



A Framework for Digital Transformation in Technical, Vocational Education and Training Institutions in Uganda

By

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DECLARATION

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DEDICATION

To my wife, Dorothy Namarome Muinda; my amazing daughters Nicole and Lisa; my elegant sons Patrick Jr. and Martin and to my dear parents Prof. and Mrs. Muzaale.

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May God be Honoured and Praised for the Things He has done and continues to do.

LIST OF PUBLICATIONS FROM THIS RESEARCH

Ongoing

1. A Framework for Improved success of Digital Transformation Projects – An Agency Theory Perspective (Muinda, 2024).

Yet to start

2. Organisation Change Management and the Importance of the CIO – CEO relationships in the success of Digital transformation Projects (Muinda, 2024).

DEFINITIONS OF KEY TERMS AND CONCEPTS

Definition of Key Term

The following are the key terms and their definitions as used in this thesis:

- 1) Technical, Vocational Education and Training (TVET) is an institution that awards certificate and diploma level awards to students after training them in a given skill (Afeti, 2018);
- 2) Internet Based delivery Models (IBDM) is a plan adhered to by a firm to successfully identify sources of income and target a given customer base with details that elaborate how to invest in order to create distinctive business value (Wang, 2021);
- 3) Gross Domestic Product (GDP) is the total market value of all the finished goods and services produced within a country during a specific time period (Lappi, 2019);
- 4) Information Technology Governance Relational Mechanisms is an approach to communication between business processes and IT processes that work together for IT performance effectiveness (Nyeko, 2019);
- 5) Decision rights are a component of organization design. They identify what business decisions need to be made both to drive the business and to drive alignment to strategy; who is involved in making them; and define the framework for how they will be made through operating processes and support tools;
- 6) IT Governance is a decision rights and accountability framework for encouraging desirable behaviours in the use of IT;
- 7) IT governance processes describe what is done to ensure Information Technology alignment with Business. These processes are governed by the IT policies in an organization that spell out specific details about routine IT operations;
- 8) IT governance Structural mechanisms: IT Governance consists of the leadership and organizational structures that sustains and extends the organization's strategy and objectives through the assignment of IT decisions, roles and responsibilities to able, competent and knowledgeable individuals in both the IT and business domains of an organization;

- 9) IT Project in this study will be restricted to digital transformation projects;
- 10) IT Project Implementation is the carrying out IT/Business activities with the aim of delivering the outputs and monitoring progress compared to the work plan during the digital transformation process;
- 11) Digital transformation is the process of using Digital Technologies to create new, or modify existing business processes, culture, and stakeholder experiences to meet changing business and market requirements in the TVET sub-sector

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LIST OF ACRONYMS

4IR	Fourth Industrial Revolution
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CIO	Chief Information Officer
COBIT	Control Objectives for Information and Related Technology
CoE	Center of Excellence
COSO	Committee of Sponsoring Organizations of the Treadway
DT	Digital Transformation
EFA	Exploratory Factor Analysis
EGDI	Electronic Governance Development Indices
HCI	Human Capital Index
ICT	Information and Communications Technology
HTMT	Heterotrait Monotrait Ratio
IS	Information Systems
IT	Information Technology
ITG	Information Technology Governance
ITIL	Information Technology Infrastructure Library
MDA	Ministries, Departments, and Agencies
MCAR	Missing Completely at Random
MoES	Ministry of Education and Sports
MoICT&NG	Ministry of Information, Communication and Technology & National Guidance
NITA	National Information Technology Authority
NITA U	National Information Technology Authority, Uganda
PLS	Partial Least Squares
SDTP	Successful Digital Transformation Framework
SEM	Structural Equation Modeling
TVET	Technical, Vocational Education and Training Institution
UNESCO	United Nations Education, Scientific and Cultural Organization

UNEVOC International Centre for Technical and Vocational Education and Training

VTI Vocational Technical Institute

ABSTRACT

In today's ever-evolving global educational landscape, Technical and Vocational Education and Training (TVET) institutions, serving as government representatives, acknowledge the pivotal role of digital technology in advancing skill delivery. This recognition transcends borders, extending its influence to various developing economies worldwide. However, the pervasive failure of digital transformation projects casts a formidable and multi-faceted shadow over these endeavors. These projects grapple with an alarming 70% failure rate, casting a shadow of uncertainty over the very existence of the organizations that embark on them (Djurovic, 2020). The financial ramifications are staggering, with an unsettling 9.9% wastage rate for every dollar invested, equivalent to UGX 9.9 million squandered for every UGX 1 billion expended.

The relentless prevalence of digital transformation project failures in regions like Uganda spotlights a core predicament: the absence of robust IT governance. The responsibility largely rests with the upper levels of Ministry of Education management, who entrust project implementation to designated agent teams in projects. A pivotal driver behind these failures is the inherent deficiency in process quality, which surfaces as a central impediment to achieving project success in digital transformation endeavors (CHAOS, 2020; Rohn, 2022).

Conventional solutions, including established frameworks, have proven ineffectual in addressing this enduring challenge. In response, this study has culminated in the creation of a "Framework for Improved Digital Transformation Projects," meticulously tailored to the unique operational landscape of TVET institutions in Uganda. This framework aspires to proactively counteract the mounting challenge of project failures within the dynamic TVET environments, nurturing the conditions conducive to successful digital transformation outcomes (UNESCO-UNEVOC, 2022).

To realize this overarching objective, this study has defined specific goals, including discerning the prerequisites for a successful digital transformation framework in Ugandan TVETs, formulating a framework conducive to digital transformation in these institutions, and evaluating the efficacy of the designed framework.

This thesis encompasses an exhaustive literature review that digs into the domain of information technology governance, the predicaments and realities of digital transformation, and the evolving trend of digital transformation failure, declining from 70% to 66% in developed economies while intensifying in the developing world. This study has identified and incorporated theories such as agency theory, dynamic capabilities theory, and Delone & McLean theory as the foundational underpinnings of this study.

By employing a mixed-method approach, encompassing sequential explanatory mixed methods, SPSS for quantitative data analysis, NVivo for qualitative analysis, thematic analysis, and partial least squares structured equation modelling for factor analysis, this methodology furnishes a robust framework for this research.

As this study unfolds its results section, the findings reveal that process quality plays an instrumental role in amplifying the success of digital transformation. The comprehensive analysis reflects positive responses to indicators across seven latent variables, revealing the critical significance of elements such as goal conflict, communication, task programmability, contract type, and digital transformation. The reliability tests in this study have duly affirmed the dependability of these variables.

In conclusion, this study underscores the profound importance of process quality in achieving successful digital transformation. As the technological landscape continues its rapid evolution, securing success in digital transformation projects within Ugandan TVET institutions assumes unprecedented significance. This research presents a unique perspective on enhancing the influence of process quality on digital transformation success, bearing in mind the distinctive context of these institutions and ushering in prospects for more favorable project outcomes. Recognizing the role of process quality can refine communication protocols, address goal conflicts, enhance task programmability, and mitigate shirking behavior—vital facets in the execution of digital transformation.

CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The rapid adoption of digital technologies within Technical and Vocational Education and Training (TVET) institutions presents a landscape characterized by numerous opportunities and challenges, signifying significant shifts in how these institutions function and deliver their educational products and services (ILO, 2021). It's essential to note that this digital transformation occurs in the context of Industry 4.0, which acts as a primary driver of innovation within the TVET sector (ILO, 2021). Consequently, the formulation of policies for digital TVET emerges as a strategic response to this emerging industrial paradigm (ILO, 2020).

Furthermore, it's imperative to recognize that the influence of digital transformation extends beyond mere structural and operational changes; it also encompasses the intrinsic quality of processes within TVET institutions. Historically, these institutions have been viewed as repositories of tangible assets, which can be skillfully leveraged to create value within the realm of digital transformation projects (Hamel & Prahalad, 1990, as cited in Smith, 2023). In our examination of the case for the digitalization of TVET institutions, it becomes readily apparent that the quality of processes within these institutions plays a pivotal role (Eisenhardt & Martin, 2000; Johnson, 2022).

It is important to note that

Even amid the profound changes brought about by digital transformation, it remains imperative for policymakers to engage in introspection regarding the adaptations necessary to ensure that employment and skills strategies, services, and tools not only adjust but also enhance the overall quality and accessibility of education and training. If the newly acquired tools for digital transformation are not used, the entire digitalization effort will have been a waste. This consideration is particularly pertinent to mitigate the deepening of the digital divide (Smith, 2023).

In the context of Uganda, there is a growing emphasis on harnessing digital technology to enhance the operations of Technical and Vocational Education and Training (TVET) institutions. TVET encompasses vital functions such as teaching, learning, and information management, all aimed at benefiting various stakeholders. The Ugandan government has assumed a leadership role in spearheading these transformative endeavors, driven by a resolute

commitment to elevate the quality of education. The Ministry of Education and Sports holds a pivotal role in orchestrating and ensuring the success of these initiatives, bearing ultimate responsibility for the formulation and execution of robust implementation strategies that guarantee optimal outcomes.

Within this framework, the Ministry, often likened to the principal actor, delegates the practical execution of digital transformation projects to an entity known as the "Agent." This "Agent" takes the form of a specialized implementation team tasked with translating vision into reality. However, empirical research findings underscore a recurrent issue in the efficacy of the processes governing digital transformation endeavors. On numerous occasions, the agents representing top management interests, while acting on behalf of the principal (the Ministry), appear to harbor divergent objectives, grapple with communication deficiencies, and engage in tasks pertaining to digital transformation that lack clearly defined parameters.

The study examined political intrigues and various other factors that manifested throughout the digital transformation journey in Ugandan TVETs. It specifically focused on the complexities of developing specifications for ICT equipment, including how different components of the equipment were specified to work together. Additionally, the study researched into the observed lapses in due diligence at various stages, the absence of clear roles and responsibilities in some instances, and the challenges exacerbated by interpersonal differences within the organization's leadership. Critical processes are vital for the success of digital transformation in education institutions. These processes include needs assessment, budget planning, procurement, infrastructure setup, software integration, and training programs. Training is particularly important due to the insufficient digital skills required to use new equipment. Furthermore, the journey entails the integration of digital technology into the curriculum, coupled with rigorous pilot testing to ensure readiness before full-scale deployment across TVET institutions. Continuous monitoring, evaluation, and the provision of technical support are integral components of this digital transformation strategy. The main goal of this project was to empower TVET institutions to effectively harness digital technology for enhanced teaching, learning, and information management, ultimately benefiting all stakeholders.

