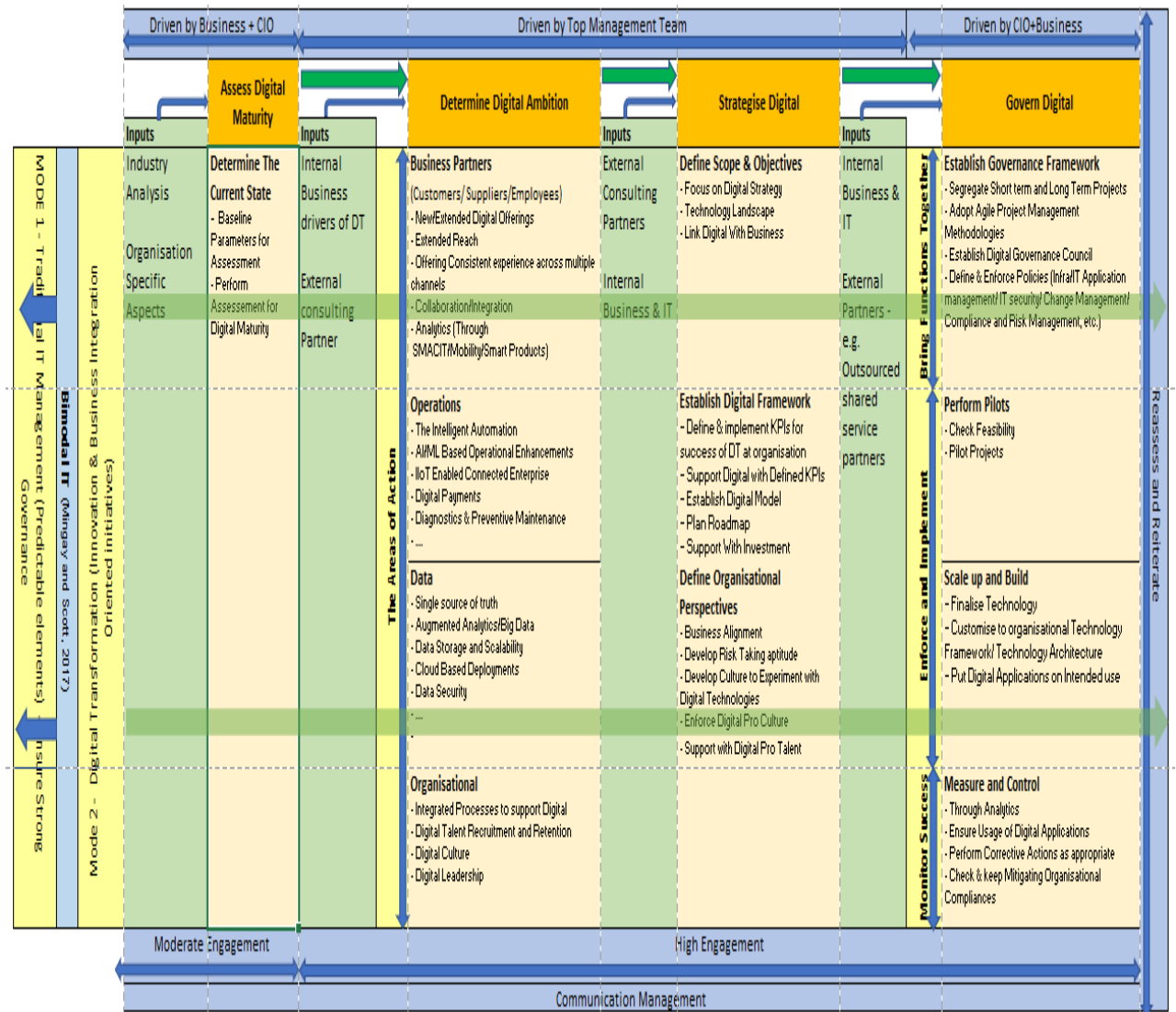


Figure 5.5: A holistic approach to Digital Transformation

Step 1 - Assess Digital Maturity

The first step focuses on an overall assessment of the present status of digital maturity. The focus at this point should be to assess the current business status in terms of digital initiatives and processes (Rossmann, 2018; Remane et al., 2017). To evaluate the present digital capabilities, organisations can utilise frameworks such as Strength, Weakness, Opportunities

and Threats (SWOT) analysis to more emphatically do the self-assessment of internally oriented capabilities to the organisation. In addition to SWOT, the assessment dimensions can also include social, technological, economic, legal, political and environmental. To better assess their digital maturity, the organisations should do exploration on digital presence of the other organisations in their own or similar business domains (Rossmann, 2018). The organisations should conduct research and provide facts to back up their assertions. As noted in Section 5.2, examining market dynamics, competitor information, and locating references of the firms that have gone through a process similar to the one envisioned can be baselined for stating the process. Further as discussed in Section 5.3, the CIOs can be quite instrumental in this assessment by leveraging their business relationships and IT insights. At the same time being central point of discussion with TMT CIOs can act as facilitators for correctly articulating potential organisational dimensions towards DT (Section 5.2). The insights can be drawn from competitors also by assessing their digital landscape. The organisations should clearly demarcate the factors (digital dimensions) on which comparison is made.

Next, as noted in section 5.2, the organisation should be able to identify the current difficulties and/or potential areas that are significant to the organisation as a result of this phase's activities. As the outcome of this step, the organisations should clearly consolidate the digital dimensions, their assessment of the present-day maturity status on those dimensions, and also the flaws or gaps across those dimensions. The ownership of assessing digital maturity should lie with business, and IT functions together and may be supported by an external digital consulting partner.

Once done thoroughly, this outcome becomes the baseline to determine the digital ambition of their digital journey.

Step 2- Determine Digital Ambition

Given the abundance of digital technologies accessible, understanding how some of these digital offerings will truly benefit the organisation is quite significant (Kirill, 2021). Therefore, once the digital maturity assessment is done and dimensions are baselined, the organisations should determine their digital ambitions. This means critically brainstorming and evaluating where they want to be in the digital landscape and how they plan their business to be complemented through digital (Rich, 2017). The organisations may consider the dimensions

evaluated in Phase 1 and add any new dimension that they want to consider for their digital presence. As a first step to accomplish this, it is suggested to consider the business's most pressing concerns and connect them to innovative techniques (Section 5.2). Next, examine newly accessible techniques to determine how they might open up new possibilities (Section 5.2). Implementing a new CRM business application, for example, may result in more relevant analytics, which could result in higher conversion rates. The organisation should be able to identify the current difficulties and/or potential areas that are significant to the organisation as a result of this activity.

As elaborated above, the digital ambition dimensions will be highly contextual to the organisations. However, for simplicity of presentation, the model presents four such dimensions as *business partners*, *operations*, *data* and *organisational*, as these were the most prominent dimensions observed during this research (Section 5.2). The table 5.1 presents the details of these four dimensions and their sub-dimensions. Against each dimension, sub-dimensions are presented. Under the sub dimension, sign "(...)" denotes that there could be more organisation specific sub-dimensions that can be considered. In practice, organisations should critically evaluate all their digital ambition dimensions. Further, it is suggested that this activity should be done in iterations till there is no significant addition or deletion from the list and the maturity of digital dimensions is achieved.

Table 5.1: Digital dimension and Sub dimensions

Determine Digital Ambition	
Dimensions	Sub-dimensions
Business Partners (Customers/ Suppliers/Employees)	<ul style="list-style-type: none"> - New/Extended Digital Offerings - Extended Reach - Offering Consistent experience across multiple channels - Collaboration/Integration - Analytics (Through SMACIT/Mobility/Smart Products) (.....)
Operations	<ul style="list-style-type: none"> - The Intelligent Automation - AI/ML Based Operational Enhancements - IIoT Enabled Connected Enterprise - Digital Payments - Diagnostics & Preventive Maintenance (.....)
Data	<ul style="list-style-type: none"> - Single source of truth - Augmented Analytics/Big Data - Data Storage and Scalability - Cloud-Based Deployments - Data Security (.....)
Organisational	<ul style="list-style-type: none"> - Integrated Processes to support digital - Digital Talent Recruitment and Retention - Digital Culture - Digital Leadership (.....)

Determining the digital ambition can be quite a difficult task in practice as it entails developing the guiding principles based on a holistic understanding of the business landscape and technology offerings. As noted in Section 5.3, the CIOs can turn out to be quite instrumental for articulating the digital ambitions by providing insights on the prevailing technological offerings through their network. The organisations can also turn out for experienced digital consulting partner support. The academic literature offers several approaches in this context. For example, according to Ross et al. (2016) the organisations must select a focus area - customer engagement or digitised solutions to channelise their efforts toward DT. The authors further suggest a strong IT operational backbone for strategy execution which is supported by agile digital services. As noted in section 5.3, These agile services are further build up through continuous organisational redesigning, addressing structures, systems, roles, partnerships and skills that are required for the execution of digital strategy. Similarly, Nylen and Holmstrom (2015) argue that digital technologies possess common features such as flexibility and reconfigurability, unpredictability and fluidity, that have the capability to drive uncoordinated business problems. Further, digital technologies constantly improvise themselves toward better processing capability and speed with lower prices. Therefore, as discussed in section 5.2, the use of these digital technologies should not only be limited to internal process improvements but also to enhance and adapt digitally enabled business models.

Specifically, this research observed that the need for DT was not originating only from any specific domain, such as customer or operational domains, but the needs were being generated holistically across all functions and organisational dimensions. Under the influence of this observation and considering the highly dynamic landscape of DT from a practical perspective, this research's developed model does not confine to any specific domain for implementation of DT. Therefore, the suggested model recommends a holistic approach instead of confining to specific directional efforts. This is also because of the well-established fact that DT impacts almost every dimension of business. Therefore, as noted in section 5.2, it is very important that all the business functions should contribute integrated for the overall success of the organisation.

In summary, the digital looking businesses must plan to merge existing business competencies with new capabilities enabled by digital technologies, which gradually becomes their

distinctive competency and difficult feat to duplicate. To achieve this, the organisations must critically understand and analyse their specific drivers of digital transformation under the prevailing technological continuum. The ownership of driving digital ambition should lie with the top management team (TMT) and may be supported by CIO and/or an external digital consulting partner.

Step 3 - Strategise Digital

In order to successfully carry out the digital transformation, Weill and Woerner (2018) emphasise the significance of having a clear digital strategy and leaders willing to encourage inventions and change. Organisations must start by clearly defining the scope and objectives of their digital transformation journey. The emphasis should be on the strategic aspects of how the digital can complement the business rather than technology at this point. Less mature digital organisations focus on tackling discrete business challenges with specific digital technologies, whereas more mature digital firms focus on integrating digital technologies and employing a coherent and unambiguous digital strategy (Kane et al., 2016). Technology is indeed an important part and consideration for DT (Section 5.2) that needs appropriate attention (Heavin and Power, 2018). But, as noted in Section 5.3, focusing more on technology and less on strategy perspective slows down the speed and effectiveness of the digital transformation efforts. A ready reference approach facilitates quick decisions on these aspects. Especially, scalability and infrastructure considerations are crucial in making strategic decisions about digital technology implementation and CIOs are responsible for planning both of these (Section 5.3). Large amounts of data are required for digital transformation. Keeping everything on hard drives becomes both costly and unreliable. Before moving on to innovation, businesses must determine whether to use cloud computing or on-premise hosting (Vanessa, 2021). Furthermore, all digital activities should have the ability to expand. It would be better to analyse what else needs to be added to this.

Therefore, as mentioned in Section 5.3, it is suggested to establish a strong foundation of IT governance through an agreed-upon technology framework at the organisation. This framework should then be used to build and scale digital capabilities. Further, it is recommended that the DT should be strategized holistically across the organisation. This means that organisations should not conserve themselves to any specific perspective such as

customer or operations. It is best that the strategy should be broad, covering all the aspects to complement the business digitally.

Further, as mentioned above, the technology landscape forms a considerably significant part of digital transformation strategy. This means that, business should not only focus on implementation of buzz technology, which would be fading away (Chanas et al., 2019). Instead, the digital strategy should concentrate on making smaller but equally important changes with sustainable and established technologies. Further, strategising the organisational perspectives, including the organisational culture, forms a very important of digital strategy (Section 5.2). The digital strategy should always be started from the top and then worked the way down (Seth, 2021). According to Valentine et al. (2014), in the digital economy, the board's purpose is shifting from members having a primarily financial and legal focus to digital becoming an integral part of corporate governance. The CEO should have a clear vision for the company's future and know how to communicate these goals to the rest of the staff. Digital education and project implementation for radical corporate change using technology for communication, task management, and client support. Therefore, the TMT should be at the forefront of DT strategy development. The CIOs support to TMT and other business executives turns out to be foremost instrumental to strategise DT (Section 5.3).

As Teece and Pisano (2003) discuss, the organisations cannot shift their business strategies and markets overnight due to technological advancements. It is a gradual process based on continuous testing and analysis. Further, this perspective is unique to each organisation, depending on its current status, positioning, client relationships, and stage of digital maturity. Therefore, as noted in Section 5.3, a strategic roadmap to digital transformation is necessary, which is complemented alongside with the enterprise IT architecture. The digital transformation roadmap should orchestrate a clear quantification on what the organisation is attempting to achieve (Schwartz and Davis, 1981). For this it is recommended that the KPIs should be defined to promote the digital transformation (Schrage et al., 2022). Further, from an investment standpoint, digital ventures necessitate judgemental decision making. TMT should make strategic decisions about digital budgets (Section 5.3). Internal projects should be replaced with external initiatives that have a broad influence on core value propositions. These value propositions are then gradually converted to projects for execution, and the organisations need a strong talent pool for execution supported by a pro digital culture for

adoption. Therefore, both mentioned aspects, talent and culture, should also be duly strategised from the organisational perspective.

Another important aspect of mature IT governance is a mutually respectful relationship between the CEO and the CIO (Vugec et al., 2017), who represent the business and IT alignment (Section 2.4.1). As De Haes and Van Grembergen (2009) mention about the support for strategic IT initiatives comes from the top, with top executives encouraging technology and strategic priorities. Further the authors elaborate that this is usually attempted with a multiple ways such as fostering adaptable and flexible IT infrastructure, gradually but steadily changing organisational culture toward exploration with technology, taking risks, and building talent. A trusting and respectful CEO-CIO partnership brings top-level backing for strategic digital initiatives, cultivating strategic technological initiatives with a broader external reach, facilitating adaptable and flexible IT infrastructure, and a gradually but steadily changing organisational culture towards exploration form technology, experimenting and taking risks, and building talent for tacit organisational knowledge (Section 5.2). Therefore, it suggested that the organisations attempting DT should focus on managing the CIOs relationships with C level leaders to harness better synergies.

To summarise, as Kane et al. (2016) mention that a well-thought-out strategy, rather than technology, is what propels digital transformation. Therefore, the organisations should astutely craft their digital strategy to complement their business. Once strategized next it becomes necessary to prioritise the initiatives while selecting and executing projects. This aspect is elaborated in step 4 (Governing Digital) further.

Step 4 - Govern Digital

When the organisation decides on the best strategy to expand and drive digital transformation, it's unavoidable that the approach will be drawn out by various stakeholders with opposing opinions (Seth, 2021). Each stakeholder may wish to promote his own vision. Few of the suggestions may have valid business grounds, but these ideas might be incompatible with an ideal digital transformation that focuses on integrated company visions and strategies. Any digital endeavour can be derailed by a lack of clarity about who owns which decisions about content, architecture, information design, platforms, and other aspects. Because of the lack of transparency surrounding decision-making, the DT journey

might take additional time and costs than expected (Spremic, 2017). Therefore, as proposed in Section 5.3, the organisations need to have a strong digital governance framework.

This research's model suggests setting up a formal mechanism to govern digital transformation through the establishment of a centralised organisational unit as the digital governance council (DGC). The broader objective of establishing DGC is to be bringing cohesiveness, centricity, and uniformity across the organisation for digital governance effectively. It is suggested that DGC should comprise the best-in-class team members from all business verticals with an objective of leading, representing and implementing digital across the organisation (Section 5.2). The DGC subsequently acts as the steering committee to establish consistent rules, policies and compliances, including the IT infrastructural aspects for governing the digital projects. More importantly, the DGC members act as opinion leaders both ways, to represent their department and as the opinion leaders for the digital initiatives.

For effective governance, the model suggests a bimodal IT approach; mode 1 represents the business as usual support for IT, while mode 2 represents the approach to address and govern more business integrated digital initiatives. But despite being following bimodal IT, the model proposes a cohesive fitment of both modes to the organisational IT architecture. Data security is just as critical, if not more so than DT implementation (Zhang and Hon, 2020, Thangavelu et al., 2020). Organisations should guarantee that all IT security rules are followed to the letter. Before coming up with innovative approaches, it should be made sure that the compliances are completely informed with the privacy legislation. Therefore, following the bimodal architecture, this is also critical to ensure that the compliance and guidelines to central IT functions such as infra and IT security are universally applicable and aligned to both the modes.

It is recommended that DGC should come up with both large-scale transformation plans and small scale initiatives focused on specific pain points. Charting these plans separately will support in taking prioritisation decisions. Though, the DGC team does not have to limit itself to any one aspect. Still, it's important to take things one step at a time when it comes to execution and concentrates on holistic transformation over time. As noted in Section 5.3, the CIOs can take up this responsibility of prioritisation in discussion with business executives. The organisation can grow in any direction, but it's crucial to decide which one will be the top priority at any given time for the implementation of digital projects (Weill and Woerner,

2018). Once the projects are shortlisted, and started, the project management should be owned by individual project managers from concerned business departments. To address the technological aspects, the project governance is to be complemented by related information technology consultant as the functional team (Section 5.3). Agile and Kanban based tools of project management are suggested to be used for faster implementation and clear tracking of projects (Shrivastava & Rathod, 2019). It is suggested to start from smaller, high-value delivery projects for faster achievements and to build the confidence of the stakeholders.

Further, digital projects are new in many aspects (Matt and Hess, 2015), and most of the time, there is no learning curve developed for these. Moreover, digital, by its very nature, promotes experimentation with technologies (Section 5.2). Consequently, digital projects carry a high level of risk of failure (Dokuchaev, 2020). Piloting digital initiatives reduces the risk of failure many times (Seth, 2021). Therefore, it is suggested that the organisations may engage start-ups to bring agility and cost-effectiveness to the digital initiatives while at the same time reducing the risk of big bang failures. Also, the pilots may support for finalisation and fitment of technology as per enterprise IT architecture. Once the pilot is successful, the organisations can quickly scale these pilots up for implementation at full fledged larger scale and put the digital applications to business use. As discussed in Section 5.3, the CIOs through their partner network evaluate agile partners and promote piloting.

As suggested by Guinan et al. (2019), the success of digital projects is potentially dependent on the project team's delivery. Therefore, the governing team becomes one of the most important considerations for overall digital governance. More importantly as the resources of DT are considered knowledgeable, they possess high marketable skills. Therefore, they need to be kept motivated. Also, to foster better team collaboration, the team members should be encouraged to share their experiences (Seth, 2021). That way, the team members can contribute their viewpoints or concerns that the organisations may not have considered. Each team member of the digital transformation team should be assigned a particular role. And project governance methodology must plan regular meetings with the entire staff.

Additionally, the DT governance system must ensure that the set KPIs are implemented. This must be supported by defined metrics and other established methods for tracking progress (Yamamoto, 2020). The organisations must ensure to take corrective actions put the digital applications on the track where ever the measured ROI is below expected returns. The DGC

can be instrumental here also to address and channelise any business or IT side issues to set. Further, simultaneously with monitoring success, it is important to ensure that the organisational compliances are appropriately controlled. Therefore, the organisations need to make monitoring and control an overlapping activity for all phases of their digital projects.

Effective communication is the key to success in the implementation of DT. The communication should be very effective and should be designed to establish a connection with all the stakeholders of organisations (Papavasiliou and Gorod, 2022). The model suggests consistent communication throughout the implementation of this framework. However, the intensity of communication may vary in the context of the phase the organisation is in while implementing DT. The model proposes starting with moderate communication in the first process and scaling it to high engagement in the rest of the steps. However, this again is organisational specific; say, some organisations who are absolutely new to the DT may want to begin with high engagement communications initially. More importantly, ensuring consistent and influential communication is a must for the success of digital initiatives. As noted in Section 5.3, the CIOs can orchestrate effective communication mechanism all across the organisations to effectively govern digital initiatives.

Finally, as mentioned earlier, implementing DT is an iterative process that demands continuous reassessment and adjustments. It is not a one-time activity. Therefore, the model suggests that the entire implementation process should be continuously recalibrated and readjusted as per organisational dynamics. Gradually as the implementation processes are set and stabilised, the organisations will have a better probability of success in achieving their digital transformation.

Having discussed the aspects of three research questions set up as part of this research, this section from here on will consolidate the findings.

5.5 Conclusion

To summarise the discussion, the primary purpose of this study was to gain a thorough grasp of the notion of digital transformation by identifying drivers, the role of the CIO and building a suggestive model for implementing DT successfully at the organisations. An inference that is presented through this research is that, unlike the earlier times, when the businesses were

defensive in taking giant leaps, DT has entirely transformed the business rules. Effective and innovative use of information technology (IT) has the ability to revolutionise enterprises and produce shareholder value in today's highly competitive business climate (Wynn & Williams, 2012). But DT isn't just confined to putting IT solutions in place. It should be thought of it as a complete organisational transformation that impacts all the business dimensions in a broader sense. Organisations face constant impacts through their internal and external business environment that influences their competitive situations. To survive, businesses rely on and switch to innovative solutions through digital technologies. They tend to capitalise the technological developments as an opportunity for advancements in their customer offerings, efficient operations, Internal organisational processes and establishing new business models.

The chief information officers (CIO) as the head of IT traditionally, are considered responsible for bringing digital transformation to the organisations. But the role of CIOs is itself transforming at a fast pace under the influence of digital transformation to comply with the pace of change of DT. The CIOs now need to take bold steps to play forward and tap the technological opportunities. They must comprehensively redesign IT offerings innovatively alongside equipping the organisations with suitable technologies and infrastructure to facilitate faster experimentation and agile implementation of digital technologies to foster real-time advantages for business.

Further, it was observed that the case organisations devised and adopted their own approaches to attempt DT, and there was no common approach across the organisations. This empirically confirms that DT is an organisation specific phenomenon and must be customized to best fit organisational requirements. Notwithstanding the high organisation specificity about DT, this research attempts to build a model for guiding the organisations for implementing DT. The model aims to present a consolidated and cohesive approach for organisations that can be custom fit into their context. The proposed model suggests attempting DT in four iterative steps, starting with assessing the current capabilities, evaluating, and benchmarking the digital ambition, strategising digital in collaboration with business to achieve the digital ambition and governing the digital efforts to ensure success in digital transformation endeavours. Overall, the model attempts to simplify the phenomenon of DT and to rationalise the practicalities for increasing the success rates in the digital

transformation endeavours. The research has several implications. These are being presented in the upcoming chapter.

Chapter 6 – Conclusion, Research Implications, Limitations & Future scope of research

6.1 Chapter Overview

This research aims at contributing on digital transformation domain under the information systems field of academic body of knowledge, as well as to practice, by highlighting important aspects of digital transformation in the organisations. The study delineates on the importance of drivers of digital transformation and illustrates the ways in which CIOs can contribute to DT for their digital transformation. Additionally, each section provides useful information for practitioners undergoing or preparing to undergo a digital transition as well as unique theoretical implications for information systems research.

This chapter discusses the implications, limitations, and future scope of research. The theoretical implications are discussed first. This is followed by the practical implications. Finally, the chapter presents the limitations and future scope of research.

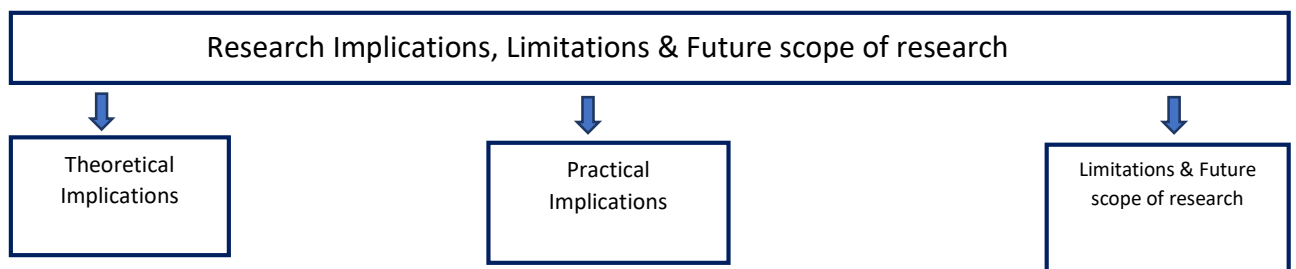


Figure 6.1: Overview of Chapter

6.2 Theoretical Implications

This study contributes to the current body of knowledge by synthesising the literature of DT, examining the drivers of DT, role of CIOs in digital transformation, and developing a suggestive model to implement DT. The academic implications are bring presented below followed by the practical implications in section 6.2.

Firstly, the study evaluates the progression of research under digital transformation domain. Through the literature review it synthesises a large body of knowledge under DT. As the literature under DT is fragmented (Chawla & Goyal, 2021), the study consolidates the

literature to act as a ready reference repository for researchers. By consolidating the literature, the research present insights on the current status of research, critical future trends and different school of thoughts to equip the IS researchers to delineate on key focus areas for digitally transforming the organisation. Next, the study derives the research areas and emerging research streams to present a clear inclination of the directions where the academic research under the overall domain of DT is progressing. A vibrant representation of research areas facilitates the researchers to explore the research domain of their choice. As more and more digital technologies and their applications keep emerging, the DT researchers can enlarge these research steams pertaining to their area of interest in the DT's subdomains.

Next, the research explores the drives that make organisations digitally transform. Building this understanding is important to identify and channelise the preadoption process at multiple levels in the organisations. With the clear understanding of these factors the acceptance and success of DT can be influenced (Netheler, 2018). For this, four overarching dimensions as *business innovation and process improvement*, *business sustainability*, *internal organisational aspiration* and *unplanned external exigencies* are evaluated. These represent the main reasons for the organisations to change the business models with the adoption of digital technologies, thus, enrich the extant literature by setting the base for further exploration. It was observed that external exigencies emerging from legal regulations and unplanned factors (e.g. COVID -19) became prominent push to drive DT during the recent times. Further, the external exigencies got readily enforced in the organisations because of compliance pressures and because of non-availability of workarounds.

The identification of the drivers also puts forward a different perspective to the researchers to understand the disruptive phenomenon and fast changing organisational progressions under the influence of digital technologies (Stentoft et al., 2019). At the same time, understanding the fundamental factors allow businesses, individuals, and even institutions to influence the digital adoption process effectively and constructively. More importantly, evaluating the drives is also important to set the expectations and check the fitment of technologies to the digital strategy of business. The upcoming researches can explore on the causality of these factors. Knowing the influencing factors will also permit the organisations to develop their risk mitigation plans beforehand. The research can explore on these aspects longitudinally to explore if identification of drives minimises the risk of failure of digital

projects. Additionally, organisations should create employee engagement strategies by being aware of these components in advance because they play a key impact in the success of DT (Osmundsen et al., 2018). Future studies may examine the best ways to develop DT through successful staff involvement. The evaluated drivers present multiple organisational dimensions ranging from organisational motivation, organisational sustainability, and external exigencies. The findings of the analysis also serve as the foundation for the developing the fundamentals for the organisational shift to digital transformation, which the research can further expand in different organisations.