The primary focus of this study centered on explaining the factors that played a role in the recurring failure of crucial digital transformation projects within Ugandan TVETs. This

intention implied that through diligent supervision of each phase in the digital transformation process and an unwavering dedication to maintaining the quality of the processes, there existed a significant potential for improving the prevailing issue of digital transformation failures.

To address the challenge discussed above, this research study conducted a comprehensive examination of existing solutions to improve the success of digital transformation. The primary aim was to determine the key factors that contribute to the success and failure of such projects from literature. Additionally, this study identified potential avenues for future research in this domain. Our research approach involved a cross-sectional investigation, focusing on essential stakeholders within the TVET sub-sector, selected purposively based on their significance. Performance indicators were employed that were deemed critical in shaping the success of digital transformation.

Both qualitative and quantitative research data were gathered through an on-site field study. The quantitative data was collected through stakeholder-specific structured questionnaires, while qualitative data was collected through a field study at the selected TVET institutions. Also, individual focus group discussions were held.

This study extends upon the research conducted by Mahaney and Lederer in 2003. It evaluates how increased monitoring and reduced shirking behavior contribute to the success of projects. These factors are connected to the quality of project management and the effectiveness of processes in ensuring that tasks are executed as intended. While the study does not explicitly assess "process quality" as an independent construct, it examines several factors that can influence the quality of processes within digital transformation and their subsequent impact on project outcomes.

Our findings emphasize a critical issue: a conflict in goals between the agents and the principal (top management) significantly contributes to the poor governance and outcome of digital transformation. This conflict, compounded by insufficient communication between agents and the principal concerning various project aspects, as well as the absence of well-defined digital transformation tasks with clear roles and responsibilities for each participant, proves to be detrimental.

This study has shown that when these factors are influenced by "process quality," they play a pivotal role in achieving the success of digital transformation.

In order to establish meaningful insights into the factors that contribute to success or failure of digital transformation projects in Uganda Technical, Vocational Education and Training Institutions (TVETs), this study systematically discussed the four Principal backgrounds which were carefully established to explain the evolution of the study based on historical, theoretical, conceptual and contextual backgrounds as elaborated in the following subsections.

1.1.1 Historical Perspective

This study explores the historical perspective of Technical and Vocational Education and Training (TVET) on a global, continental, regional and local scale. TVET has a rich history that has witnessed notable shifts in response to changing industrial needs, technological advancements, and globalization (Wafi et al., 2023). Understanding this evolution provides valuable insights into the current state of TVET and its relevance in the modern world. TVET has ancient origins, dating back to civilizations where apprenticeships and vocational training were the primary modes of skill acquisition (Oko & Okey, 2023). Skilled artisans passed on their knowledge to the next generation, setting the foundation for vocational education (Oko & Okey, 2023).

The 18th and 19th centuries marked a pivotal point in the demand for skilled workers due to the Industrial Revolution. This period saw the emergence of formalized vocational training and trade schools to meet the needs of rapidly evolving industries.

Throughout the 20th century, many countries established dedicated vocational education systems designed to prepare students for specific trades and industries. These programs placed a strong emphasis on hands-on training and practical skill development.

TVET systems vary widely across the globe. Different countries prioritized different aspects of vocational education. Some nations emphasized apprenticeships and work-based learning, while others had more structured and comprehensive technical and vocational education programs.

The advent of the digital age and globalization prompted TVET to adapt to meet the demands of rapidly changing industries. Today, there is an increasing focus on incorporating technology and digital skills into TVET programs.

In recent years therefore, there has been a growing acknowledgment of the pivotal role of TVET in addressing skill shortages and supporting economic development. Numerous countries are currently reforming their TVET systems to align them with the needs of modern industries and to provide a pathway to decent work for individuals.

On a global front, TVET has gained international attention, with organizations such as UNESCO and the International Labour Organization (ILO) advocating for the expansion and enhancement of TVET systems worldwide. These organizations work collaboratively to create standards and guidelines for TVET, aiming to ensure its quality and relevance.

The historical perspective of TVET showcases its journey from informal apprenticeships to more formalized vocational education systems, underlining its adaptability to the changing needs of industries and the labour market in a modern, globalized world. This comprehensive overview lays the groundwork for a deeper understanding of the current state of TVET and its ongoing evolution.

Uganda as a country embraced TVET and has greatly invested in this subsector. On the 9th February 2018, the Government of Uganda announced the selection of 12 Vocational Technical Institutes (VTIs) to act as institutes of excellence to deliver high quality demand driven programmes in skilling Ugandans (TheNewVision, 2018). This is in addition to the four existing centres of excellence that already exist, namely Bukalasa Agricultural College, Uganda Technical College Lira, Uganda Technical College Elgon and Uganda Technical College Bushenyi.

1.1.2 Contextual Perspective

In order for Government to achieve its goal, the selected technical institutions were revamped. Further still, Government approved the Technical, Vocational Education and Education Training Policy on the 14th January 2019 with a view to build a firm background for effective policy implementation. This policy was approved to ensure effective implementation of this venture which among others was to undertake preliminary activities to enable the roll out of key reforms envisaged under the policy (MoES, 2019). Essential among these undertakings is

the formulation of standards, procedures and guidelines to guide the implementation of this policy.

Among the policy objectives and strategies of the TVET Policy (Objective 6.2) is to promote a flexible and demand driven TVET delivery system through competence based modularized packages and use of ICT (MoES, 2019). The entire project, included Digital transformation efforts including the purchase of ICT equipment funded by the World Bank which was costed at One Hundred Million United States dollars. The ICT equipment is instrumental in enabling TVET institutions to adapt to the latest trends where teaching and learning is becoming more measurable and goal-oriented.

Further, decisions on when, how and where individuals learn can no longer be constrained to a specific time or place (USDP, 2020). Thus, the need to embrace digitization of teaching and learning as a critical success factor for TVET institutions. This digital transformation effort costed 4.7 billion Uganda shillings. Like all projects, the approach to use ICT in TVET institutions in Uganda has also had its setbacks and failures (USDP, 2021).

The outcome of these digitization efforts turned out to be very poor. This was also true globally when the rate of digital transformation project failure hit an all-time high of 70%. It was until recently in the year 2017 when there was an observable drop in failure of digital transformation projects compared to what it was before. It became even more intriguing when the drop from 70% to 66%, in failure of these projects was observed in developed economies only (CHAOS, 2020).

Curiously, the rate of failure appears to have persisted at 70% or higher in developing economies. This high, incessant failure rate was also observed in Ugandan TVET institutions attempting to change how teaching and learning will be done using digital technology.

According to the most recent United Nations report that presented the E-government development Indices (EGDI) for various countries, the top countries in high E-government development countries by category are Denmark (EGDI of 0.9717), Finland (EGDI of 0.953), United States of America (EGDI of 0.9151), German (EGDI of 0.8770) and Canada (EGDI of 0.8511). The same report presented the E-government development Indices for the middle E-government development countries by category. The selected ones for reference in this study are South Africa (EGDI of 0.7357), Kenya (EGDI of 0.5589), Rwanda (EGDI of 0.5489), Nigeria (EGDI of 0.4525), Uganda (EGDI of 0.4424), and South Sudan (EGDI of 0.852) (UN,

2023). Although Uganda falls within the middle E-government development Index – EGDI of 0.3599 in 2016, 0.4055 in 2018 and 0.4499 in 2020, the rate of digital transformation project failure is still high. In 2022, Uganda's EGDI dropped to 0.4424 from 0.4499 by 75 points, despite a remarkable increase in Uganda's Human Capital index (HCI) from 0.4668 in 2016 to 0.5631 in 2022 (UN, 2023). The HCI takes account of the level of education and skills of a given country's population. In view of this, it is evident that the failure rate of such projects has been steadily decreasing among developed economies. Correspondingly, within developing countries, there is a concerning trend of increasing failure rates in digital transformation (UN, 2023). Furthermore, it's important to note that even when digital transformation (DT) in developing countries are completed within the scheduled timeframe, they often fall short of achieving their intended objectives, as evidenced by reports such as was reported by NITA-U in 2013 and 2017. This failure has significant consequences, including the disappointment of project beneficiaries who are left with inferior infrastructure and applications, as highlighted by Ejia and Ramegowda in 2020. Additionally, it can lead to unfavorable assessments from development partners, potentially jeopardizing future financial support, as suggested by Saxena in 2021. This situation also results in the wastage of national resources, as reported by NITA-U in 2017, and poor returns on investments, as discussed by Cresswell in 2004, among other adverse effects stemming from the increasing number of project failures.

Moreover, the complexity of hardware, as indicated by Letiagina and Malov in 2021, contributes to an escalation of project risks. Furthermore, the absence of a comprehensive ICT in Education policy and a legal and regulatory framework poses challenges. These factors make it difficult to directly apply the recommendations of existing IT governance frameworks to organizations and institutions in developing countries like Uganda, as highlighted in the Digital Agenda Strategy of 2023.

It has emerged that the management and use of Information Technology in the East African Region is a complex mix of organizational, traditional, political, legal and technical concerns (Nfuka, 2012). Unfortunately, the management of the Information Technology organization hardly has autonomy over decisions to set and measure Information Technology performance and the contribution of Information Technology to performance goals (Othman et al., 2010).

In the realm of IT projects in Uganda, a distinct absence of established oversight mechanisms to safeguard the excellence and efficacy of Digital Transformation endeavors is readily apparent. This shortfall is conspicuous through the non-existence of organizational frameworks such as an IT project steering committee and the lack of well-defined roles and responsibilities, collectively undermining the quality of these undertakings. (Horwath et al., 2012; NITA-U, 2013; Riyadi et al., 2021; Wulandari & Buliali, 2019). Such arrangements in this context must be a top high level executive team consisting of representatives from multiple departments and divisions that are allocated or assigned the task of aligning Information Technology strategy with Business strategy by matching organizational concerns with technology potential while setting strategic direction for the organization (Ali & Green, 2005; Fattah & Setyadi, 2021).