Further, the study presents unique insights about how CIOs contribute to DT. The study depicts that the leadership is more critical in the digital era than ever. The digital era puts leaders to the test every day. While traditional CIO roles (e.g., strategic alignment, IT governance, or people management) outlined in the literature (Haffke et al., 2016; Singh and Hess 2017; Sebastian et al., 2017) are still relevant, the DT context adds some new responsibilities and nuances to the CIO role which are not very prominently discussed in literature. For instance, it was observed that due to the ever-expanding gamut of technology (e.g., cloud, IoT, analytics, AI, ML, blockchain), the issue of the technology landscape and enterprise architecture (Kar & Thakurta, 2021) is taking prominent attention for CIOs. As these new technologies are still emerging and are often supplied by different vendors, the CIOs focus more on collaborative value co-creation.

Also, old established business processes become inflexible over time and pose a bottleneck to digital processes (Van Looy, 2021). However, the granularities of this are not expanded under prevailing research. The research demonstrates that CIOs maintain a fine balance between keeping legacy applications sustained for business operations and scaling up on new digital applications. The upcoming research can explore on when and how the CIOs should optimally make a decision on retiring legacy. The study further demonstrates that digital has posed new challenges for CIOs by uplifting organisational expectations from them. This has opened many new attributes to CIO roles under DT. The research unveils these dimensions and enriches the academic literature with granular level tasks that CIOs perform. The findings reveal that CIOs are now expected to lead, collaborate, adapt, inspire, and find win-win ways within and outside their administrative boundaries. These requirements often put the CIOs in dilemmas where the CIOs have to choose from conflicting requirements such as short-term

vs long term, automation vs manual orientation, build vs buying (Seth, 2021). The CIOs have to balance these tradeoffs. Hence the transformation from manager to leader has become imperative for the CIOs in the digital era. This fast pace of change has some negative sides also, case CIOs discussed issues of obsession, anxiety and sometimes depression which are essential to be managed. The upcoming research can explore and suggest on these challenges and how should the CIOs approach these issues. Similarly, their non orientation on DT creates challenges for CIOs. Despite the TMT's view towards DT, the fact remains that they hold a strong structural power. The upcoming research can dive down further on how should CIOs manage and leverage the TMT to succeed in their DT endeavours.

6.3 Practical Implications

This research also has potential practical implications. Management models are growing increasingly complex as organisations embrace new-age technologies in the digital era. The older organisational processes become inflexible and inefficient with time and pose multiple challenges to the organisations. Managerial attention becomes a crucial element for comprehending these impediments. Managers must not only keep up with technology advancements but also hone their management skills in order to effectively manage practical disruptions that happen during the digital transformation process specifically. This study equips practitioners to outline essential emphasis areas for a successful transition to digitally enabled organisations by providing useful insights on empirical aspects of DT.

The literature has dealt extensively with ambiguities, uncertainties and hurdles around DT (Wendt, 2021; Solberg, 2020; Matt & Hess, 2015). The results of this study, in the form of a developed comprehensive framework, provide a way for the researchers in forming an effective collaborative representation to effectively manage DT. The upcoming studies can build on this systematic approach to prevent those hurdles and uncertainties emerging out of various reasons. The DT strategy for the organisation can become game changer if implemented correctly. It necessitates an accurate assessment of the underlying factors and associated risks. This study provides with a decisive approach in that direction by proposing a comprehensive framework that illustrates the path for successful implementation of DT for the organisations. The model presents a sequential approach towards implementing DT through four differentiated steps, assess digital maturity, determine digital ambition,

strategise digital and govern digital. Each of these steps in its own caters to its peculiar nuances. The model caters to implementation of DT in general which can be fine-tuned by researchers to fit in to specific organisation of interest. To establish the guidelines for each industry type, it is also possible to investigate how well this model fits with specific industry. To the best of understanding, so far, there is no such customisable model published in academic literature. As the model suggests continuous realignment to suit the organisational dynamics, the researchers can further explore on implementation approaches by baselining this model for the longitudinal studies.

The study also derives identifying stakeholder's needs and expectations as as to assess and fine tune digital technology offerings that can serve them better (Haffke et al., 2017). The organisations will be able to better focus their efforts in pertinent directions for their strategic decisions if they have a clear knowledge of the driving dynamics that lead to the adoption of DT. The study suggests that businesses should execute process reengineering (Vishvakarma et al., 2021) in accordance with their digital strategy and have a solid DT plan. Understanding the drivers will enable the organisations to align their core values for efficiency and profitability. The study provides a ready reference baseline for evaluating the drives of the organisations for the practitioners which are new to digital and are planning to implement DT. Looking at presented drivers will also provide an inclination to organisations about what is driving others to adopt DT and to expand in which direction that fits in their scenario. The organisations can also quantify their efforts once they have appropriate identification of underlying forces and plan the technology budgets with more accuracy.

Managers can secure the success of their DT initiatives by leveraging this acquired knowledge in many practical aspects, such as assessing the current organisational status of DT, strategically deciding best fit digital applications, their organisational implications, associated risks and mitigation plans, partner selection, and policy formulation. An organisation can transition and achieve its digital transformation goals by concentrating on digital leadership attributes, adaptable and scalable digital operations, digitalized customer experiences, and developing digital innovations (Leischnig et al., 2017). The study outlines the key aspects of contribution that CIOs should have to lead the adoption of DT. The study reveals that alongside other dimensions, IT security and compliance is one of the essential pillars of the process of DT in the organisations. Thus, the CIOs should set up proper governance

mechanisms to address IT security and risk compliances. The study further suggests that for setting up the appropriate governance mechanisms the digital technologies can be used for building up of interactive platforms where multiple digital applications can be managed together. Setting up these dashboards also facilitate consolidation of digital applications for CIOs decision making. Organisations often address the technical aspects but human aspects often get unattended. Because employee engagement and culture have a significant role in the success of DT (Osmundsen et al., 2018), organisations can prepare employee engagement strategies by being aware of these elements in advance. The study suggests achieving this by measurable criteria that enables the organisations to effectively create stakeholder involvement strategies.

Further, the study deconstructs the practical issues that CIOs must address to improve the likelihood of success, optimise spending, and improve the ROI of DT efforts. The research offers insights into significant areas that are and will be critical to the success of CIOs in the coming time. CIOs may develop and successfully coach others to respond to challenges and make DT a win at their workplace. The aspirants who are planning their transition to the CIO role may focus their attention on building these core skills to accord success in their endeavours. The TMT and business leaders can use these insights to encapsulate strategy to achieve business prerogatives through DT effectively and to align their IT expectations. Knowing what to expect, they can leverage this understanding to the selection of a suitable candidate for the CIO position at their organisation.

Overserving that the success rate of DT projects is low (Davenport & Westerman, 2018), this research presents framework to address DT practically. Alongside, the framework suggest empirical aspects to close the gaps that lead to the disconnect among the functions resulting in high failure rates of digital initiatives. Thus, the proposed framework presents a holistic, integrated approach to implementing DT end to end. The organisations can customise this framework as a structural approach to their DT strategy and its execution to fit in their organisational perspectives with very little modifications. Additionally, adopting this model as an approach to DT will also bring consistency and consolidation to organisational efforts. Amalgamation of the digital landscape will also build and cascade a common understanding of DT across the entire organisation rendering the removal of organisational silos. Progressively, this will bring economies of scale and scope by means of closer integration of

technological landscape and business functions and elimination of duplicate methods throughout the organisation. These aspects collectively will bring better success for the organisational journey towards digitally driven enterprises. More importantly, using this proposed framework, organisations can additionally emphasise enhancing and refocusing on their core capabilities leading to generation of new digitally driven revenue streams. In a nutshell, the study will serve as a ready reckoner for practitioners throughout their digital transformation journey, providing them with real information and useful insights to maximise the rewards of their efforts.

6.4 Limitations and Future scope of study

This study has some limitations that upcoming researchers can suitably address. The study is restricted to selected cases, and the inferences drawn are based on these cases. Although the case study method is considered the most exhaustive, it represents a subset of the overall phenomenon. This is specifically important as DT is an organisational specific phenomenon (Berghaus and Back, 2017). The case organisations were selected across automobile, healthcare, service, chemical, textile and construction. There are organisations which represent the industrial sectors beyond the selected case organisations. Further, there can be additional insights varying the case organisations or selecting organisations from different industry verticals. As DT is a vast phenomenon, it is essential to disclose some of the expected limitations of this study.

The research is based on established concept of interview based qualitative data analysis for generating the insights. The research procedure was carried out in stages and was documented. Therefore, the approach can be recognised as valid based on general standards for qualitative research quality (Keller, 2017; Marying, 2014). It is suggested to generalise the results cautiously because identical responses of the interviewees are not enough to assert general reliability. Also, the research was conducted on large size organisations. The DT perspective may vary per industry type for example, small and medium enterprises (SME) may see some potential benefits from other technologies. As a result, their drivers could be different from large scale organisations. Hence, future research should also focus on industry type and deliberate on the role of CIOs and drivers of DT to those organisations. Additionally, longitudinal studies can be carried out to assess how the drivers themselves evolve over time.

The empirical analysis in this study is based on semi structured interviews which is circumstantial. Building an analysis on from this perspective can be seen as a constraint because one cannot be certain that the interviewees had a comprehensive understanding of the subjects being studied. Hence, there is a possibility that some insights remain underappreciated. Further, though the results were triangulated with functional participants and available information in public domain, there is still a possibility for participant and hindsight bias. Future studies can thus investigate this phenomenon by using multiple responders from each department and also using multiple techniques for data collection to triangulate and strengthen the results. Future researchers may take a broader sample size covering a wide diversity of industries for a more comprehensive understanding and generalization of results.

To determine the inter-relationships among the identified drivers, the future studies can use techniques such as structural equation modelling to determine the interlinking of drivers. Appraising these inter relationships will enable deployment of cohesive governance strategies. Similarly, the research streams presented have been segregated with researcher's own understanding. Also, the citation analysis is based on the quantity it does not emphasise quality. Prior studies and data collection on the CIO role have primarily been conducted in western societies (Al-Taie et al., 2014; Hütter & Riedl, 2017). Since cultural factors and legal regulations can influence the conduct and development of the CIO role, we suggest more studies based in developing economies. There can also be longitudinal studies to analyse novel aspects such as CIOs transitioning to newer business roles, CIOs influence on ecosystem partners, their contributions on IT security & cloud infrastructure, impact of Industry-specific skills of CIOs on the success of DT and CIO role in adoption of new technologies. As there is a high failure rate of DT projects, deliberation must be done of what went wrong and how could CIOs prevent those failures.

Overall, it is observed that DT efforts are increasing in practice, and more research is recommended to provide case-based practical insights for DT users and implementation partners. It is expected to improve the success rate of DT projects. Furthermore, as observed that DT's potential benefit realisation is when it is used with interdepartmental or inter-organisational collaboration to influence the entire ecosystem. As a result, it is advised that future research include holistic organisational perspectives rather than limiting them to single

domains. In the long run, longitudinal studies may reveal quantitative revenue linkages and the effects of digitalisation on the firm's competitiveness. It is also proposed to develop a generally recognised quantitative metric to evaluate the extent of DT in diverse organisations so that the degree of DT can be compared across organisations, which has yet to be addressed in the DT research. Finally, while much study has been done on DT, its responsibilities, and applications, further research in the IT security domain is needed. This is because when it comes to the real deployment of DT, secured applications will always be the first evaluation criteria. As a result, this subject field should be investigated further in the future. Finally, it is proposed that this research be expanded upon by undertaking quantitative studies to provide more quantitatively measurable insights from the longitudinal perspective.

References

- Agarwal, R., Gao, G., DesRoches, C., & Jha, A. K. (2010). The digital transformation of healthcare: Current status and the road ahead. *Information Systems Research*, 21 (4), 796-809.
- Aghaei Chadegani, A., Salehi, H., Yunus, M., Farhadi, H., Fooladi, M., Farhadi, M., & Ale Ebrahim, N. (2013). A comparison between two main academic literature collections: Web of Science and Scopus databases. *Asian social science*, 9 (5), 18-26.
- Allen, B.(2021). A CIO's guide to making digital transformation work. Retrieved on June 12, 2021 from <https://www.ciodive.com/news/cio-digital-transformation-guide/599806>
- Armstrong, C. P., & Sambamurthy, V. (1999). Information technology assimilation in firms: The influence of senior leadership and IT infrastructures. *Information systems research*, 10(4), 304-327.
- Apogaeis (2020). Digital Transformation & the Role of a Chief Information Officer (CIO). Retrieved on June 15, 2021 from <https://www.apogaeis.com/blog/digital-transformation-the-role-of-a-chief-information-officer-cio>
- Asim, M., & Nasim, S. (2022). Modeling Enterprise Flexibility and Competitiveness for Indian Pharmaceutical Firms: A Qualitative Study. *Global Journal of Flexible Systems Management*, 1-21.
- Banker, R. D., Hu, N., Pavlou, P. A., & Luftman, J. (2011). CIO reporting structure, strategic positioning, and firm performance. *MIS quarterly*, 487-504.
- Barrett, P., Davies, F., Zhang, Y., & Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of a holistic, multi-level analysis. *Building and Environment*, 89, 118-133.
- Baryshnikova, A., & Taratukhin, V. (2017). Digital transformation framework for smart factory.
- Benlian, A., & Haffke, I. (2016). Does mutuality matter? Examining the bilateral nature and effects of CEO–CIO mutual understanding. *The Journal of Strategic Information Systems*, 25 (2), 104–126.
- Berghaus, S., & Back, A. (2017, December). Disentangling the fuzzy front end of digital transformation: Activities and approaches. *Association for Information Systems*.
- Berman, S. and Marshall, A. (2014). The next digital transformation: from an individual-centered to an everyone-to-everyone economy", *Strategy & Leadership*, 42 (5), 9-17.
- Berman, S. J., & Bell, R. (2011). Digital transformation: Creating new business models where digital meets physical. *IBM Institute for Business Value*, 1-17.
- Berman, S.J. (2012). Digital transformation: Opportunities to create new business models. *Strategy & Leadership*, 40 (2), 16–24.
- Bernard, H. R. (2017). *Research methods in anthropology: Qualitative and quantitative approaches*. Rowman & Littlefield.
- Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital Business Strategy: Toward a Next Generation of Insights. *MIS Quarterly*, 37 (2), 471–482.
- Blanka, C., Krumay, B., & Rueckel, D. (2022). The interplay of digital transformation and employee competency: A design science approach. *Technological Forecasting and Social Change*, 178, 121575.

Block Corrie, 16 march 2022 Accessed 19.06.2022 at <https://www.forbes.com/sites/forbescoachescouncil/2022/03/16/12-reasons-your-digital-transformation-will-fail/?sh=5810e7d41f1e>

Bienhaus, F., & Haddud, A. (2018). Procurement 4.0: factors influencing the digitisation of procurement and supply chains. *Journal of Business Process Management*, 24 (4), 965–984.

Bilgeri, D., Wortmann, F., & Fleisch, E. (2017). How digital transformation affects large manufacturing companies' organization.

Blackburn, M., Alexander, J., David J., & Klabjan, D. (2017), "Big data and the Future of R&D management", *Research-technology management*, 6 (5), 43-51.

Bockshecker, A., Hackstein, S., & Baumöl, U. (2018). Systematization of the term digital transformation and its phenomena from a socio-technical perspective—A literature review.

Bogers, M., Chesbrough, H., & Moedas, C. (2018). Open innovation: research, practices, & policies. *California management review*, 60 (2), 5-16.

Bouncken, R. B., Kraus, S., & Roig-Tierno, N. (2021). Knowledge-and innovation-based business models for future growth: Digitalized business models and portfolio considerations. *Review of Managerial Science*, 15(1), 1-14.

Bowersox, D. J., Closs, D. J., & Drayer, R. W. (2005). The digital transformation: technology and beyond. *Supply Chain Management Review*, 9(1), 22-29.

Boynton, A. C., & Zmud, R. W. (1984). An assessment of critical success factors. *Sloan management review*, 25(4), 17-27.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.

Bruce Rogers, 7 Jan 2016 accessed on 19.06.2022 at <https://www.forbes.com/sites/brucerogers/2016/01/07/why-84-of-companies-fail-at-digital-transformation/?sh=2e420355397b>

Brivot, M., Lam, H., & Gendron, Y. (2014). Digitalization and Promotion: An Empirical Study in a Large Law Firm. *British Journal of Management*, 25 (4), 805–818.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. WW Norton & Company.

Bughin, J., & Van Zeebroeck, N. (2017). Does digital transformation pay off? Validating strategic responses to digital disruption. In *Academy of Management Proceedings* (Vol. 2017, No. 1, p. 15155). Briarcliff Manor, NY 10510: Academy of Management.

Burchardt, C., & Maisch, B. (2019). Digitalization needs a cultural change—examples of applying Agility and Open Innovation to drive the digital transformation. *Procedia Cirp*, 84, 112-117.

Caniato, F., Gelsomi, L. M., Perego, A., & Ronchi, S. (2016). Does finance solve the supply chain financing problem?" *Supply Chain Management: An International Journal*, 21 (5), 534–549.

Capitani, G. (2018). CIO's: Drivers or Followers of Digital Transformation?. In *CIOs and the Digital Transformation* (pp. 69-83). Springer, Cham.

- Caputo, F., Cillo, V., Candelo, E., & Liu, Y. (2019). Innovating through digital revolution. *Management Decision*, 57 (8), pp 2032–2051.
- Carr, N. G. (2003). IT doesn't matter. *Educause Review*, 38, 24-38.
- Chanias, S., & Hess, T. (2016). Understanding digital transformation strategy formation: Insights from Europe's automotive industry.
- Chanias, S., Myers, M. D., & Hess, T. (2019). Digital transformation strategy making in pre-digital organizations: The case of a financial services provider. *The Journal of Strategic Information Systems*, 28(1), 17-33.
- Chawla, R. N., & Goyal, P. (2021). Emerging trends in digital transformation: a bibliometric analysis. *Benchmarking: An International Journal*.
- Chen, C., Ibekwe-SanJuan, F. and Hou, J. (2010). The structure and dynamics of co-citation clusters: A multiple perspective co-citation analysis. *Journal of the American Society for Information Science*, 61 (7), 1386– 1409.
- Chen, D. Q., Preston, D. S., & Xia, W. (2010). Antecedents and effects of CIO supply-side and demand-side leadership: A staged maturity model. *Journal of Management Information Systems*, 27(1), 231-272.
- Chen, K. and Guan, J., (2011). A bibliometric investigation of research performance in emerging nanobiopharmaceuticals. *Journal of Informatics*, 5), 233–247.
- Chen, Y. C., & Wu, J. H. (2011). IT management capability and its impact on the performance of a CIO. *Information & management*, 48(4-5), 145-156.
- Choudhury, A., Behl, A., Sheorey, P. A., & Pal, A. (2021). Digital supply chain to unlock new agility: a TISM approach. *Benchmarking: An International Journal*.
- Christensen, C. M. (1997) *The Innovators Dilemma: When New Technologies Cause Great Firms to Fail*. Boston: Harvard Business School Press.
- Christensen, C. M., & Overdorf, M. (2000). Meeting the challenge of disruptive change. *Harvard business review*, 78(2), 66-77.
- Chun, M., & Mooney, J. (2009). CIO roles and responsibilities: Twenty-five years of evolution and change. *Information & management*, 46(6), 323-334.
- Corrocher, N., & Ordanini, A. (2002). Measuring the Digital Divide: A Framework for the Analysis of Cross-Country Differences. *Journal of Information Technology*, Vol 17 (1), 9–19.
- Cortés-S. and Julián D. (2019), "Digital Transformation in Latin America – A Bibliometric Landscape of a Nascent Field," *SocArXiv 65vjq*, Center for Open Science.
- Dhasarathy, A., Gill, I., & Khan, N. (2020). The CIO challenge: Modern business needs a new kind of tech leader. *McKinsey Digital*.
- Davenport, T. H. (1993). *Process innovation: reengineering work through information technology*. Harvard Business Press.
- Davenport, T. H., & Westerman, G. (2018). Why so many high-profile digital transformations fail. *Harvard Business Review*, 9, 15.

- De Haes, S., & Van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management*, 26(2), 123-137.
- DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*, 19(4), 9-30.
- Dery, K., Sebastian, I. M., & van der Meulen, N. (2017). The digital workplace is key to digital innovation. *MIS Quarterly Executive*, 16(2).
- Deshpande, S., Hudnurkar, M., & Rathod, U. (2022). An exploratory study into manufacturing supply chain vulnerability and its drivers. *Benchmarking: An International Journal*.
- Diener, F., & Špaček, M. (2021). Digital transformation in banking: A managerial perspective on barriers to change. *Sustainability*, 13(4), 2032.
- Dokuchaev, V. A. (2020, October). Digital transformation: New drivers and new risks. In 2020 International Conference on Engineering Management of Communication and Technology (EMCTECH) (pp. 1-7). IEEE.
- Dombrowski, U., & Fochler, S. (2018, July). Servitization as a key driver for Digital Transformation of manufacturing companies' Spare Parts Service. In 2018 IEEE International Conference on Service Operations and Logistics, and Informatics (SOLI) (pp. 291-296). IEEE.
- Dougherty D. (2018). Managers fail to innovate and academics fail to explain how. *Management and Organisation Review*, 1 (1), 229-239.
- Dougherty, D., & Dunne, D. D. (2012). Digital science and knowledge boundaries in complex innovation. *Organization Science*, Vol 23 (5), 1467-1484.
- Downes, L., & Nunes, P. (2013). Big bang disruption. *Harvard business review*, 44-56.
- Dremel, C., Wulf, J., Herterich, M. M., Waizmann, J. C., & Brenner, W. (2017). How AUDI AG Established Big Data Analytics in Its Digital Transformation. *MIS Quarterly Executive*, 16 (2), 81-100.
- Dzikowski, P. (2018). A bibliometric analysis of born global firms. *Journal of Business Research*. 85), 281-294.
- Earley, S. (2014). The Digital Transformation: Staying Competitive. *IT Pro (March/ April)*, 58–60.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of management review*, 14(4), 532-550.
- Enns, H. G., Huff, S. L., & Golden, B. R. (2003). CIO influence behaviors: the impact of technical background. *Information & Management*, 40(5), 467-485.
- Enns, H. G., Huff, S. L., & Higgins, C. A. (2003). CIO lateral influence behaviors: Gaining peers' commitment to strategic information systems. *MIS quarterly*, 155-176.
- Faro, B., Abedin, B., & Kozanoglu, D. C. (2019, January). Continuous transformation of public–sector organisations in the digital era. In 25th Americas Conference on Information Systems, AMCIS 2019.
- Feeny, D. F., & Willcocks, L. P. (1998). Core IS capabilities for exploiting information technology. *Sloan management review*, 39(3), 9-21.
- Fitzgerald M, Kruschwitz N, Bonnet D and Welch M (2014). Embracing digital technology: a new strategic imperative. *MIT Sloan Management Rev*, 55), 1–12

- Feng, C. Q., & Wang, T. (2019). Does CIO risk appetite matter? Evidence from information security breach incidents. *International Journal of Accounting Information Systems*, 32, 59-75.
- Feroz, A. K., Zo, H., & Chiravuri, A. (2021). Digital transformation and environmental sustainability: A review and research agenda. *Sustainability*, 13(3), 1530.
- Fitzgerald, M. (2013). How Starbucks has gone digital. *MIT Sloan Manage. Rev.*, 54 (5), 1–8.
- Fitzgerald, M., Kruschwitz, N., Bonnet, D., & Welch, M. (2014). Embracing digital technology: A new strategic imperative. *MIT sloan management review*, 55(2), 1.
- Fletcher, G. and Griffiths, M. (2020). Digital transformation during a lockdown. *International Journal of Information Management*, 55.
- Frank, A. G., Mendes, G. H. S., Ayala, N. F., & Ghezzi, A. (2019). Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective. *Technological Forecasting and Social Change*, 141), 341–351.
- Fritze, M. P., Eisingerich, A. B., & Benkenstein, M. (2018). Digital transformation and possession attachment: examining the endowment effect for consumers' relationships with hedonic and utilitarian digital service technologies. *Electronic Commerce Research*, 19 (2), 311–337.
- Garfield, E. (1972). Citation Analysis as a Tool in Journal Evaluation: Journals can be ranked by frequency and impact of citations for science policy studies". *Science*, 4060), 471–479.
- Gerth, T., & Peppard, J. (2020). The Ambiguity of the CIO Role. In *Taking the Reins as CIO* (pp. 1-24). Palgrave Macmillan, Cham.
- Gibbert, M., Ruigrok, W., & Wicki, B. (2008). What passes as a rigorous case study?. *Strategic management journal*, 29(13), 1465-1474.
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational research methods*, 16(1), 15-31.
- Ghobakhloo, M. (2020). Determinants of information and digital technology implementation for smart manufacturing. *International Journal of Production Research*, 58(8), 2384-2405.
- Gong, Y., Yang, J. and Shi, X. (2020). Towards a comprehensive understanding of digital transformation in government: Analysis of flexibility and enterprise architecture. *Government Information Quarterly*, 37 (3).
- Gong, Y., & Janssen, M. (2021). Roles and capabilities of enterprise architecture in big data analytics technology adoption and implementation. *Journal of theoretical and applied electronic commerce research*, 16(1), 37-51.
- Gottschalk, P. (1999). Strategic management of IS/IT functions: the role of the CIO in Norwegian organisations. *International Journal of Information Management*, 19(5), 389-399.
- Gouveia, A. J., & Varajão, J. (2019). CIOCB: A framework of competences for the Chief Information Officer—preliminary study. *Procedia Computer Science*, 164, 219-224.
- Goyal, P., Rahman, Z., & Kazmi, A. A. (2013). Corporate sustainability performance and firm performance research: Literature review and future research agenda. *Management Decision*, 51 (2), 361-379.