Moreover, it is postulated that organizations in Uganda are also either unable or unwilling to learn from mistakes and successes which is critical to DT project management and continuous improvements of such projects (Nelson, 2021). As a consequence, substantial Information Technology investments continue to be made in order to support operations and strategic undertakings (Caluwe et al., 2021; Trends, 2020; Valentine & Stewart, 2015) that continue to fail at an alarming rate (Lauesen, 2020; Rajala & Aaltonen, 2020) and yet IT project managers continue to plan for significant expenditure in ongoing Digital Transformation for development projects.

In Uganda, very little is known to have been done to understand why Digital Transformation projects fail and why those being implemented are not effectively put to use as was planned (Anjoga & Kituyi, 2017). Moreover, the failure of most DT projects in Uganda could be predicted and are therefore avoidable (Rajkumar, 2013). The causes of these failures are not very well documented.

The outcome of this study led to the design of a framework for both structures and processes that facilitate coordination, learning in a team, sharing and amalgamation of individual knowledge so that well informed decisions for DT project implementation will be made (Sah & Stiglitz, 1984). This framework minimizes unnecessary formalities to project approval and execution when the players in the organization contribute to IT project success (Felin & Powell, 2016) at each milestone of the project to achieve quality of every process.

1.1.3 Conceptual Perspective

The precise reasons behind project failures in Uganda are not yet fully grasped. However, this study proposes a hypothesis that during project implementation, several independent variables were at play. These elements include Goal Conflict, Shirking, Communication, and Task Programmability. These factors were influenced by another variable known as Process Quality, which ultimately contributes to improved success of digital transformation.

The outcome of these projects is formed by the involvement of the principal, as discussed by DesJardine et al. (2022). Studies in the realm of the influence of “private politics” on corporate actions related to organizational and stakeholder interests are largely governed by the social movement theory (Reid & Toffel, 2010). The influence of “private politics” has repercussions for the achievement of success in digital transformation projects, as observed in the works of Mahaney and Lederer (2003b) and McDonnell et al. (2015).

Shirking is the other variable. Shirking occurs when the agents or project implementers do other activities of more interest at the expense of the project. Shirking is a risk to digital transformation projects since the project implementers take on other assignments that compete for the agent’s time and effort. Agents may shirk their responsibilities in the project by taking advantage of the information asymmetry between both partners by exploiting their information advantage to their own benefit and to the detriment of the principal and the institution as a whole (Münch & Wieczorek, 2023).

Another factor considered was Communication. Effective participation of Top Management in the digital transformation endeavor necessitated transparent communication between the agent and the principal. Moreover, the study analyzed corresponding survey responses from CIOs and CEOs using dyadic data analysis (Haffke, 2017), forming a social network wherein two individuals were connected to gauge the influence of the CIO-CEO relationship on Digital Transformation projects. Limited information existed on how this collaboration affected their partnership within the Ugandan context. Additionally, a scarcity of documented literature emphasizes the significance of the CIO-CEO relationship concerning the triumph of digital transformation projects. These factors collectively contribute to the establishment of clear communication, a factor hypothesized to play a pivotal role in the success of digital transformation within TVETs.

Another variable under examination was Task Programmability. Task programmability assesses the extent to which attributes of each task are precisely defined, with the aim of minimizing ambiguity concerning roles and specific project activities. Serving as a mediating factor was Process Quality. Process quality acted as a mediator for task programmability by influencing how clearly defined tasks were carried out. Well-defined tasks were more likely to be successfully executed when supported by high-quality processes, contributing to the success of digital transformation projects.

1.1.4 Theoretical Perspective

In the pursuit of identifying factors that enhance the execution of Digital Transformation Projects, the study extensively reviewed pertinent literature. Various models and frameworks related to information system adoption were examined to pinpoint key elements influencing project success in digital transformation. The Agency Theory Framework by Mahaney & Lederer (2003) was expanded upon.

Elements of the DeLone and Mclean Theory were integrated to enhance comprehension of digital transformation project success. The Agency theory was chosen as the foundational theory because it plays a crucial role in comprehending and analyzing the relationships among the variables discussed in subsection 1.1.3 of the Conceptual Background.

Moreover, agency theory holds particular relevance in studies related to oversight roles, which mirrors the function of Top Management (government representatives) in this study's scenario (Schillemans & Busuioc, 2015). Furthermore, this framework applies to the interplay between IT/Business Project Managers (agents) and Government Representatives (principal), forming an agency relationship. Therefore, Agency theory suggests a pronounced view of governance that emphasizes monitoring and control of agent to curtail avoidable risks from the inception of a DT project to its implementation through maintaining value assessment of the project to a reasonable extent (Eisenhardt & Eisenhardt, 2018; Nurhidayah Yahya et al., 2022; Nyeko, 2019). The agent (Project Coordination Unit) represents the principal (The Government of Uganda, represented by Top Management of the Ministry of Education and Sports) in a particular business transaction (Digital transformation projects in TVET Institutions).

The agent is expected to represent the best interests of the principal without regard for self-interest (W. DeLone et al., 2018; W. H. DeLone & McLean, 1992). This does not happen.

Evidently, from literature, the Agency theory is in itself not a panacea to Digital Transformation Project execution failure.

Despite the numerous merits of the Agency theory, it has been found to have weaknesses. In this context, the Agency Theory is limited to its applicability and effectiveness in real-world organizational contexts. More specifically, Agency Theory by itself is not fully adaptable to complex environments and does not support enhanced employee engagement. This in itself means that the long-term success of a digital transformation project would be limited to short term compliance of the project needs and requirements. This therefore calls for a structured approach in Ugandan TVETs, specifically within the context of Technical and Vocational Education and Training institutions. In this context, a process mechanism in IT governance refers to a systematic framework that guides the planning, execution, and management of IT-related processes. Such a framework is crucial to ensure that digital transformation projects and IT activities within these institutions are carried out efficiently and effectively, while remaining aligned with the unique goals and requirements of TVETs (Dirk Steuperert, Steven De Haes, Tim Huygh, 2021). This study focused on studying the factors for achieving this success and did not explore how the processes were planned for, executed or managed.

This framework describes the individuals with the requisite skill and competence, appointed by Top Management and empowered by Top Management to act as the principal in execution of projects and monitoring the behaviour of management to influence desirable governance outcomes (Nyeko, 2019). It was therefore hypothesized in this study that “process quality” leading to successful digital transformation will be realised.

The DeLone and McLean theory was also used because the outcome of such projects must be accepted and used (by the users) in order to define information system project success (Petter et al., 2008). Both these theories support the emphasis on monitoring, decision and advisory responsibilities and the use of dynamic capabilities (Pitelis & Teece, 2010).

Moreover, the use of the two theories broadens the theoretical foundation by not only investigating a single theory but also by extending and integrating different theories and essential concepts in the field of Information Technology Governance.

This framework was grounded in the agency theory (Mahaney and Lederer, 2003; Davis, 2013; Schillemans & Busuioc, 2015) from a dynamic capability view point. Furthermore, reference

to the Coordination Theory (Crowston et al., 2006) was made so as to review Agency Theory in a manner that highlights its relevance to the issues and factors in this study.

Coordination continues to be an interest of both organizational scholars and more recently, scientists in the computing field (Crowston et al., 2006). In the interdisciplinary Study of Coordination, Malone and Crowston (1994) explain that coordination simply means the management of dependencies between actions. In other words, if for instance, there is no interdependence in the actions leading to a successful implementation of an Information technology Project, there is nothing to coordinate about project implementation success in that organization (Malone & Crowston, 1994). This argument is consistent with (Thompson, 1967; Thompson et al., 2017) who argue that uncertainty seems to be the unavoidable problem for complex organizations.

Coping with this uncertainty is the core of governance, and in this case digital transformation project governance. Organizations have been perceived as “institutional” and therefore not perceived as scientific entities.

Deriving from Scott (1992) we appreciate that institutions develop and adapt, unprompted and aware of the fact that Institutions are social and political entities. Institutions are not mechanical and bureaucratic arrangements. Institutions therefore are formed by their participating individuals and the interaction of their interests. The formed institution is consequently accommodative of the input from the individuals in the institution and how their interests interact with one another.

Bureaucracies on the other hand are intangible, distant and detached from employee’s emotions. This study did not specifically observe whether institutionalization and not bureaucracies foster improved Digital Transformation Projects (Spender & Kessler, 1995).

The study however observed that the TVET institution fills an individual’s activity with importance beyond technical requirements of the task at hand. Spender and Kessler (1995) posit that institutionalization is achieved by involving the individual in the social and representative meaning of the organization’s social activities which include the institutions politics and power systems (March & Olsen, 1996). These activities are defined as the tasks and decision-making mechanism designed to achieve desirable outcomes from combined actions between interdependent units (Thompson, 1967; Thompson et al., 2017) in digital transformation of an institution.

In the context of process quality and dynamic capabilities as a strategic framework, institutions were perceived as collections of tangible assets (physical, organizational, and human) that could be effectively leveraged to create value in the context of digital transformation projects (Hamel & Prahalad, 1990). While some argued that dynamic capabilities were institution-specific (Teece et al., 1997), others, like Eisenhardt & Martin (2000), contended that certain dynamic capabilities exhibited notable similarities across institutions. This suggested that there were shared methodologies for managing digital transformation projects, as underscored by Eisenhardt & Martin (2000).

However, given the ongoing debate and the apparent simplicity of these capabilities, it became apparent that there was a lack of structured guidance available to managers who sought to navigate the intricacies of digital transformation project processes while upholding their quality standards (Daniel & Wilson, 2003). This study sought to establish the importance of these processes and whether their quality indeed impacts digital transformation.

The threat, therefore, to competitive advantage, through Digital transformation (IT projects and their implementation) comes from the inside of the institution and not only from the outside of the institution through the failure of dynamic capabilities (Eisenhardt & Martin, 2000) because dynamic capabilities create flexibility which is a precondition for Information Technology Project implementation and success in dynamic environments (Daniel & Wilson, 2003). This directly impacts on the quality of processes (Process Quality) that ultimately impact on the outcomes of digital transformation (Sindre & Sørumgård, 1996).

1.2 Problem Statement

In dynamic environments, TVET institutions, representing the government, emphasize the significance of digital technology utilization by instructors, students, and administrators to enhance skill delivery. This is vital not just in Uganda but also across other developing economies. The effect of the failure of digital transformation projects is profound and multi-faceted. With an alarming failure rate of 70%, these projects pose a substantial threat to the very survival of organizations (Djurovic, 2020). The financial toll is staggering, as a significant 9.9% wastage occurs for every dollar invested in a digital transformation project, translating to UGX 9.9 million wasted for every UGX 1 billion spent. Despite substantial financial

commitments, the persistent occurrence of digital transformation project failures in regions like Uganda highlights the problem of inadequate IT governance. The principal responsibility rests with top-tier Ministry of Education management, who frequently delegate project implementation to designated agent teams. A central catalyst behind these failures is the inherent deficiency in process quality, which subsequently reverberates as a key hindrance to achieving project success in digital transformation endeavors (CHAOS, 2020; Rohn, 2022). Established solutions, including frameworks, have proven to be insufficient in addressing this persistent challenge. This study resulted in the creation of a "Framework for Improved Digital Transformation Projects," carefully tailored to the distinct operational context of TVET institutions. This framework aims to proactively mitigate the escalating concern of project failures within the dynamic environments of TVETs and, in turn, cultivate the conditions essential for successful digital transformation outcomes (UNESCO-UNEVOC, 2022).

1.2.1 Thesis Outline

The structure of this thesis therefore, is as follows:

Chapter 1 presents a background of the study, which provides insights and justification for the research. This is followed by a statement of the research problem, research questions, research objectives, scope, and justification of the study.

Chapter 2 presents a review of important concepts in IT Governance and TVETs in General. A view of how projects are managed is reviewed briefly. Thereafter, the chapter explores the theoretical frameworks on agents and their principals, use and application of digital transformation resources, that are relevant to this study. The chapter concludes by presenting a conceptual framework that is relied upon through the rest of the study.

Chapter 3 Presents the research methodology. The methods include the philosophical stance, the research approach, the adopted research method, and its instantiation in the study. Also, the chapter describes the design of the field survey, the techniques of data analysis employed, and the evaluation of the framework.

Chapter 4 presents the results of the field study that was conducted to uncover subjective experiences in the digital transformation journey at each institution. Furthermore, this chapter

presents an explanation of complex situations and unexpected findings from quantitative research.

Chapter 5 presents the results of the field study that was conducted to test and effect the theoretical framework for improved success of digital transformation projects. First, Exploratory Factor Analysis results are presented. The confirmatory factor analysis results are thereafter presented. The same chapter then presents the results from testing of the relationships between independent variables, the mediating and dependent variables.

Chapter 6 presents the theoretical framework for improved success of digital transformation projects for TVETs in the context of Uganda. The process and method for developing the framework are presented first. A detailed iterative process on how the final framework is derived, is explained in this chapter.

Chapter 7 presents the results of the evaluation of instantiation of the frame work for SDTP using structured walkthrough and experimentation. Also, a discussion of the prototype development process is provided. The development involved deriving functional and non-functional requirements, modelling of requirements and describing the technologies used. The description of the prototype and its evaluation are also discussed.

Chapter 8 presents a discussion of the study findings, conclusions made, study limitations and the recommendations to researchers for future work.

1.3 Main Research Question

What framework can provide support for digital transformation in Ugandan Technical, Vocational Education and Training Institutions (TVETs).?

1.3.1 Specific Research Questions

1. What are the requirements for a framework for digital transformation in TVETs?
2. What Framework design best supports digital transformation in Ugandan TVETs?
3. To what extent can the effectiveness of the designed digital transformation framework be evaluated?

1.4 Main Study Objective

To develop a framework for improved success of digital transformation projects in Ugandan Technical, Vocational Education and Training Institutions (TVETs).

1.4.1 Specific Objectives

To achieve the general objective above, the specific objectives are as follows:

1. To determine requirements for a framework for success of digital transformation projects in Ugandan TVETs.
2. To design a framework that supports digital transformation in Ugandan TVETs.
3. To evaluate the designed framework for digital transformation in Ugandan TVETs.

1.4 Scope of the Study

This section describes the geographic scope, content and time scope for this study. Section 1.4.1 that follows, describes the geographic scope; section 1.4.2 describes the content scope and section 1.4.3 describes the timelines within which fieldwork activities were carried out.

1.4.1 Geographic Scope

The study took place in Uganda's four regions: Northern, Central, Eastern, and Western. These regions are experiencing rapid urbanization and are adopting digital technologies in their daily operations, exemplifying a developing economy. The research will concentrate on Centers of Excellence (CoE's) within Technical, Vocational Education and Training (TVET) institutions and the corresponding Local Governments.

The study was also extended to selected Vocational Training Institutions (VTI's) affiliated with each CoE. These institutions were among those undergoing digital transformation (MoES, 2013). Many organizations, especially technical colleges in Uganda, had actively embraced the digital revolution (MoES, 2013, 2019). This trend began years ago when the Government of Uganda, through the Albertine Region Sustainable Development Project, embarked on enhancing the quality of Technical, Vocational Education and Training (TVET) to align with employers' needs and promote broader access to TVET skills for economic development.

1.4.2 Content Scope

Previous research highlighted the widespread adoption of Information Technology in various Ugandan organizations, including Technical, Vocational Education and Training (TVET) Institutions (Kizito, 2020). This study specifically focused on Information Technology Projects. The primary objective of these projects was to integrate digital technology into the operational aspects of TVETs, leading to a fundamental transformation in how these institutions operated and delivered value to their stakeholders.

The study's scope revolved around Information Technology Governance Mechanisms, with particular attention to processes, roles, and responsibilities (Steuperert et al., 2021). Recognizing the lack of relevant literature in the context of Ugandan TVETs, the study conducted a contextual examination of possible IT Governance issues that could explain project failure. Moreover, a comprehensive analysis of digital transformation initiatives was conducted.

It is worth noting that this study was limited to the development of a framework aimed at enhancing digital transformation in selected TVET entities in Uganda. The scope was specifically confined to IT projects within the TVET category of learning institutions. The research was focused on investigating the practical implementation of digital transformation within the context of TVETs in Uganda.

1.4.3 Time Scope

The study was cross-sectional, and data collection was conducted in three phases as follows:

- i. Field study research was conducted between March 2023 and May 2023. This study aimed at testing the conceptual framework for Digital Transformation in Ugandan TVETs and to validate its constructs and aspects.

- ii. Structured walkthroughs were conducted between September 2023 and October 2023. Structured walkthroughs helped to evaluate this frame work for digital transformation to ascertain its strength in supporting improved digital transformation in Ugandan TVETs.

- iii. Field experiments were also conducted between November 2023 and January 2024. These experiments aimed at evaluating the instantiation of the framework for digital transformation to ascertain its practical utility.

1.5 Contribution of this Study

Motivated by the underexplored link between IT governance processes and the success of digital transformation projects (Joshi et al., 2022), this study drew insights from the IT-enabled capabilities of a TVET institution, IT capabilities, and existing findings on IT governance frameworks. It introduced, assessed, and tested the theoretical concept of IT governance process quality. Prior research has emphasized the impact of IT governance structures on digital transformation project outcomes (Joshi et al., 2022). In this study, the construct of IT governance process quality focused on IT processes and the influence of individuals within the structure on IT process identification, design, and implementation.

Earlier works in the field of Information Systems have advanced our understanding of how TVET institutions implement IT governance processes (De Haes, et al., 2020; De Magalhães et al., 2020; Van Grembergen et al., 2007). In this context, IT Governance Process quality refers to the TVET institution's ability to identify, design, and implement processes, select and allocate IT resources for decision-making, planning, service delivery, infrastructure modernization, and monitoring (Joshi et al., 2022). This study posited that the relationship between the study variables and Digital Transformation in TVET institutions is mediated by Process Quality.

Furthermore, the convergence of IT and business perspectives underscores the need to expedite and automate decision-making, given suggestions that the traditional view of IT governance may no longer hold true (De Magalhães et al., 2020). Other researchers have also highlighted the potential obsolescence of the traditional IT governance view in today's digital transformation landscape, necessitating further exploration (DeLone et al., 2018). Moreover, outdated and inefficient processes detrimentally affect IT Governance of digital transformation projects (Atrash, 2022). Process quality, as detailed in subsection 2.9.1, mediates Goal Conflict, Communication, Shirking, Task Programmability and Digital Transformation.

Agency theory postulates the possibility of goal conflict between business and IT project process managers in the realm of digital transformation. This is evident in projects formulated without IT department involvement in their inception and execution. Significantly, CIOs and

IT Managers become engaged in IT project implementation usually after contract signing, a stage where preliminary project foundations are established. Excluding IT Managers at the project's outset presents risks. Each process is integral to achieving IT governance for enhanced digital transformation project success.

The study conducted a comprehensive investigation into the factors influencing digital transformation project success within Ugandan TVET Institutions. It utilized a conceptual framework inspired by prior research and introduced the concept of "Process Quality" as a link between independent variables and project success. The study explored various relationships, such as the impact of Goal Conflict, Communication, Shirking, and Task Programmability on digital transformation. Both quantitative and qualitative methods were employed to analyze these relationships, providing a well-rounded understanding. Additionally, the study examined how Process Quality mediated the connections between different variables and digital transformation success. Overall, the research contributes to the field by using advanced modeling techniques to shed light on the dynamics of digital transformation in Ugandan TVETs.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides insights into the success rates of Digital Transformation (DT) projects involving both hardware deployment and software development. It also explores the current state of the art and the state of practice in endeavours aimed at establishing globally acceptable digital transformation practices. The first part of the literature review covers a general overview of IT Governance and related literature on the definition of Success, Digital Transformation project implementation, and the magnitude of failure of Digital transformation projects. The second part covers information technology governance in more detail. Section 2.4 presents different Information Technology Models and Frameworks. Section 2.5 discusses the strengths and weaknesses of selected IT Governance Frameworks. Section 2.6 presents a review of IT Governance in Practice. The last part describes TVET institutions in Uganda, the underpinning theories and theoretical frameworks for digital transformation, the conceptual framework for improved success of digital transformation projects and also presents the study hypotheses.

2.2 IT governance

In an effort to underscore the importance of reporting in digital transformation projects, researchers have identified a significant issue of under-reporting in healthcare projects on a global scale, with an estimated prevalence of 90%. Despite this, there is a lack of effective interventions that combine Fourth Industrial Revolution (4IR) technologies and strategies to mitigate under-reporting and enhance both the quantity and quality of reporting in digital transformation project execution (Li et al., 2022).