- Griffith, D. A., & Chen, Q. (2004). The influence of virtual direct experience (VDE) on on-line ad message effectiveness. *Journal of Advertising*, 33 (1), 55-68.
- Grotherr, C., Wagenknecht, T., & Semmann, M. (2019). Waking Up a Sleeping Giant: Lessons from Two Extended Pilots to Transform Public Organizations by Internal Crowdsourcing. In ICIS.
- Grover, V., Jeong, S. R., Kettinger, W. J., & Lee, C. C. (1993). The chief information officer: A study of managerial roles. *Journal of management information systems*, 10(2), 107-130.
- Guillemette, M. G., & Paré, G. (2012). Toward a new theory of the contribution of the IT function in organizations. *Mis Quarterly*, 529-551.
- Guinan, P. J., Parise, S., & Langowitz, N. (2019). Creating an innovative digital project team: Levers to enable digital transformation. *Business Horizons*, 62(6), 717-727.
- GÜLERYÜZ, Ö., & DUYGULU, E. Can Managerial Roles and Skills Change? An Exploratory Study in the Context of Industry 4.0. *Manisa Celal Bayar Üniversitesi Sosyal Bilimler Dergisi*, 18(4), 33-48.
- Gürhan-Canli, Z., Sarial-Abi, G., & Hayran, C. (2018). Consumers and brands across the globe: Research synthesis and new directions. *Journal of International Marketing*, 26 (1), 96-117.
- Haffke, I. (2017). The implications of digital business transformation for corporate leadership, the IT function, and business-IT alignment.
- Haffke, I., Kalgovas, B. and Benlian, A. (2016). The Role of the CIO and CDO in an Organisation's Digital Transformation."37th International Conference on Information Systems (ICIS), Dublin, Ireland.
- Hafseld, K. H., Hussein, B., & Rauzy, A. R. (2022). Government inter-organizational, digital transformation projects: five key lessons learned from a Norwegian case study. *Procedia Computer Science*, 196, 910-919.
- Hagberg, J., Sundstrom, M., & Egels-Zandén, N. (2016). The digitalization of retailing: an exploratory framework. *International Journal of Retail & Distribution Management*, 44 (7), 694-712.
- Hansen, A.M., Kraemmergaard, P. and Mathiassen, L., (2011). Rapid Adaptation in Digital Transformation: A Participatory Process for Engaging IS and business Leaders", *MIS Quarterly Executive*, 10 (4), 175–186.
- Hansen, R., & Sia, S. K. (2015). Hummel's Digital Transformation toward Omnichannel Retailing: Key Lessons Learned. *MIS Quarterly Executive*, 14 (2), 51-66.
- Hausberg, J. P., Liere-Netheler, K., Packmohr, S., Pakura, S., & Vogelsang, K. (2019). Research streams on digital transformation from a holistic business perspective: a systematic literature review and citation network analysis. *Journal of Business Economics*, 89 (8), 931-963.
- Hai, T. N., Van, Q. N., & Thi Tuyet, M. N. (2021). Digital transformation: Opportunities and challenges for leaders in the emerging countries in response to COVID-19 pandemic. *Emerging Science Journal*, 5, 21-36.
- Hauser, D., Paolacci, G., & Chandler, J. (2019). Common concerns with MTurk as a participant pool: Evidence and solutions. In *Handbook of research methods in consumer psychology* (pp. 319-337). Routledge.
- Haverkort, B. R., & Zimmermann, A. (2017). Smart industry: How ICT will change the game!. *IEEE internet computing*, 21(1), 8-10.

- Heavin, C., & Power, D. J. (2018). Challenges for digital transformation—towards a conceptual decision support guide for managers. *Journal of Decision Systems*, 27(sup1), 38-45.
- Hedman, J., & Henningsson, S. (2015). The new Normal: Market cooperation in the mobile payments ecosystem. *Electronic Commerce Research and Applications*, 14 (5), 305-318.
- Heilig, L., Lalla-Ruiz, E., & Voß, S. (2017). Digital transformation in maritime ports: analysis and a game theoretic framework. *Netnomics: Economic research and electronic networking*, 18(2), 227-254.
- Henfridsson, O, Mathiassen, L., & Svahn, F. (2014). Managing technological change in the digital age: the role of architectural frames. *Journal of Information Technology*, 29 (1), 27-43.
- Henriette, E., Feki, M., & Boughzala, I. (2015). The shape of digital transformation: a systematic literature review. *MCIS 2015 proceedings*, 10), 431-443.
- Heslop, B. (2019), December19. A brief history of digital transformation. available at <http://www.supplychainbeyond.com/a-brief-history-of-digital-transformation/> (accessed on 26th March, 2021).
- Hildebrandt, Björn, Andre Hanelt, Sebastian Firk, and Lutz Kolbe. "Entering the digital era—the impact of digital technology-related m&as on business model innovations of automobile oems." (2015).
- Hinings, B., Gegenhuber, T., & Greenwood, R. (2018). Digital innovation and transformation: An institutional perspective. *Information and Organization*, 28 (1), 52-61.
- Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online readings in psychology and culture*, 2(1), 2307-0919.
- Horlacher, A., Klarner, P., & Hess, T. (2016). Crossing boundaries: organization design parameters surrounding CDOs and their digital transformation activities. 22nd Americas Conference on Information Systems (AMCIS), San Diego, CA.
- Holmström, J. (2022). From AI to digital transformation: The AI readiness framework. *Business Horizons*, 65(3), 329-339.
- Huang, M-Ch., Yen, G.-F., & Liu, T-Ch. (2014). Re-examining supply chain integration and the supplier's performance relationships under uncertainty. *Supply Chain Management: An International Journal*, 19 (1), 64–78.
- Huang, G., Liu, Z., Van Der Maaten, L., & Weinberger, K. Q. (2017). Densely connected convolutional networks. In *Proceedings of the IEEE conference on computer vision and pattern recognition* (pp. 4700-4708).
- Hunter, G. (2010). The chief information officer: A review of the role. *Journal of Information, Information Technology, and Organizations*, 5(1), 125-143.
- Hütter, A., & Riedl, R. (2017). Chief information officer role effectiveness: literature review and implications for research and practice. *Chief Information Officer Role Effectiveness*, 1-30.
- Ilvonen, I., Thalmann, S., Manhart, M., & Sillaber, C. (2018). Reconciling digital transformation and knowledge protection: a research agenda. *Knowledge Management Research & Practice*, 16 (2), 235-244.
- Ismail, M. H., Khater, M., & Zaki, M. (2017). *Digital business transformation and strategy: What do we know so far*. Cambridge Service Alliance, 10.

- Ives, B., & Olson, M. H. (1981). Manager or technician? The nature of the information systems manager's job. *MIS Quarterly*, 49-63.
- Jha, A., Sharma, R. R. K., & Kumar, V. (2022). Critical success factors for open source innovation in pharma industry: learning from two case studies. *The TQM Journal*, (ahead-of-print).
- Jiang and Katsamakos (2010). Impact of e-book technology: ownership and market asymmetries in digital transformation", *Electronic Commerce Research and Applications*, 9 (5), 386-399.
- Jocevski, M., Arvidsson, N., Miragliotta, G., Ghezzi, A., & Mangiaracina, R. (2019). Transitions towards omni-channel retailing strategies: a business model perspective. *International Journal of Retail & Distribution Management*. 47 (2), 78-93.
- Joshya, K. X., & Thakurta, R. (2022). What's Next? Connecting the Past and Future of Business-IT Alignment Research. *Asia Pacific Journal of Information Systems*, 32(2), 395-434.
- Jovanović, M., Dlačić, J., & Okanović, M. (2018). Digitalization and society's sustainable development—Measures and implications. *Zbornik Radova Ekonomski Fakultet u Rijeka*, 36 (2), 905-928.
- Kabra, G., Ramesh, A., Akhtar, P., & Dash, M. K. (2017). Understanding behavioural intention to use information technology: Insights from humanitarian practitioners. *Telematics and Informatics*, 34(7), 1250-1261.
- Kagermann, H. (2015). Change through digitization—Value creation in the age of Industry 4.0. In *Management of permanent change* (pp. 23-45). Springer Gabler, Wiesbaden.
- Kähkipuro, P. (2018). Governance framework for digital transformation in higher education. In *EUNIS Congress*.
- Kajikawa, Y., Ohno, J., Takeda, Y., Matsushima, K., & Komiyama, H. (2007). Creating an academic landscape of sustainability science: an analysis of the citation network. *Sustainability Science*, 2 (2), 221-231.
- Kane and Gerald (2019), "The Technology Fallacy People are the Real key to digital transformation", *Research-Technology Management*, 62 (6), 44-49.
- Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2015). Strategy, Not technology, drives digital transformation. *MIT Sloan Management Review and Deloitte University Press*, 14), 1-25.
- Kane, G.C. (2014). The American Red Cross: adding digital volunteers to its ranks. *MIT Sloan Manage. Rev.*, 55 (4), 1–6.
- Kar, S., & Thakurta, R. (2021). A Literature Review on Enterprise Architecture: Towards a Research Agenda. *Asia Pacific Journal of Information Systems*, 31(3), 296-334.
- Karahanna, E., & Watson, R. T. (2006). Information systems leadership. *IEEE Transactions on Engineering Management*, 53(2), 171-176.
- Karimi, J. and Walter, Z. (2015). The Role of Dynamic Capabilities in Responding to Digital Disruption: A Factor-Based Study of the Newspaper Industry. *Journal of Management Information Systems*, 32 (1), 39-81.
- Kearns, G. S., & Lederer, A. L. (2003). A resource-based view of strategic IT alignment: how knowledge sharing creates competitive advantage. *Decision sciences*, 34(1), 1-29.

- Kearns, G. S., & Sabherwal, R. (2006). Strategic alignment between business and information technology: a knowledge-based view of behaviors, outcome, and consequences. *Journal of management information systems*, 23(3), 129-162.
- Keller, A. (2017). How to gauge the relevance of codes in qualitative data analysis?-A technique based on information retrieval.
- Kettinger, W. J., Zhang, C., & Marchand, D. A. (2011). CIO and Business Executive Leadership Approaches to Establishing Company-Wide Information Orientation. *MIS Quarterly Executive*, 10(4).
- Kim, D., Lee, H. J., & Cho, S. (2008). Response modeling with support vector regression.. *Expert Systems with Applications*, 34 (2), 1102-1108.
- Kim, J., & McMillan, S. J. (2008). Evaluation of internet advertising research: A bibliometric analysis of citations from key sources. *Journal of Advertising*, 37 (1), 99-112.
- Kirill, Y. (2021). What Is Digital Transformation: Strategy, Trends, Implementation. Retrieved on May 12, 2021 from <https://jelvix.com/blog/how-start-digital-transformation-of-business>
- Kohli, R. & Johnson, S. (2011). Digital Transformation in Latecomer Industries: CIO and CEO leadership lessons from Enacana Oil & Gas (USA) Inc.", *MIS Quarterly Executive*, 10 (4).
- Kohtamäki, M., Parida, V., Oghazi, P., Gebauer, H., & Baines, T. (2019). Digital servitization business models in ecosystems: A theory of the firm. *Journal of Business Research*, 104), 380-392.
- Korhonen, J. J. (2015). The changing role of the CIO. in *Transition*, 58.
- Kumar, A., & Anbanandam, R. (2019). Development of social sustainability index for freight transportation system. *Journal of cleaner production*, 210, 77-92.
- Kumar, K., & Bardhan, A. K. (2020). A choice-based model to reduce primary care load on tertiary hospitals. *International Journal of Management Science and Engineering Management*, 15(3), 155-164.
- Kumar, V., Das, D., & Bardhan, A. K. (2022). Carbon Footprint Implications of Demand and Supply Uncertainties in Supply Chains: A Simulation Study. *International Journal of Modelling and Simulation*, 42(4), 680-705.
- Kurke, L. B., & Aldrich, H. E. (1983). Note—Mintzberg was right!: A replication and extension of the nature of managerial work. *Management science*, 29(8), 975-984.
- Leidner, D. E., & Mackay, J. M. (2007). How incoming CIOs transition into their new jobs. *MIS Quarterly Executive*, 6(1).
- Leidner, D. E., Beatty, R. C., & Mackay, J. M. (2008). How CIOs manage IT during economic decline: Surviving and thriving amid uncertainty. *MIS Quarterly Executive*, 2(1), 7.
- Leidner, D. E., Lo, J., & Gonzalez, E. (2010). An empirical investigation of IS strategy and IS contribution to firm performance.
- Leischnig, A., Ivens, B. S., & Kammerlander, N. (2017). A new conceptual lens for marketing: A configurational perspective based on the business model concept. *AMS Review*, 7(3), 138-153.
- Lember, V., Brandsen, T., & Tönurist, P. (2019). The potential impacts of digital technologies on co-production and co-creation", *Public Management Review*, 21 (11), 1665-1686.

- Lenka, S., Parida, V., & Wincent, J. (2017). Digitalization capabilities as enablers of value co-creation in servitizing firms. *Psychology & marketing*, 34 (1), 92-100.
- Lerch, C., & Gotsch, M. (2015). Digitalized product-service systems in manufacturing firms: A case study analysis. *Research-technology management*, 58 (5), 45-52.
- Li, D., Ding, F., & Wu, J. (2012). Innovative Usage of Information Systems: Does CIO Role Effectiveness Matter?.
- Li, L., Su, F., Zhang, W., & Mao, J. Y. (2018). Digital transformation by SME entrepreneurs: A capability perspective. *Information Systems Journal*, 28(6), 1129-1157.
- Liu, D. Y., Chen, S. W., & Chou, T. C. (2011). Resource fit in digital transformation: Lessons learned from the CBC Bank global e-banking project. *Management Decision*.
- Lucas Jr, H., Agarwal, R., Clemons, E. K., El Sawy, O. A., & Weber, B. (2013). Impactful research on transformational information technology: An opportunity to inform new audiences. *Mis Quarterly*, 371-382.
- Lusch, R. F., & Nambisan, S. (2015). Service innovation. *MIS quarterly*, 39(1), 155-176.
- Liere-Netheler, K., Vogelsang, K., & Packmohr, S. (2018). Drivers of digital transformation in manufacturing” , 51st Hawaii International Conference on System Sciences (HICSS), Waikoloa, Hawaii), 3926-3935.
- Lyytinen, K., & Rose, G. M. (2003). The disruptive nature of information technology innovations: the case of internet computing in systems development organizations. *MIS quarterly*, 557-596.
- Markus, M. L., & Robey, D. (1988). Information technology and organizational change: Causal structure in theory and research. *Management science*, 34 (5), 583-598.
- Marshakova, I. V. (1973). System of document connections based on reference. *Nauchno-tekhnicheskaya informatsiya seriya 2-informatsionnye protsessy i sistemy*, 6), 3-8.
- Martínez-López, F. J., Merigó, J. M., Valenzuela-Fernández, L., & Nicolás, C. (2018). Fifty years of the European Journal of Marketing: a bibliometric analysis. *European Journal of Marketing*, 52 ((1/2), 439-468.
- Mathauer, M., & Hofmann, E. (2019). Technology adoption by logistics service providers. *International Journal of Physical Distribution & Logistics Management*, 49 (4), 416-434.
- Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & Information Systems Engineering*. 57 (5), 339-343.
- Mazumder, S., & Garg, S. (2021). Decoding digital transformational outsourcing: The role of service providers' capabilities. *International Journal of Information Management*, 58, 102295.
- MAZUMDER, S., & Garg, S. (2021). Necessary-but-not-sufficient service provider capabilities in digital transformational outsourcing. In *Academy of Management*
- Mayring, P. (2014). Qualitative content analysis: theoretical foundation, basic procedures and software solution.
- McCarthy, P., Sammon, D., & Alhassan, I. (2021). Digital Transformation Leadership Characteristics: a Literature Analysis. *Journal of Decision Systems*, 1-30.