The focus on the problem and its solution, leveraging digital technologies, varies considerably between decision-makers and those responsible for implementing decisions made by Top Management. This variance is due to the disruptive nature of digital transformation, which is influenced by social shifts, economic changes, and political dynamics both within and outside the organization (Wade, 2018).

Furthermore, it is theorized that the failure of such projects can be attributed to the oversight of ICT officers in TVET institutions. It is proposed that involving the Chief Information Officer (CIO) or Head of Information Technology in the supervision of digital transformation projects

would lead to enhanced success in IT investments for TVET institutions (De Haes & Van Grembergen, 2008; Jokonya & Lubbe, 2009). Additionally, the presence of a CIO in digital transformation projects can alleviate adaptation pressures by facilitating organizational change (Bendig et al., 2022).

Interestingly, this proposition contrasts with Haffke's (2017) findings, which suggest that the CIO's understanding of the CEO's role plays a more pivotal role in predicting the quality of the CIO-CEO teamwork than the CEO's understanding of the CIO's role. This distinction emphasizes the importance of the CIO-CEO partnership. Thus, understanding the CEO may hold more significance for the CIO than vice versa, as this could impact the success of digital transformation projects (Benlian & Haffke, 2016).

This study also delves into the matched-pair survey responses of CIOs and CEOs using dyadic data analysis (Haffke, 2017) to investigate the influence of the CIO-CEO relationship on digital transformation projects, particularly in the Ugandan context where limited knowledge exists about how this collaboration affects their partnership.

For effective business-IT alignment, research highlights the importance of an IT-competent steering committee that supports the C-suite in demonstrating IT leadership while addressing challenges and issues in project execution (Bassellier et al., 2001; Milano & Brun, 2021; Ribeiro et al., 2021). A strong CEO-CIO relationship is believed to contribute to the alignment of IT and business in organizations such as TVET institutions.

Research suggests that achieving the aforementioned factors leads to significant success in projects employing digital technologies. Each of these dimensions supports strategic planning, a critical factor for the success of any digital transformation agenda (Feeny et al., 1992; Pakusadewa et al., 2021). The failure of digital transformation projects can be financially burdensome for TVET institutions.

In conclusion, this study aims to contribute to the field of digital transformation projects in developing economies, specifically in Technical, Vocational, and Education Training Institutions in Uganda. It offers a framework to enhance the implementation of such projects with improved success through effective IT Governance.

2.2.1 Challenges and Realities of Digital Transformation Projects

In recent times, numerous institutions have increasingly integrated digital technologies into their operations within this digital information era. Across the globe, organizations have recognized the necessity of pursuing digital transformation due to the widespread impacts of the global pandemic.

The term "digital transformation project" can often be used interchangeably with an Information Technology project in a broader context. More specifically, a digital transformation project refers to the utilization of digital technologies to either create new or modify existing business processes, culture, and stakeholder experiences to align with evolving business and market demands.

Digital transformation encompasses various manifestations. It could involve enhancing established processes by introducing technology that supports those processes, making minor adjustments to an ongoing digital implementation, or even overhauling an entire information system with the latest technology.

The ultimate goal of a digital transformation project is to enhance efficiency by optimizing operations and, in some instances, increasing an organization's profits. When executed effectively, these projects yield positive changes for both the organization and its customers. However, such positive outcomes are not guaranteed every time, and digital transformation projects often encounter failure.

From a historical perspective, the success rate of Information Technology Infrastructure projects, encompassing hardware deployment and software development, remains consistently low at around 30% in developing economies (Fattah & Setyadi, 2021; Stoica, 2021).

Global statistics from past research highlight that in 2015, a staggering 91% of organizations and institutions struggled to successfully implement digital transformation projects (Rossi, 2015). Among the remaining 9% that considered themselves successful in delivering value through these projects, only 5% managed to achieve their planned strategic goals and business objectives (Rossi, 2015). Additionally, among the 56% that perceived their projects as successful, the absence of a more dynamic environment and an externally oriented strategy often prevented them from attaining improved profitability (Turedi & Zhu, 2019).

2.2.2 Trends in Digital Transformation

From 2006 until around 2017, there was a consistent trend of project failure. However, this trend shifted in developed economies eleven years later (Florentine, 2017; Langley, 2017). The Standish Group's Annual CHAOS report (2020) also indicates a decrease in the global DT project failure rate in developed countries, dropping from 70% to 66% based on the analysis of 50,000 projects globally (CHAOS, 2020).

It is theorized that the increase in DT project success after 2017 is attributed to digital convergence (Tickle, 2018). Tickle (2018) suggests that the alignment of business and Information technology has led to enhanced cross-functionality of DT projects. This involves collaboration between Business leaders and IT experts to create effective solutions for business value, resulting in higher returns on IT infrastructure and software investment, commonly referred to as business and IT alignment.

Effective team communication and the clear assignment of roles and responsibilities also play a pivotal role in this improvement (Snipes, 2021a). Numerous researchers and scholars support this view of decreased DT project failure in developed economies (Caluwe et al., 2021; De Haes et al., 2016; De Haes et al., 2020a; Steuperert et al., 2021; Weill & Woodham, 2003). Teece (2010) further proposes that the success or failure of digital transformation is influenced by the development and utilization of internal dynamic capabilities.

Dynamic capabilities within the context of digital transformation in Ugandan TVETs represent an Institution's capacity to detect and respond to digital changes, seize digital opportunities, and adapt its digital resources and strategies for success in an ever-changing digital environment. These capabilities encompass sensing, seizing, and reconfiguring in the digital landscape, enabling institutions to proactively shape their digital environment and ensure competitiveness, innovation, and long-term success in their digital transformation efforts (Teece, 2010).

The establishment or enhancement of business models is foundational to an institution's dynamic capabilities (Pitelis & Teece, 2010; Teece, 2010). Additionally, insufficient resources significantly contribute to project failure; however, clearly defined roles and responsibilities contribute to success in digital transformation (Bhika, 2017).

2.2.3 Digital Transformation - Contrast by Economic Strength

Interestingly, the failure rate of DT projects in developing economies continues to rise (Stoica, 2021). Despite global efforts to mitigate DT project failure rates, the high failure rate of these projects persists in developing economies like Uganda (Nelson, 2021; Stoica, 2021). Paradoxically, the trend for project failure in Europe is decreasing, showcasing improvements in digital transformation project outcomes (Florentine, 2017).

Studies tracking DT project success trends over the past eighteen years reveal an upward trajectory in Europe (Langley, 2017). However, these same studies indicate that further advancements are necessary despite the recorded enhancements in project success rates.

Langley (2017), the Chief Executive Officer of the Project Management Institute, unveiled findings from a report that highlighted how government organizations allocate an average of 9.7% of their total project budget to waste on digital transformation projects. This wastage is attributed to ineffective communication roles, the absence of business-IT alignment, and a general mismanagement of resources due to subpar process quality in aligning projects with strategic initiatives. The 9.7% squandering of project funds signifies a positive change in the outcomes of digital transformation projects in European nations since 2017, in contrast to an average rate of 70% failure, along with a loss of project funds persisting at 9.9% (Djurovic, 2020) or even higher in developing economies (Kituyi & Kasse, 2016; Nelson, 2021; Rajala & Aaltonen, 2020).

2.2.4 Mitigation of Digital Transformation failure

To mitigate the increasing Digital Transformation failure rate, government is increasingly adopting established IT governance frameworks like ITIL and COBIT. More so, National Regulatory authorities, such as Uganda's National Information Technology Authority (NITA), play a crucial role in overseeing and regulating IT projects, including digital transformation initiatives. Consequently, ITIL facilitates enhanced efficiency and effectiveness in the management of information and technology (Kaen & Kaen, 2011; Lopes, 2021). Another valuable IT governance framework for promoting good practices and policies is the Control Objectives for Information and Related Technology (COBIT). COBIT presents principles that guide the process and direction of IT Governance (Hartono et al., 2020). While both of these renowned IT governance frameworks are exceptional at providing universal mechanisms for

implementing Information Technology governance on a global scale, neither framework offers a one-size-fits-all solution for organizations and institutions in developing economies. Despite the well-established global benefits of applying IT governance principles, the adoption and implementation of these principles in developing countries remain relatively low (Ako-Nai & Singh, 2019; Ndagire, 2020).

NITA has reported a notable failure rate of Digital Transformation Projects in public institutions (NITA-U, 2013). The authority has indicated that many DT projects either fail to deliver on time or do not achieve the intended objectives of the project, leading to adverse effects on citizen service delivery (CIPESA, 2015; NITA-U, 2013; The_East_African, 2009).

Building on this realization, therefore is also a deficiency in the approach to decision rights, administration, and risk management in the development of information systems for digital transformation (Letiagina & Malov, 2021; Samchynska & Vinnyk, 2017). The lack of structured decision rights administration and clear accountability for specifying roles (defining who does what and when) in the development, deployment, and governance of IT systems hampers the effective and consistent utilization and daily management of Information Technology in public institutions (Nfuka, 2009). This further justifies the need for this study.

Furthermore, existing literature underscores that the exploration of Information Technology Governance for Digital Transformation in Technical, Vocational, and Educational Training Institutions in Uganda remains largely unexplored (Afeti, 2018; Bitwayiki, 2019; Chinien, 2003; M. Othman et al., 2011

2.2.5 Effects of Project Failure

The consequences of digital transformation project failures are extensive and complex. With a concerning failure rate of 70%, these initiatives present a significant risk to the continued existence of organizations (Djurovic, 2020). The financial impact is substantial, with a substantial 9.9% loss for every dollar invested in a digital transformation project, equating to a wastage of UGX 9.9 million for every UGX 1 billion spent.

This dire situation unfolds on various fronts. Project failure can manifest right at the project's outset or result in projects not being completed within the designated timeframe. Even projects that seemingly conclude on time may still be considered failures if they fall short of delivering

the intended objectives also attributed to very poor process quality (Lynn & Emanuel, 2021; NITA-U, 2013). Moreover, the repercussions extend beyond timelines and objectives; the performance and form of IT systems also play a pivotal role. Achieving a desired level of performance and suitability for the specific needs of developing countries is crucial for successful digital transformation initiatives (Ominde et al., 2021).

The absence of adequate Information Technology (IT) governance compounds the challenges. Despite efforts in IT management, the uncharted territory of information technology governance for enhanced digital transformation projects in Uganda remains a critical gap (Akono-Nai & Singh, 2019; Ndagire, 2020). This research delves into the reasons behind the persistent project failure narrative, even in light of global efforts in IT management.

The study seeks to understand why the project failure rate for IT project execution continues to rise within developing economies, despite improvements witnessed in developed economies. To address this dilemma, the study proposes an innovative solution in the form of a Governance framework, illuminated through the lens of Dynamic Capabilities. This framework aims to fill the void left by previous IT project management endeavors, which alone have been unable to curtail the failure of digital transformation project implementation. By doing so, the research endeavors to pave the way for a transformative change in the landscape of digital transformation endeavors.

2.2.6 Dynamic capabilities of TVETs in digital transformation

The prevailing conditions in TVETs such as competition have compelled the organizations to evolve, renew, and reshape their operational methodologies, innovatively coined as Process Quality in this study, through the avenue of digital transformation (DeLone et al., 2018). To achieve Process Quality necessitates a reconfiguration and reconstruction of the management and monitoring of their resources and capabilities to align with the demands of the competitive landscape (Wang & Ahmed, 2007). The realm of the TVET subsector, both regionally (Jared et al., 2016) and particularly in Uganda (MoES, 2019), is not exempt from this imperative.

Reviewing and restructuring existing business processes before implementing automation solutions aims to enhance process quality by optimizing workflows, eliminating inefficiencies, and aligning processes with the organization's goals (Baguma & Lubega, 2013).

The recent policy shift within the TVET subsector underscores a renewed emphasis on adaptable learning and aligning with employer-led work methods (Jared et al., 2016; MoES, 2019). This transition, reflected in amendments to the BTSET Act of 2008, has been superseded by the 2019 TVET policy and the Vision 2040 framework (MoES, 2020), collectively guiding socio-economic transformation. This approach resonates with the principles of enhancing process quality and cultivating dynamic capabilities (DeLone et al., 2018; C. Wang & Ahmed, 2007). By optimizing learning experiences, similar to process re-engineering in operations, the subsector embraces continuous improvement (Felin & Powell, 2016) and aligns with the flexible responsiveness of dynamic capabilities (Stinchcombe, 1990; Felin & Powell, 2016). This harmonious interplay not only readies learners for the job market but also establishes a culture of quality-driven innovation, contributing to socio-economic transformation (MoES, 2020) and organizational resilience.

Arthur Stinchcombe's viewpoint highlights the need for specific individuals within organizations to possess the expertise to manage uncertainties that could lead to IT project failures (Stinchcombe, 1990). This prompts the question of who possesses the necessary skills to navigate uncertainties in Digital Transformation IT projects within dynamic competitive landscapes. Stinchcombe's perspective underscores that such individuals bolster the organization's ability to manage processes, uphold process quality, and leverage dynamic capabilities effectively. This integration empowers the organization to adapt, innovate, and optimize processes amidst changing circumstances, contributing to successful digital transformation initiatives (Stinchcombe, 1990).

In the context of decision-making, it is acknowledged that every individual contributes unique perspectives, yet no single individual possesses all the requisite information for collective decisions (Arrow, 1974). This highlights the necessity for a collective dynamic capability's framework, known as Polyarchy, which disperses decision-making authority widely among individuals (Sah & Stiglitz, 1984; William & Ephraim, 2003). This approach harnesses organizational elements such as information, knowledge, experience, capabilities, and communication from diverse stakeholders. This stands in contrast to autocracy, where decision-making authority resides with a sole individual (Felin & Powell, 2016).

Empowering specialized individuals and sub-units enhances process quality and dynamic capabilities by fostering creativity, experimentation, and innovation during digital

transformation initiatives (DeLone et al., 2018; Felin & Powell, 2016). This approach enables these entities to operate independently, refining processes, adapting to changes, and capitalizing on opportunities, thus improving process quality and nurturing dynamic capabilities.

2.2.7 Digital transformation projects in TVET institutions

As mentioned in chapter one of this thesis, the Government of Uganda significantly invested in Information Technology. This investment was a process that involved business undertakings to replace worn-out equipment and to purchase more up-to-date equipment to improve various business processes in the Technical and Vocational Education and Training Institutions (MoES, 2013, 2019). Often, such a venture or undertaking was referred to as a project by corporate and financial analysts (Freeman & Beale, 1992). Freeman and Beale clarified that a project was only a part of the investment process of a business venture. Table 2.1 presented the details of an Information Technology Venture.

Table 2.1: A table showing the various components of a venture as opposed to a project

Information Technology venture			
Component 1	Component 2	Component 3	Component 4
Information Technology Investment Analysis	Asset Construction of Information Technology Infrastructure	Information Technology <u>Asset Use</u>	Maximizing of value of the Information Technology for the entity

On the other hand, an IT project (illustrated below in table 2.2) is only comprised of only two of the components of an Information Technology Venture shown above.

Table 2.2: A table showing the components of an information Technology project.

Information Technology Project (Component 1 and Component 2 only)
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Feasibility of the IT Project	Formation of the Project	Implementation of the project	Handover of the Project
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Figure 2.1: Adopted from *Measuring of Project Success* (Freeman & Beale, 1992)

As demonstrated in Table 2.2, a project is only part of the overall business undertaking or venture with the following assumptions: 1) that government initiates and manages the entire undertaking; 2) that government specifies accurately what is required to be done in the IT investment analysis stage and asset construction of IT infrastructure stage and that; 3) that government subcontracts the two stages of the venture (undertaking) to a project manager at a fixed contract price. This tends to cause an agency problem. This kind of problem will be further elaborated in this chapter.

The illustration in Fig. 2.1 shows that such a project comes to an end before actual realization of the investment and business value of the Information Technology investment.

It is at this point that we observe that “Success” is to be seen from the view point of both Government (sponsor using own resources) and the project manager (in whose care the resources are placed to execute the project) (Freeman & Beale, 1992). This is so because different people view success quite differently.

A contract manager of an IT project may view success as one that meets the business requirements, while the accountant in the same project may view success as delivering the project within budget.

The CEO will view success in this case as a project that delivers both business value and return on investment. Measuring success of a project therefore becomes a very difficult thing to achieve. Freeman and Beale measure a business undertaking as successfully using Project Success Criteria as described in table 2.3.

These interpretations of success significantly influence the quality of processes within the project. The contrasting standpoints on success, as illuminated by Freeman and Beale (1992), mirror the diverse priorities and benchmarks employed by stakeholders to evaluate the project's culmination. Moreover, these divergent perspectives on success introduce extensive effects as a result of the conflicting understandings of the project's objectives. Consequently, this leads to a conflict of goals that necessitates resolution within the project's context.

When success is defined based on meeting business requirements, the focus is on ensuring that the processes align with the intended goals and objectives. On the other hand, when success is measured by staying within the budget, it emphasizes efficient resource allocation and cost control throughout the project's processes (Freeman & Beale, 1992). Therefore, the implications of these distinct perspectives on success can influence how process quality is prioritized, monitored, and managed throughout the project lifecycle.

Table 2.3: A table showing the criteria for success or failure of a project. Project Success Criteria adopted from (Freeman & Beale, 1992)

No.	Success Criterion	Description	Frequency of mention in literature (% of 14 papers reviewed)
1.	Technical Performance	The extent to which technical requirements specified at the inception of the project were achieved	93%
2.	Efficiency of project execution	The extent to which time and costs targets were met.	93%
3.	Managerial and organizational implications	The extent to which the project was carried out without disturbing culture or values	43%
4.	Personal growth	The degree to which satisfaction of the project team in terms of interest, challenge and professional development is realized	29%
5.	Project Termination	The nonappearance of post project problems and the quality of post audit examination	14%
6.	Technical innovativeness	The eventual identification of technical problems during the project and getting them solved	14%

7.	Manufacturability and business performance	The ease with which the product resulting from the project can be developed and its commercial performance	43%
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It is demonstrated here that of the seven criteria of success, project sponsors are mostly interested in meeting technical performance, cost and duration targets as measures of success. Very little is mentioned about Process Quality through the process of digital transformation. Digital transformation should also cover quality assurance of digital outputs (Jäntti et al., 2022). It is therefore vital for both government and Information Technology project managers to demonstrate how successfully these targets have been achieved (Freeman & Beale, 1992). In other research findings from previous studies, it is compliance with project specifications and technicalities that are considered as factors for success (Sulistiyani & Tyas, 2021). Moreover, a digital transformation project cannot be successful if the project product is not used (Lech, 2013).

It is noteworthy to also mention at this point that, the seven criteria listed above do not include the explicit specifications of decision rights and responsibility (Weill & Woodham, 2003) to prompt the definition of who is responsible for IT investment duties and who provides inputs (Weill & Ross, 2004). This is interesting to see because many of the IT projects that do not succeed in TVET institutions fail because the investments are not put to use and there does not seem to be clarity in defining who is responsible for IT investment duties so as to provide the inputs for investment.

One case (in this study) shows that purchased computers remain in their boxes for years unused simply because the inputs (user needs) for investments were not done properly. Further, expensively purchased software and equipment is not deployed, servers are stored away without network infrastructure to deploy them.

This study, in the various case studies will show that Investment in TVET institutions seem been done blindly without specifying decision rights and responsibility for key processes like defining of the problem, specifying how the problem can be tackled using ICT, designing and specifying what ICTs are appropriate for such a task and whether or not physical infrastructure exists for the recommended ICTs proper use.

Could it be that such decisions need to be made for IT investment prior to conceptualization of the TVET digital transformation undertakings (NITA-U, 2013)? This would leave managers of such projects with a simpler task – to manage and execute a well-designed project.

Information Technology Governance is the specification of decision rights and responsibility which leads to the Board or Executive to define and appoint [skilled, knowledgeable person(s)] who are responsible for every specific IT investment duty. This is how an Agency works. The Board acts as the principal while the appointed, skilled persons act as the agent.

This study proposes a framework to guide who will provide inputs for each investment decision that has both IT and Business alignment at the heart of each decision from investment analysis to maximizing of value of Information technology in every TVET institution in Uganda.

2.2.8 Governance challenges of digital projects in developing economies

Recent research indicates that in developing economies, a lack of awareness about IT governance processes results in top-level executives being uninformed about the key aspects of achieving success in digital transformation projects, such as the design, implementation, and communication of IT governance requirements (Rodello & Pádua, 2014; Weill & Ross, 2004).