- McKeown, I., & Philip, G. (2003). Business transformation, information technology and competitive strategies: learning to fly. *International Journal of Information Management*, 23 (1), 3-24.
- Mihailescu, M., Mihailescu, D., & Carlsson, S. (2017). Understanding healthcare digitalization: a critical realist approach.
- Mintzberg, H. (1971). Managerial work: Analysis from observation. *Management science*, 18(2), B-97.
- Mishra, D., Gunasekaran, A., Papadopoulos, T., & Childe, S. J. (2018). Big Data and supply chain management: a review and bibliometric analysis. *Annals of Operations Research*, 270 (1), 313-336.
- Mishra, P., & Sharma, S. (2021). Organizational Culture and Its Impact on Student Engagement: A Study Based on Private and Public Universities in Rajasthan. In *Entrepreneurship and Regional Development* (pp. 201-218). Palgrave Macmillan, Cham.
- Mithas, S., Tafti, A., & Mitchell, W. (2013). How a firm's competitive environment and digital strategic posture influence digital business strategy. *MIS quarterly*, 511-536.
- Mocker, M., & Fonstad, N. O. (2017). How AUDI AG is Driving Toward the Sharing Economy. *MIS Quarterly Executive*, 16(4).
- Modgil, S., Singh, R. K., & Foropon, C. (2020). Quality management in humanitarian operations and disaster relief management: a review and future research directions. *Annals of operations research*, 1-54.
- Morakanyane, R., Grace, A. A., & O'Reilly, P. (2017). Conceptualizing Digital Transformation in Business Organizations: A Systematic Review of Literature. *Bled eConference*, 21.
- Moreau, François. "The disruptive nature of digitization: the case of the recorded music industry." *International Journal of Arts Management* 15, no. 2 (2013).
- Morton, J., Stacey, P., & Mohn, M. (2018). Building and maintaining strategic agility: an agenda and framework for executive IT leaders. *California management review*, 61(1), 94-113.
- Mueller, B., & Renken, U. (2017). Helping employees to be digital transformers—the olympus. connect case.
- Muhuri, P. K., Shukla, A. K., & Abraham, A. (2019). Industry 4.0: A bibliometric analysis and detailed overview. *Engineering applications of artificial intelligence*, 78), 218-235.
- Muzyka, D., De Koning, A., & Churchill, N. (1995). On transformation and adaptation: Building the entrepreneurial corporation. *European Management Journal*, 13 (4), 346-362.
- Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital Innovation Management: Reinventing innovation management research in a digital world. *MIS Quarterly*, 41 (1), 223-238.
- Nasim, S., & Khan, A. F. (2022). Drivers of Blockchain Adoption in Pharmaceutical Sector. In *Flexibility, Innovation, and Sustainable Business* (pp. 325-349). Springer, Singapore.
- Nederhof, A. J. (2006). Bibliometric monitoring of research performance in the social sciences and the humanities: A review. *Scientometrics*, 66 (1), 81-100
- Nittala, S. S. S., Bharadwaj, S. S., Tripathi, S. S., & Seif, H. (2022). Service innovation enabled by Internet of Things and cloud computing—a service-dominant logic perspective. *Technology Analysis & Strategic Management*, 34(4), 433-446.

- Ngai, E. W. (2005). Customer relationship management research (1992-2002): an academic literature review and classification. *Marketing intelligence & planning*, 23 (6), 582-605.
- Nylén, D., & Holmström, J. (2015). Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. *Business Horizons*, 58(1), 57-67.
- Osmundsen, K., Iden, J., & Bygstad, B. (2018, September). Digital Transformation: Drivers, Success Factors, and Implications. In *MCIS* (p. 37).
- Ossewaarde, M. (2019). Digital transformation and the renewal of social theory: Unpacking the new fraudulent myths and misplaced metaphors. *Technological forecasting and social change*, 146), 24-30.
- Pagani, M. (2013). Digital business strategy and value creation: Framing the dynamic cycle of control points. *Mis Quarterly*, 617-632.
- Pagani, M., & Pardo, C. (2017). The impact of digital technology on relationships in a business network.. *Industrial Marketing Management*, 67), 185-192.
- Papavasiliou, S., & Gorod, A. (2022, June). Stakeholder Management in Digital Transformation: A System of Systems Approach. In *2022 17th Annual System of Systems Engineering Conference (SOSE)* (pp. 500-505). IEEE.
- Pandey, N. (2021). Digital marketing strategies for firms in post covid-19 era: insights and future directions. *The new normal challenges of managerial business, social and ecological systems in the post covid-19 era*.
- Parida, V., Sjödin, D. R., Lenka, S., & Wincent, J. (2015). Developing global service innovation capabilities: How global manufacturers address the challenges of market heterogeneity. *Research-Technology Management*, 58 (5), 35-44.
- Park, S. R., Choi, D. Y., & Hong, P. (2015). Club convergence and factors of digital divide across countries. *Technological Forecasting and Social Change*, 96), 92-100.
- Parviainen, P., Tihinen, M., Kääriäinen, J., & Teppola, S. (2017). Tackling the digitalization challenge: how to benefit from digitalization in practice. *International journal of information systems and project management*, 5 (1), 63-77.
- Paul, P., Bhumali, A., & Aithal, P. S. (2018). Chief Information Officer and Their Changing Role as Information Cum Techno-Management Professionals: Brief Overview. *International Journal of Computational Research and Development (IJCRD)*, 3(1), 54-58.
- Peppard, J. (2010). Unlocking the performance of the chief information officer (CIO). *California Management Review*, 52(4), 73-99.
- Peppard, J., Edwards, C., & Lambert, R. (2011). Clarifying the Ambiguous Role of the CIO. *MIS Quarterly Executive*, 10(1).
- Pervan, G. (1998). How chief executive officers in large organizations view the management of their information systems. *Journal of Information technology*, 13(2), 95-109.
- Piccinini, E., Hanelt, A., Gregory, R., & Kolbe, L. (2015). Transforming industrial business: the impact of digital transformation on automotive organizations.

- Pilkington, A., & Liston-Heyes, C. (1999). Is production and operations management a discipline? A citation/co-citation study. *International Journal of Operations & Production Management*, 19 (1), 7-20.
- Pongratz, H. J. (2018). Of crowds and talents: discursive constructions of global online labour. *New Technology, Work and Employment*, 33 (1), 58-73.
- Ponsig(n, F., Kleinhans, S., & Bressolles, G. (2019). The contribution of quality management to an organisation's digital transformation: a qualitative study. *Total Quality Management & Business Excellence*, 30), 17-34.
- Porter, M.E. and Heppelmann, J.E. (2014)," How Smart, Connected Products Are Transforming Competition", *Harvard Business Review* (November), 66–88.
- Preston, D. S., Leidner, D. E., & Chen, D. (2008). CIO leadership profiles: Implications of matching CIO authority and leadership capability on IT impact. *MIS Quarterly Executive*, 7(2).
- Preston, D., & Karahanna, E. (2009). How to develop a shared vision: The key to IS strategic alignment. *MIS Quarterly Executive*, 8(1).
- Proctor, J (2019), June 20. Digital Transformation vs. Business Process Reengineering (BPR)" available at <https://www.inteqgroup.com/blog/digital-transformation-vs-business-process-reengineering/> , accessed on 24th January, 2021
- Proctor, J. (2017). Digital Transformation vs. Business Process Reengineering (BPR). Retrieved October 11, 2017.
- Quinn, L., Dibb, S., Simkin, L., Canhoto, A., & Analogbei, M. (2016). Troubled waters: the transformation of marketing in a digital world. *European Journal of Marketing*, 50 (12), 2103-2133.
- Rachinger, M., Rauter, R., Müller, C., Vorraber, W., & Schirgi, E. (2019). Digitalization and its influence on business model innovation. *Journal of Manufacturing Technology Management*, 30 (8), 1143–1160.
- Ramasundaram, A., Pandey, N., Shukla, Y., Alavi, S., & Wirtz, J. (2023). Fluidity and the customer experience in digital platform ecosystems. *International Journal of Information Management*, 69, 102599.
- Ranganathan, C., & Jha, S. (2008). Do CIOs matter? Assessing the value of CIO presence in top management teams. *ICIS 2008 Proceedings*, 56.
- Reich, B. H., & Benbasat, I. (1996). Measuring the linkage between business and information technology objectives. *MIS quarterly*, 55-81.
- Reis, J., Amorim, M., Melão, N., & Matos, P. (2018, March). Digital transformation: a literature review and guidelines for future research. In *World conference on information systems and technologies* (pp. 411-421). Springer, Cham.
- Remane, G., Hanelt, A., Wiesboeck, F., & Kolbe, L. M. (2017, June). Digital Maturity in Traditional industries-an Exploratory Analysis. In *ECIS* (p. 10).
- Remane, G., Hildebrandt, B., Hanelt, A., & Kolbe, L. M. (2016). Discovering new digital business model types—a study of technology startups from the mobility sector.

- Rich, T. (2017). Converting digital ambition into a reality: Delivering a modern health experience to de-stress the patient, improve the experience and enhance outcomes. *Management in Healthcare*, 1(4), 346-362.
- Ritchie, J., Lewis, J., Nicholls, C. M., & Ormston, R. (Eds.). (2013). *Qualitative research practice: A guide for social science students and researchers*. sage.
- Roscher, B. E. (2021). UNDERSTANDING THE THEORETICAL FOUNDATIONS OF CIO IMPACT ON ORGANISATIONAL EFFECTIVENESS: PRIOR AND PLANED RESEARCH. CER Comparative European Research 2021.
- Rossmann, A. (2018). Digital maturity: Conceptualization and measurement model.
- Ross, J. W., & Feeny, D. F. (1999). The evolving role of the CIO.
- Ross, J.W., Sebastian, I.M., Beath, C., Scantlebury, S., Mocker, M., Fonstad, N., Kagan, M., Krusell, S.G., & the Technology Advantage Practice of The Boston Consulting Group (2016). *Designing Digital Organisations*", Centre for Information Systems Research, 406), 1-19.
- Roth, S. (2020)). Of wolves and dogs and other false distinctions: A rejoinder to Wallis. *Systems Research and Behavioral Science*, 37 (1), 182-183.
- Rothmann, W., & Koch, J. (2014). Creativity in strategic lock-ins: The newspaper industry and the digital revolution. *Technological forecasting and social change*, 83), 66-83.
- Roumani, Y., Nwankpa, J. K., & Roumani, Y. F. (2016). Examining the relationship between firm's financial records and security vulnerabilities. *International Journal of Information Management*, 36(6), 987-994.
- Roy, S., & Kamath, R. (2020). Born on the internet, how should Suta grow?. *Emerald Emerging Markets Case Studies*.
- Roy, S., & Mukherjee, I. (2018). Integrated approach for evaluation of service quality in multistage sequential utilitarian service process. *International Journal of Quality and Service Sciences*, 10(2), 117-137.
- Sabri, Y., Micheli, G. J., & Nuur, C. (2018). Exploring the impact of innovation implementation on supply chain configuration. *Journal of Engineering and Technology Management*, 49), 60-75.
- Saha, V., Mani, V. and Goyal, P. (2020)). Emerging trends in the literature of value co-creation: a bibliometric analysis", *Benchmarking: An International Journal*, 27 (3), 981-1002.
- Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS quarterly*, 237-263.
- Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., ... & Jinks, C. (2018). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & quantity*, 52(4), 1893-1907.
- Saunders, M., Lewis, P., & Thornhill, A. (2003). *Research methods for business students*. Essex: Prentice Hall: Financial Times.
- Saxena, D. (2021). Big Data for Digital Transformation of Public Services. In *Disruptive Technology and Digital Transformation for Business and Government* (pp. 250-266). IGI Global.

- Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. *Journal of Purchasing and Supply Management*, 25 (4).
- Schräge, M., Muttreja, V., & Kwan, A. (2022). How the Wrong KPIs Doom Digital Transformation. *MIT Sloan Management Review*, 63(3), 35-40.
- Schuchmann, D., & Seufert, S. (2015). Corporate learning in times of digital transformation: a conceptual framework and service portfolio for the learning function in banking organisations. *International Journal of Corporate Learning*, 8 (1), 31-39.
- Schumpeter, J. A. (2000). Entrepreneurship as innovation. University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship.
- Schwartz, H., & Davis, S. M. (1981). Matching corporate culture and business strategy. *Organizational dynamics*, 10(1), 30-48.
- Schallmo, D., Williams, C. A., & Boardman, L. (2020). Digital transformation of business models—best practice, enablers, and roadmap. In *Digital Disruptive Innovation* (pp. 119-138).
- Sebastian, I., Ross, J., Beath, C., Mocker, M., Moloney, K., & Fonstad, N. (2017). How big old companies navigate digital transformation. *MIS Quarterly Executive*, 16 (3), 197-213.
- Seth, N. (2021). *Winning in the digital age: seven building blocks of successful digital transformation*. India Penguin Enterprise.
- Sharma, C., Bharadwaj, S. S., Gupta, N., & Jain, H. (2022). Robotic process automation adoption: contextual factors from service sectors in an emerging economy. *Journal of Enterprise Information Management*, (ahead-of-print).
- Sharma, S., & Sharma, M. (2022). Social Media Competence: An Assessment of Male and Female Users in India. In *Managing Disruptions in Business* (pp. 103-119). Palgrave Macmillan, Cham.
- Shrivastava, S. V., & Rathod, U. (2019). A goal-driven risk management approach for distributed agile development projects. *Australasian Journal of Information Systems*, 23.
- Sia, S. K., Soh, C., & Weill, P. (2016). How DBS Bank Pursued a Digital Business Strategy. *MIS Quarterly Executive*, 15(2).
- Sievert, H., & Scholz, C. (2017). Engaging employees in (at least partly) disengaged companies. Results of an interview survey within about 500 German corporations on the growing importance of digital engagement via internal social media. *Public relations review*, 43 (5), 894-903.
- Singh, A., & Hess, T. (2017). How Chief Digital Officers promote the digital transformation of their companies. *MIS Quarterly Executive*, 16 (1), 31-34.
- Singh, N., Krishnaswamy, V., & Zhang, J. Z. (2022). Intellectual structure of cybersecurity research in enterprise information systems. *Enterprise Information Systems*, 1-25.
- Sjödín, D. R., Parida, V., Leksell, M., & Petrovic, A. (2018). Smart Factory Implementation and Process Innovation: A Preliminary Maturity Model for Leveraging Digitalization in Manufacturing Moving to smart factories presents specific challenges that can be addressed through a structured approach focused on people, processes, & technologies. *Research-Technology Management*, 61 (5), 22-31.
- Sklyar, A., Kowalkowski, C., Tronvoll, B., & Sörhammar, D. (2019). Organizing for digital servitization: A service ecosystem perspective. *Journal of Business Research*, 104), 450-460.

- Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents", *Journal of the American Society for Information Science*, 24 (4), 265- 269.
- Smaltz, D. H., Sambamurthy, V., & Agarwal, R. (2006). The antecedents of CIO role effectiveness in organizations: An empirical study in the healthcare sector. *IEEE transactions on engineering management*, 53(2), 207-222.
- Sobol, M. G., & Klein, G. (2009). Relation of CIO background, IT infrastructure, and economic performance. *Information & Management*, 46(5), 271-278.
- Solberg, E., Traavik, L. E., & Wong, S. I. (2020). Digital mindsets: Recognizing and leveraging individual beliefs for digital transformation. *California Management Review*, 62(4), 105-124.
- Spitze, J. M., & Lee, J. J. (2012). The renaissance CIO project: The invisible factors of extraordinary success. *California Management Review*, 54(2), 72-91.
- Spremic, M. (2017). Governing digital technology—how mature IT governance can help in digital transformation?. *International Journal of Economics and Management Systems*, 2.
- Srai, J. S., & Lorentz, H. (2019). Developing design principles for the digitalisation of purchasing and supply management. *Journal of Purchasing and Supply Management*, 25 (1), 78-98.
- Steininger, D. M., & Gatzemeier, S. (2019). Digitally forecasting new music product success via active crowdsourcing. *Technological Forecasting and Social Change*, 146), 167-180.
- Stentoft, J., Jensen, K. W., Philipsen, K., & Haug, A. (2019, January). Drivers and barriers for Industry 4.0 readiness and practice: a SME perspective with empirical evidence. In *Proceedings of the 52nd Hawaii International Conference on System Sciences*.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques* (pp. 1-312). Thousand oaks, CA: Sage publications.
- Strozzi, F., Colicchia, C., Creazza, A., & Noè, C. (2017). Literature review on the 'Smart Factory 'concept using bibliometric tools. *International Journal of Production Research*, 55 (22), 6572-6591.
- Su, H. N., & Lee, P. C. (2010). Mapping knowledge structure by keyword co-occurrence: a first look at journal papers in *Technology Foresight*. *Scientometrics*, 85 (1), 65-79.
- Subramaniam, M., Iyer, B., & Venkatraman, V. (2019). Competing in digital ecosystems. *Business Horizons*, 62 (1), 83-94.
- Suuronen, S., Ukko, J., Eskola, R., Semken, R. S., & Rantanen, H. (2022). A systematic literature review for digital business ecosystems in the manufacturing industry: Prerequisites, challenges, and benefits. *CIRP Journal of Manufacturing Science and Technology*, 37, 414-426.
- Svahn, F., Mathiassen, L., & Lindgren, R. (2017). Embracing Digital Innovation in Incumbent Firms: How Volvo Cars Managed Competing Concerns" *MIS Quarterly*., 41 (1), 239-253.
- Szalavetz, A. (2019). Industry 4.0 and capability development in manufacturing subsidiaries. *Technological Forecasting and Social Change*, 145), 384-395.
- Tan, B., Pan, S. L., Lu, X., & Huang, L. (2015). The role of IS capabilities in the development of multi-sided platforms: the digital ecosystem strategy of Alibaba.com. *Journal of the Association for Information Systems*, 16 (4), 248-280.

- Tan, F. B., & Gallupe, R. B. (2006). Aligning business and information systems thinking: A cognitive approach. *IEEE transactions on Engineering Management*, 53(2), 223-237.
- Teece, D., & Pisano, G. (2003). The dynamic capabilities of firms. In *Handbook on knowledge management* (pp. 195-213). Springer, Berlin, Heidelberg.
- Thangavelu, M., Krishnaswamy, V., & Sharma, M. (2020). Comprehensive Information Security Awareness (CISA) in Security Incident Management (SIM): A Conceptualization. *South Asian Journal of Management*, 27(2).
- Thorseng, A. A., & Grisot, M. (2017). Digitalization as institutional work: a case of designing a tool for changing diabetes care. *Information Technology & People*.
- Thoomkuzhy, J. G., & Thangiah, M. (2020). A Qualitative Study on CIO Competencies, Cloud-IoT Implementation Challenges & the Organizational Benefits of Cloud-IoT Implementations. *EAI Endorsed Transactions on Cloud Systems*, 6(19), 167659.
- Todd, P. A., McKeen, J. D., & Gallupe, R. B. (1995). The evolution of IS job skills: A content analysis of IS job advertisements from 1970 to 1990. *MIS quarterly*, 1-27.
- Trantopoulos, K., von Krogh, G., Wallin, M. W., & Woerter, M. (2017). External knowledge and information technology: Implications for process innovation performance. *MIS quarterly*, 41 (1), 287-300.
- Tubre, T. C., & Collins, J. M. (2000). Jackson and Schuler (1985) revisited: A meta-analysis of the relationships between role ambiguity, role conflict, and job performance. *Journal of management*, 26(1), 155-169.
- Tumbas, S., Berente, N. and Brocke, J.V. (2018). Digital innovation and institutional entrepreneurship: Chief Digital Officer perspectives of their emerging role. *Journal of Information Technology*, 33 (3), 188-202.
- Ungerma, O., Dedkova, J., & Gurinova, K. (2018). The impact of marketing innovation on the competitiveness of enterprises in the context of industry 4.0. *Journal of Competitiveness*, 10 (2), 132-148.
- Valentine, E., Stewart, G., & Shiang-Yen, T. (2014). Enterprise business technology governance: a validation of three technology-governance competencies for boards of directors. *ACIS*.
- Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84 (2), 523-538.
- Van Leeuwen, T., Visser, M., Moed, H., Nederhof, T., & Van Raan, A. (2003). The Holy Grail of science policy: Exploring and combining bibliometric tools in search of scientific excellence. *Scientometrics*, 57 (2), 257-280.
- Van Looy, A. (2021). A quantitative and qualitative study of the link between business process management and digital innovation. *Information & Management*, 58(2), 103413.
- Vanessa, R.(2021). Three steps toward a digital governance framework. Retrieved on May 10,2021 from <https://catalyst.concentrix.com/blog/2021/09/digital-governance-framework/#:~:text=Digital%20governance%20is%20a%20framework,and%20ensures%20digital%20business%20maturity.>

- Vishvakarma, N. K., Sharma, R. R. K., & Kumar, A. (2021). An Empirical Analysis of Impact of Organizational Strategies on Critical Success Factors of Business Process Reengineering. *Global Journal of Flexible Systems Management*, 22(1), 55-73.
- Venkatraman N. (1994). IT-enabled business transformation: From automation to business scope redefinition. *Sloan Management Review*, 35 (2), 73-87.
- Venkatraman, N., Henderson, J. C., & Oldach, S. (1993). Continuous strategic alignment: Exploiting information technology capabilities for competitive success. *European Management Journal*, 11(2), 139-149.
- Tavoletti, E., Kazemargi, N., Cerruti, C., Grieco, C., & Appolloni, A. (2021). Business model innovation and digital transformation in global management consulting firms. *European Journal of Innovation Management*.
- Urbinati, A., Chiaroni, D., Chiesa, V., & Frattini, F. (2020). The role of digital technologies in open innovation processes: an exploratory multiple case study analysis. *R&D Management*, 50(1), 136-160.
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122), 889-901.
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28 (2), 118-144.
- Vugec, D. S., Spremić, M., & Bach, M. P. (2017). IT governance adoption in banking and insurance sector: Longitudinal case study of COBIT use. *International Journal for Quality Research*, 11(3), 691.
- Wan, J., & Cheng, K. (2019). Research on Key Success Factors of Logistics Enterprises Digital Transformation Based on Interpretative Structural Model.
- Wang, Y., Kung, L., & Byrd, T. A. (2018). Big data analytics: Understanding its capabilities and potential benefits for healthcare organizations. *Technological Forecasting and Social Change*, 126), 3-13.
- Watson, R. T. (1990). Influences on the IS manager's perceptions of key issues: Information scanning and the relationship with the CEO. *MIS Quarterly*, 217-231.
- Weill, P. (2004). Don't just lead, govern: How top-performing firms govern IT. *MIS Quarterly executive*, 3(1), 1-17.
- Weill, P., & Woerner, S. L. (2013). The Future of the CIO in a Digital Economy. *MIS Quarterly Executive*, 12(2).
- Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Blegind-Jensen, T. (2021). Unpacking the difference between digital transformation and IT-enabled organizational transformation. *Journal of the Association for Information Systems*, 22(1), 102-129.
- Wessel, J., Turetskyy, A., Wojahn, O., Herrmann, C., & Thiede, S. (2020). Tracking and tracing for data mining application in the lithium-ion battery production. *Procedia CIRP*, 93, 162-167.
- Westerman, G., Bonnet, D., & McAfee, A. (2014). The nine elements of digital transformation. *MIT Sloan Management Review*, 55 (3), 1-6.

- Westerman, G., Calm ejane, C., Bonnet, D., Ferraris, P., & McAfee, A. (2011). Digital Transformation: A roadmap for billion-dollar organizations. MIT Center for digital business and capgemini consulting, 1), 1-68.
- Westerman, G., Tannou, M., Bonnet, D., Ferraris, P., & McAfee, A. (2012). The Digital Advantage: How digital leaders outperform their peers in every industry. MIT Sloan Management and Capgemini Consulting, MA, 2), 2-23.
- Westfall, A. (2020). Information technology project failure caused by inadequate project scoping: an exploratory qualitative inquiry on inadequate project scopes (Doctoral dissertation, Capella University).
- Wendt, T. (2021, February). Organized futures. On the ambiguity of the digital absorption of uncertainty. In *Frontiers in Education* (Vol. 6, p. 554336). Frontiers Media SA.
- Wynn Jr, D., & Williams, C. K. (2012). Principles for conducting critical realist case study research in information systems. *MIS quarterly*, 787-810.
- Xiong, J., Wang, K., Yan, J., Xu, L., & Huang, H. (2021). The window of opportunity brought by the COVID-19 pandemic: an ill wind blows for digitalisation leapfrogging. *Technology Analysis & Strategic Management*, 1-13.
- Yamamoto, S. (2020). A strategic map for digital transformation. *Procedia Computer Science*, 176, 1374-1381.
- Yin, R. K. (2017). *Case study research and Applications: Design and methods*. 6th Edition sage.
- Yoo, Y., Boland Jr, R. J., Lyytinen, K., & Majchrzak, A. (2012). Organizing for innovation in the digitized world. *Organization science*, 23 (5), 1398-1408.
- Yoo, Y., Bryant, A., & Wigand, R. T. (2010). Designing digital communities that transform urban life: introduction to the special section on digital cities. *Communications of the Association for Information Systems*, 27 (1), 637-640.
- Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). Research commentary—the new organizing logic of digital innovation: an agenda for information systems research. *Information systems research*, 21(4), 724-735.
- Zahra, S. A., Ireland, R. D., & Hitt, M. A. (2000). International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. *Academy of Management journal*, 43(5), 925-950.
- Zaki, M. (2019). Digital transformation: harnessing digital technologies for the next generation of services. *Journal of Services Marketing*.
- Zeng, M. A., Dennstedt, B., & Koller, H. (2016). Democratizing Journalism—How User-Generated Content and User Communities Affect Publishers’ Business Models. *Creativity and Innovation Management*, 25 (4), 536-551.
- Zhang, J., & Hon, H. W. (2020). Towards responsible digital transformation. *California Management Review*, 62(3).

- Zhang, Y., Zhang, G., Chen, H., Porter, A.L., Zhu, D. and Lu, J. (2016). Topic analysis and forecasting for science, technology and innovation: Methodology with a case study focusing on big data research.. *Technological Forecasting and Social Change*, 105), 179-191.
- Zhao, D. and Strotmann, A. (2014). The knowledge base and research front of information science 2006–2010: An author cocitation and bibliographic coupling analysis. *Journal of the Association for Information Science and Technology*, 65 (5), 995-1006.
- Zhao, D. and Strotmann, A. (2015). Analysis and visualization of citation networks. *Synthesis lectures on information concepts, retrieval, & services*, 7 (1), 1-207.
- Zhai, H., Yang, M., & Chan, K. C. (2022). Does digital transformation enhance a firm's performance? Evidence from China. *Technology in Society*, 68, 101841.
- Zhao, X., Sun, X., Zhao, L., & Xing, Y. (2022). Can the digital transformation of manufacturing enterprises promote enterprise innovation?. *Business Process Management Journal*, (ahead-of-print).
- Zhu, K., Dong, S., Xu, S. X., & Kraemer, K. L. (2006). Innovation diffusion in global contexts: determinants of post-adoption digital transformation of European companies. *European journal of information systems*, 15(6), 601-616.
- Zittrain, J. (2008). *Privacy 2.0*. *U. Chi. Legal F.*, 65.