Moreover, Baguma and Lubega have identified and suggested crucial strategies aimed at enhancing the successful implementation of E-Government projects in Uganda and other developing nations (Baguma & Lubega, 2013). However, it's worth noting that these recommendations lack detailed explanations regarding their practical realization or the methodology used in formulating these strategies. Notably, they omit any reference to product usage or process quality, factors that often serve as indicators of a digital transformation project's success (DeLone & McLean, 1992).

Furthermore, the recommendations by Baguma & Lubega in 2013 fail to provide guidance on the allocation of responsibility for IT investment decisions, a critical aspect emphasized by Weill & Ross (2004). Additionally, there is no clarity on how these decisions should be made and monitored, as highlighted by Sulistiyan & Tyas in 2021. Consequently, these recommendations do not offer a comprehensive solution to address the ongoing challenge of digital transformation project failures in Uganda.

In a bid to further understand IT project implementation success, we note that respondents of various studies agree that product quality significantly influences the success of an IT project

(W. H. DeLone & McLean, 1992; Petter et al., 2008). It is plain to see that one cannot achieve product quality if the product is not in use (William & Ephraim, 2003). Nonuse of IT systems, services and information appears to contribute to the digital transformation implementation problem in Ugandan TVET institutions thereby leading to increasing project failure.

2.2.9 Project Implementation and decision support

The bulk of decisions within any business endeavor are typically made by top executives (Gavilanes-Molina & Merchán-Rodríguez, 2022). Meanwhile, IT professionals in management often focus on outlining the practical execution of the business undertaking in day-to-day operations (Krey et al., 2011). In simpler terms, top executives are responsible for strategic management and the governance of Information Technology projects, with the goal of delivering business value to the organization, whereas Project Managers oversee the daily project operations. These decisions are predicated on the IT project scope established by the project board (Weill & Ross, 2004).

Most of the Projects in Uganda depend on Project Managers to make the majority of decisions that deal with strategic management and governance of Information Technology projects (NITA-U, 2013). In this methodology, the National IT Authority of Uganda provides accounting officers and Top Management Teams principles and practice of IT Project Management to enable Project Managers to have a common basis upon which to execute Information Technology projects successfully.

This approach to Information Technology Projects within Uganda could be the reason for such increased failure of Information Technology projects. It is getting clearer that effective Project Implementation requires effective Information Technology Governance which must address the following: 1) The decisions that must be made to ensure effective utilization and management of IT; 2) Clearly indicate who should make decisions; 3) Define how these decisions will be made and monitored (Weill & Ross, 2004).

Available literature consistently demonstrates that decision rights regarding investments in Information Technology are determined by Information Technology governance (strategy) rather than the management of daily Information Technology operations (Ahdadou et al., 2022; Gavilanes-Molina & Merchán-Rodríguez, 2022; Weill & Woodham, 2003).

In today's post-Covid landscape, marked by the increasing complexity and widespread use of Information Technology, there is an urgent need to strengthen Information Technology governance (Ahdadou et al., 2022).

IT governance in its simplest terms aims to put in place clear decision rights and accountability mechanisms to achieve behavior that is desirable in an enterprise (Weill & Ross, 2004). Also, Van Grembergen and De Haes (2009) describe IT Governance as a fragment of corporate governance. They argue that, business / IT alignment and creation of business value from IT enabled investments lead to improved success of IT projects by implementing processes, structures and relational mechanisms in the organization. In so doing, both business and IT people will be enabled to execute their responsibilities optimally for the business (de Haes & van Grembergen, 2009).

In other literature, the ISO 38500 International Standard for Corporate Governance of Information Technology defines IT Governance as that system by which both the present and future application of Information Technology is directed and controlled (Feltus, 2008; ISO, 2008).

Despite the extensive definitions, recommendations, and success criteria discussed above, the harsh reality persists: Information Technology projects frequently falter, often experiencing limited or no success in their execution, even when considered within the context of established IT governance frameworks and standards. This is apparent from the growing instances of substantial cost and time overruns in IT projects, a trend observed in literature across both developed and developing nations (Stoica, 2021).

For many years, scholars and researchers have been aware of the widespread failures of numerous projects within government institutions globally (Lauesen, 2020; Rajala & Aaltonen, 2020). Nevertheless, on an international scale, the public sector persists in making substantial financial plans for ongoing Digital Transformation projects (Nfuka, 2012).

In Finland, in the year 2015, ongoing development projects in both municipal and state organizations were valued at approximately two billion euros (Lappi, 2019). In the public domain alone, the annual Information and Communication Technology (ICT) expenditure of the state government in 2016 was a staggering 780 million euros which translates to 1.43% of the country's Gross Domestic Product (GDP) (Lappi, 2019). This in itself raises curiosity as to how these funds are being put to good use for the public.

In Uganda, there is a notable lack of comprehensive studies or research aimed at understanding the causes of Digital Transformation project failures and the reasons why such projects are not being implemented as initially intended, as highlighted by Anjoga & Kituyi in 2017.

Several studies have responded to the problem of increasing failure of IT projects using the same approach used in developed countries. In these studies, practices in the public sector have been analyzed with a focus on the effectiveness of IT governance (Martin et al., 2005). There is still limited knowledge in literature that is sufficient to respond to the problem of increasing failure of digital transformation projects in developing economies like Uganda.

2.2.10 Information Technology Governance explained

IT Governance is a fairly new concept that emerged in the 1990's. Henderson and Venkatraman (1992) used the term IT Governance for the first time to describe the intricate arrangement of relationships between organizations in the market place that is necessary for Information

Technology application success (J. Henderson et al., 1992). IT Governance is positioned at various layers in an organization as the three layers of IT governance responsibility as shown in Figure 2.1 (De Haes & Van Grembergen, 2008).

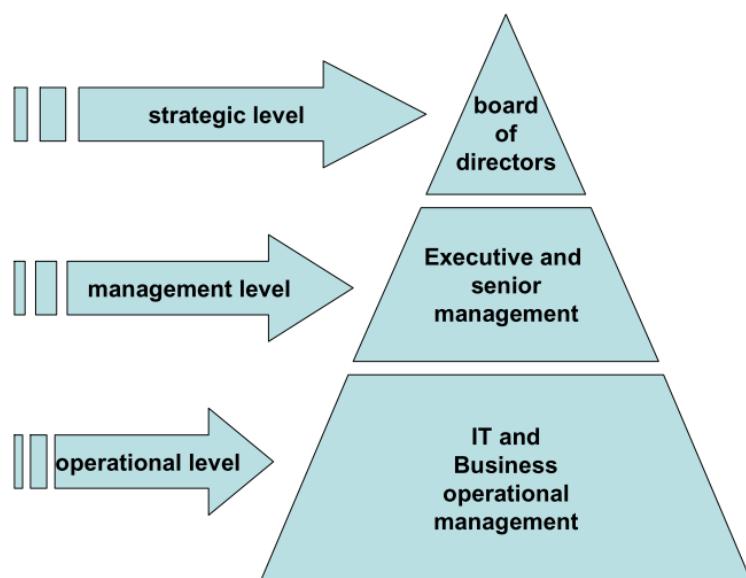


Figure 2.1: The three layers of IT governance responsibility (De Haes & Van Grembergen, 2008)

There is the Board of Directors layer, Executive and Senior management layer and then the business management layer with the operational IT level layer. This by extension implies that

all levels (business and IT) need to be involved in the IT governance process by understanding their roles and responsibilities in the framework.

An IT Governance framework is comprised of structures, processes and relational mechanisms that constitute the different elements necessary for IT Governance as described in Figure 2.2 (De Haes & Van Grembergen, 2008).

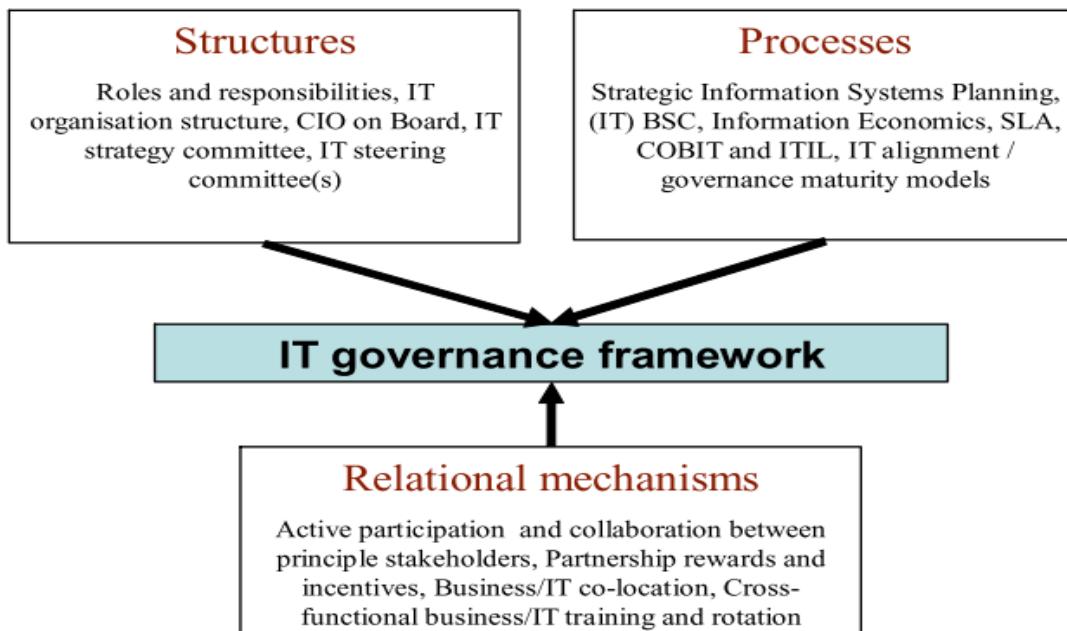


Figure 2.2: An example of practices for IT governance (De Haes & Van Grembergen, 2008)

The terms IT Governance and IT management may at times be confused with each other. The term “governance” is derived from the overarching corporate governance concept that refers to oversight preserved by a governing board of directors over executives responsible for (IT) Management. IT Governance primarily addresses the potential “Agency” problems (Beachboard et al., 2010; ITGI, 2008). The salient differences between IT Governance and IT Management are illustrated in Figure 2.3 (Romero_Consulting, 2005).