Annexure 1 - Digital Transformation Research Streams and Authors

Research Area	Research Stream	Research Domain	Author
1. Organisational impacts	1. Business Model Transformation	Business Model Innovation	Rachinger (2019), Grieger (2019), Laudien (2019), Zeng (2016)
	2. Digital Infrastructure	Digital Infrastructure	Ovrelid (2019), Mellet(2019)
	3. Digital Innovation	Digital Innovation	Laifi (2016), Wiesboeck (2019), Henfridsson (2014), Ferreira (2019), Trantopoulos (2017), Neirotti (2019), Nambisan (2019), Galindo-Martin (2019), Belz (2019), Cano-Kollmann (2018), Dougherty (2012)
		Innovation Management	Frishammar (2019), Huesig (2019)
		Open innovation	Urbinati (2020)
	4. Business models	DT impact on human resource	Cozzolino (2018)
	5. Leadership	Leadership	Gerth (2016), Kohli (2011), Benlian (2016), Hansen (2011), Auvinen (2019), Westerman (2016)
		Role of CDO	Singh (2017)
		Culture	Westerman (2019)

	6. Organisational effects	DT impact on corporate governance	Manita (2020)
		DT impact on R&D	Farrington (2017)
		DT role in crowdfunding	Wang (2019)
		DT Role in crowdsourcing	Steininger (2019)
		Firm Performance	Caputo (2019)
		DT applications and the role of IT security	Clarke (2019)
2. Applied Applications and Insights	7. DT Applications	DT applications in big data	Blackburn (2017)
		DT applications and role in big data	Ylijoki (2019)
		DT applications in AI	Magistretti (2019), Brock (2019)
		DT applications in big data	Schildt (2017), Nuccio (2019)
		DT applications in blockchain	Schmidt (2019), KurpjuweitFerrer-Gomila (2019)
		DT applications in Industry 4.0	Horvath (2019), Barata (2020), Santos (2020), Szalavetz (2019), Rocha (2019), Ungerman (2018)

		DT applications in IoT	Hasselblatt (2018), Monteiro (2019)
		DT applications in machine learning	Teresa Ballester (2019)
		DT applications in robotic process automation	Kaivo-Oja (2017), Hofmann (2020), Upchurch (2018)
	8. DT Implementation	Ambidexterity	Akesson (2018), Li (2018)
		Case application / DT implementation	Rothmann (2014), Martinez (2019), Sebastian (2017), El Sawy (2016), Gray (2013), Liu (2011), Chanas (2019), Sia (2016), Du (2016), Dremel (2017), Frank (2019), Santos (2019), Ellingsen (2019), Gebre-Mariam (2019), Gravesteijn (2018), Nishihara (2018), Pal (2016), Brivot (2014), Roux Martinez (2011), Baraldi (2006)
		Challenges	Eklinder frick (2020)
		Dynamic Capabilities	Karimi (2015), Jantunen (2018)
		Internationalisati on Theory application at MNC	Banalieva (2019)
		9. DT Role	DT role in education

		DT role in fashion	Arribas (2018), Scuotto (2019)
		DT role in fintech	Basole (2018), Breidbach (2019), Carles Maixe-Altes (2019), Larsson (2017), Holmlund (2017), Hedman (2015)
		DT role in healthcare	Agarwal (2010), Mettler (2018), Gastaldi (2018), Wallin (2017), Niemela (2019)
		DT Role in Insurance	Stoekli (2018), Pousttchi (2019)
		DT Role in International Marketing	Ojala (2018)
		DT Role in Mining	Jonsson (2018)
		DT role in retail	Hagberg (2016), Fuentes (2017), Soutjis (2017), Jocevski (2019), Hansen (2015), Savastano (2019), Pousttchi (2018), Haenninen (2018), Reinartz (2019), Kaatz (2019)
		DT role in telecom	Majumdar (1997)
		Experiential computing	Yoo (2010)
		SME Digitalization	Chen (2016), Cenamor (2019), Milosevic (2018), North (2020), Ghobakhloo (2020), Cassetta (2020), Kianto (2018)

3. Operational Processes	10. Human Resource	DT impact on human resource	Di Gregorio (2019), Dengler (2018), Christ-Brendemuehl (2019), Kane (2019), Balsmeier (2019), Knights (2020), Van der schaft, Tijunaitis (2019), Backstrom (2019), Kammerlander (2018), Pongratz (2018), Jandric (2018), Sievert (2017)
	11. IT Governance	IT Governance	Wyne Gregory (2018)
	12. Knowledge Management	Knowledge Management	Aslesen (2019), Ilvonen (2018)
	13. Manufacturing	Co-creation	Lenka (2017)
		DT impact on manufacturing	Luthje (2019)
		DT role in manufacturing	Sjodin (2018), Sommarberg (2019), Lugert (2018), Caniato (2016)
		DT role in quality management	Ponsignon (2019)
		DT role in supply chain	Sabri (2018), Stank (2019), Handfield (2019), Hartley (2019)
		DT role in supply chain and purchase	Srai (2019), Bienhaus (2018), Andersson (2018)
		DT role in supply chain	Gustafsson (2019)
Servitisation		Lerch (2015), Sklyar (2019), Kohtamaki (2019), Lindhult (2018),	

			Sklyar (2019a), Parida (2015), Reim (2019), Bjorkdahl (2019)
		Servitization- SD logic	Belingeri (2019)
			Goduscheit (2018)
	14. Marketing	Co-creation	Hughes (2019)
		Consumer Research	Airoldi (2021)
		Customer Relationship Management	Fritze (2019)
		DT impact on B2B relationships	Pagani (2017)
		DT impact on co-creation and co-production	Lember (2019)
		DT role in marketing	Quinn (2016)
		DT role in social media marketing	Ancillai (2019)
		International Marketing	Vadana (2020)
		Learnings and Challenges	Quinton (2017)
		15. Strategy	Building Dynamic Capabilities

		Strategy Formulation	Subramaniam (2019), Hess (2016), Tekic (2019), Crittenden (2019), Gust (2017), Andal-Ancion (2003), Powell (2016), Fremont (2019), Jin (2020), Guinan (2019), Furr (2019), Govindarajan (2019), Troshani (2018), Hinings (2018), Dougherty (2018), Majumdar (2018), Orlandi (2016)
4. Social Aspects	16. Geographic Digital Divide	Digital Divide in countries	Corrocher (2002)
		Digital Divide in countries	Park (2015)
	17. Sustainable Development	DT role in sustainable development	Jovanovic (2018)
	18. Society	DT impact on society	Ravenelle (2020)
		Society Theory	Roth (2019a), Ossewaarde (2019), Wenzel (2019), Guy (2019), Palmas (2019), Roth (2019)
		Strategy Formulation	Kilkki (2018)

Researcher name: Raghu Nandan

Supervisor name: Dr. Praveen Goyal (Supervisor), Dr. Deepak Saxena (Co -Supervisor)
(Department of Management, Birla Institute of Technology & Science, Pilani)

Dear Sir/ Madam

You are cordially invited to participate in this research project carried out by *Mr. Raghu Chawla, Dr. Praveen Goyal & Dr. Deepak Kumar Saxena*. Your participation is voluntary. Even if you agree to participate now, you can withdraw at any time without any consequences of any kind.

- **PURPOSE OF THE STUDY**

Digital technologies are redefining the way organisations operate. Leveraging the new-age digital technologies, organisations are incessantly reframing their business models in numerous ways, such as redesigning personalised offerings to customers, inventing networked supply chains with partners and adopting smarter operational processes or starting new digital line of businesses altogether. Our study is designed to investigate this Digital Transformation phenomenon with regards to its drivers, the role of the executives in digital transformation initiatives and on how to implement digital transformation effectively in the organisations.

- **PROCEDURES**

The study will involve the participant through an interview by the researcher. The interview process will entail discussions about the drivers (factors, pre-conditions that has forced the organisation about adopting digital transformation), the role of the executive in digital transformation of the organisation and how has the organisation progressed over digital transformation initiatives over time. *The overall interview process is expected to take 1 hour of your time.*

- **POTENTIAL RISKS AND DISCOMFORTS**

There are no potential risks and discomforts associated with the interview process.

- **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

As organisations move in the digital era by embracing new-age technologies, management models are becoming equally complex. This is imposing managers to not only stay abreast of

technological trends but also to hone their management skills to effectively manage practical disruptions that arise during the process of digital transformation. This research may benefit you and your organisation by building a holistic understanding on Digital Transformation and more importantly, proposing insightful methodology on how to effectively implement digital transformation at your organisation.

- **CONFIDENTIALITY AND DATA PROTECTION**

Any information which is obtained from the participant during this research will be treated with utmost confidentiality and will be used only for academic purpose only. Analysis will be conducted at an overall level and the name/identity of the individuals, and the organization will not be revealed.

Date

Signature of participant

Research introduction to participant (Pre Interview)

- Introduction of our research and its objectives (DT drivers, Role of CIO and implementation best practices)
- Declaration of conformity and confidentiality

Discussion Points

Drivers of Digital Transformation

- What are your views on your organisation’s digital journey so far?
- What were some of the key factors (driving forces) to take up digital initiatives?
- How do you find digital technologies impacting the overall industry? What are some of the key impact areas specific to your organization?

Role of CIO in Digital Transformation

- What is (was) the general focus of IT in the organization? Who is primarily responsible for leading digital initiatives? How is the business and IT role planned and How are the initiatives governed?
- What does the overall digital strategy of your organisation look like, is it impacting business strategy. How the strategy was crafted?
- What was the top management team’s (TMT Executive’s) role in the DT initiatives? Their awareness about DT and how have the events progressed in this regard (In context of strategic role of executives).
- What was (is) the overall role of Chief Information officer/Chief Digital officer in the digital Transformation? How is the reporting structured?
- How did the lower level managers and IT team contributed to DT initiatives.

How to successfully implement DT

- What was the implementation methodology followed for implementing DT, was it done through your own team or partner team, role of consultants?

- What are some of the major contributions that DT initiatives have brought so far (such as business processes improvements/ revenue/ culture/ ways of working etc.)?

- What aspects do you see that governed success or a failure to the DT initiatives? What are some of the key points that you would like to recommend for effective implementation of DT.

- How was the knowledge built on DT, how the cultural adoption was done, how was IT security aspect managed. What were some of the challenges faced?

- What would you do differently if you have to do it again.

List of Publications

- Chawla, R. N., Goyal, P., & Saxena, D. (2023). Exploring the Drivers of Digital Transformation in Indian Organizations: A multi-sector study. *Int. J. of Information Systems and Change Management (accepted)*.
- Chawla, R. N., Saxena, D., & Goyal, P. (2022). The Critical Role of the Chief Information Officer in Smart Management of Digital Transformation. In *Handbook of Research on Smart Management for Digital Transformation* (pp. 165-189).
- Chawla, R. N., & Goyal, P. (2021). Emerging trends in digital transformation: a bibliometric analysis. *Benchmarking: An International Journal*, Vol 29 (4). (pp. 1069-1112).

Manuscripts under Review

- Chawla, R. N., Goyal, P., & Saxena, D. The Role of CIO in Digital Transformation – An Empirical view. *Information Systems and e-Business Management (Under Review)*

Raghu Nandan Chawla is a research scholar at Birla Institute of Technology & Science (BITS) Pilani, India. He has been associated with renowned organizations of repute and has successfully delivered many projects under various leadership and consulting roles for over 17 years. He received his Post Graduate Diploma in Management for Working Executives from Indian Institute of Management (IIM), Lucknow. His research interest includes Digital Transformation and Information Technology Strategy.

Dr. Praveen Goyal is working as an Associate Professor in Department of Management, Birla Institute of Technology & Science (BITS) Pilani. He received his PhD in Management from Indian Institute of Technology Roorkee, India. He has published papers in the area of CSR, corporate sustainability in Management Decision, Benchmarking: An International Journal, Journal of Modelling in Management, Sustainable Production and Consumption etc.

His research interest includes Performance measurement, CSR, Strategic Management and value co-creation. He is the recipient of the Emerald Literati Network Awards for Excellence 2016. He has been guest editor for special issue on Evidence-based Processes in Business and Systems in International Journal of Business and Systems Research, and “Evidence based management practices in accounting and finance”, in International Journal of Management Practice.

Dr. Deepak Kumar Saxena holds a PhD in Management Information Systems from Trinity College Dublin (Ireland). After obtaining his PhD, he worked with Trinity College Dublin (Postdoctoral Research Fellow), Dublin Institute of Technology (Lecturer), and Birla Institute of Technology & Science Pilani (Assistant Professor). Prior to his PhD, he worked with the Indian Space Research Centre, Council for Scientific and Industrial Research, and Defence Research and Development Organisation in difference capacities. His current areas of interest include Enterprise Systems (on-premise and cloud-based), Digital Transformation, and AI Ethics. He has published his works in journals such as Australasian Journal of Information Systems, Electronic Journal of Information Systems in Developing Countries, International Journal of Project Management, Irish Journal of Management, Journal of Information Science, and Journal of Information Technology Teaching Cases, among others. He is currently serving as an Associate Editor for Electronic Journal of Business Research Methods (Scopus-indexed) and serving on the review panel of more than 10 internationally reputed Information Systems journals. His edited book 'IoT and Cloud Computing for Societal Good' has been recently published as part of the EAI/Springer Innovations in Communication and Computing book series (EAIISICC).