Efforts and attempts have been made to promote good IT governance by the increasing IT governance frameworks that have been proposed since the early 1990's. Studies' reports show and affirm that such efforts in applying IT governance principles and frameworks help to eliminate risks and possibly lessen such risks to manageable levels (Letiagina & Malov, 2021; Maruping et al., 2019; Salmela, 2008).

Renown international associations that regulate Information Technology Governance (ITG) standards and best practices have pronounced different ITG frameworks that inspire ITG best practices.

The Control Objectives for Information and Related Technology (COBIT) and the Information Technology Infrastructure Library (ITIL) frameworks are probably some of the most common which are seen to be complementary rather than competing IT governance frameworks applied to digital transformation undertakings (José et al., 2013). Both frameworks, importantly, aim towards improving quality of IT services in organization's by helping to ensure alignment between the application of Information Technology (IT) and the organization's business goals (De Haes, Van Grembergen, et al., 2020b).

There are 14 different IT Governance frameworks/practices, also used for IT management and processes for software engineering. All 14 frameworks compete for effective governance of Information Technology. ITIL and COBIT, however, have the highest registered rate of implementation globally and industry wide (Uysal & Çetinkaya, 2021).

Neither COBIT nor ITIL measures quality of Information Technology Project Performance. It is therefore imperative that other methodologies are used in combination (Michalska, 2008). Moreover, literature and prior research describe a lot about structures and practices of ITG and hardly about governance in developing economies (Ngqondi & Mauwa, 2020a). This seems to be evident in organizations or institutions in developing economies where the IT portfolio is either nonexistent or is fragmented.

Information Technology today not only plays a pivotal role in institutions. It is now common knowledge that the processes in an IT department and its structures must be aligned with the strategic business needs of an institution as priority for success in the performance of the organization or institution (Wulandari & Buliali, 2019).

IT Governance (ITG) in this context, therefore, is defined as how an organization applies IT with the view of realizing maximum IT performance (output), which leads to better decision making and resolving challenges in organizations (Wulandari & Buliali, 2019).

Digital transformation is the trend today in organizations and institutions causing great reliance on IT for business value which also has necessitated the need to mitigate the risks associated with the requirement to manage and govern IT (Caluwe et al., 2021).

In a bid to address the evident lack of essential frameworks to understand the budding possibilities of Information Technology for years to come, (J. C. Henderson & Venkatraman, 1993) developed the Strategic Alignment Model for the essential domains in IT Governance which include business strategy, organizational processes, and structure, Information Technology Strategy and business strategy.

ITG addresses demands of an institution with a key focus on institutional issues like institutional structure for IT leadership, accountability of resource usage, customer satisfaction, lower costs of running a business, IT investments based on needs of the institution, integrity, and improved quality of services (Ngondi & Mauwa, 2020b).

The above notwithstanding, the promotion of education development and innovation is taking center stage intending to build a global community that combines education with the latest technologies like Virtual Reality, Augmented Reality, Big Data, and Artificial Intelligence (Unesco IITE, 2021).

In March 2021, the UNESCO Institute for Information Technology in Education held an Online Expert Meeting with the Theme entitled “*Building future schools through ICT Competency development*”. Members states in Central Asia and the African Region are to be supported with a framework where the states will benefit from support and assistance to promote equity in and through TVET by defining appropriate policy measures. Within the 10 key topical issues discussed as priorities for IT in TVET institutions during the expert online meeting, the participants remain silent on the issue of IT Governance (Unesco IITE, 2021). This in my view is greatly flawed.

Moreover, Institutions and firms are increasingly implementing web-based applications (Coltman et al., 2001). (Coltman et al., 2001) argues that there is a need for managers [of business in institutions] to ask whether the growth of the Internet and its capability is evolutionary, meaning that pre-internet strategies and modes of management are still highly relevant or revolutionary.

(Marshall et al., 2005) agrees with (Coltman et al., 2001) but says that despite the enthusiasm of the post-Internet e-business trends and digital revolution there is an inevitable collapse in the confidence in IT and its management. This is where governance of IT comes in. This in my view, points to the fact that the relationship between IT governance in IT project success needs to be explored in the case of TVETs in Uganda to have a strategic fit for the reduction in digital transformation project failure.

2.2.11 Business Value from IT Governance

According to (Kraemer, 2016), IT Business value is the impact of Information Technology generated by organizational performance. Research findings show that improvement of organizational performance may be as a result of the contribution of Information Technology.

(Angelou & Economides, 2012) argue that business value linked with information, increases with better-quality decision making and employee empowerment. (Angelou & Economides, 2012) argument is in line with assertion by (Coltman et al., 2001) who stresses the fact that the players (structures) in a firm and *how* they go about the business processes is what adds business value and not in *what* is done as routine in an institution.

I disagree that this is all it takes to add business value. The players in the firm must provide their contribution through clear structures, have clear communication among the players and that the IT processes are monitored and guided by an IT policy. The policy clearly defines *who* does *what*.

It is established in various studies that returns from Information Systems and Information Technologies investments through IT project implementation are a concern in the Ugandan business space (Caluwe et al., 2021). This is why this study proposes the enactment of an IT governance framework to strengthen all five elements of IT governance, namely: 1) Value creation; 2) Performance management; 3) Strategic alignment of IT with business; 4) Resource management and Risk management.

2.2.12 IT/Business Process alignment

The way processes in organizations are positioned/aligned with information technology, ultimately determines, success for any effort to apply technology introduced in institutions (Coltman et al., 2001).

In light of the previous discussions, it becomes evident that incorporating the need for process quality is a critical aspect in digital transformation projects (Lynn & Emanuel, 2021; NITA-U, 2013). This underscores the importance of not only focusing on IT governance but also ensuring that the processes involved in these projects are of high quality and efficiency.

2.3 Information Technology Governance Mechanisms

Conceptually, Information Technology Governance is comprised of three independent variable spheres which include Relational Mechanisms (communication approaches), Structural Mechanisms (decision making structures) and Process Mechanisms (de Haes & van Grembergen, 2009; Turedi & Zhu, 2019).

The three independent variables indicated above determine Information Technology performance in an organisation (Resad Setyadi et al., 2021).

Relational mechanisms refer to the synergies between the players in both Business and Information Technology management. Here, communication strategies are developed and enforced with a view to build synergies between the organisations business managers, business supervisors and IT managers (Weill & Woodham, 2003).

The process mechanisms in an organisation refer to aspects that lead to compliance with rules or guidelines in IT operations. All three mechanisms are shown in Figure 2.3.

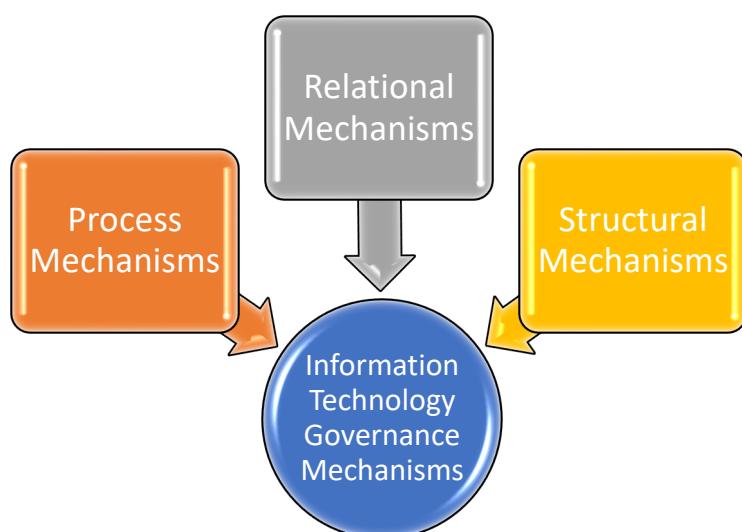


Figure 2.3: A Conceptual model showing the ITG Mechanism model (Resad Setyadi et al., 2021).

These include IT monitoring and evaluation, decision making and control (Sirisomboonsuk et al., 2017). The decision rights and responsibilities are determined by the structure mechanisms. Both management and IT business decision makers for activities that rely on IT in an organisation are assigned rights and responsibilities. Structure mechanisms determine these rights and responsibilities (Turedi & Zhu, 2019).

The overall aim of Information Technology governance is to ensure IT decisions that impact business value and promote trust of stakeholders (Resad Setyadi et al., 2021).

2.3.1 Relational Mechanisms

In IT governance, relational mechanisms are the *facilitator* for attaining and maintaining the alignment efforts between business processes and IT processes which must work together for IT performance effectiveness.

Relational mechanisms therefore support the necessary two-way communication between IT and the Business. These mechanisms act as this bond between the two (Nyeko, 2019). Training to foster communication approaches amongst IT, administration and business staff is required.

Further, occupation and staff rotation/alternation on the use of knowledge-sharing systems regarding IT governance's practices and routines is effected (de Haes & van Grembergen, 2009). Through unplanned get-together for IT managers and business managers. Partnerships, communication approaches and non-formal meetings between business and IT managers and job rotation fosters relational mechanisms in an organisation for better conduction of IT governance principles and decision in the enterprise (Weill & Ross, 2004).

Prior research has given emphasis on the significance of relational mechanisms in an IT governance framework (De Haes, Van Grembergen, et al., 2020b; J. C. Henderson & Venkatraman, 1993).

2.3.2 Structural Mechanisms

Information Technology decisions, roles and responsibilities in the various units of an organization make up an Information Technology Governance Structures (de Haes & van Grembergen, 2009). These structures determine the rights and responsibilities of the various players in IT business and management decisions as they play out in the use of IT in an organization (Turedi & Zhu, 2019). An example of such mechanisms includes IT strategic Committees and steering committees.

2.3.3 Process Mechanisms

In an organization, the IT Governance Process Mechanisms describe direction setting, monitoring of Information Technology, control, decision making and evaluation to comply with the rules that govern IT operations (Sirisomboonsuk et al., 2018).

IT Governance Process Mechanism are governed by the IT policies in an organization that spell out specific details about routine IT operations. The way processes in organizations are positioned/aligned with information technology, ultimately determines, success for any effort to apply technology introduced in institutions (Coltman et al., 2001).

Prior research by (Strassmann, 1990) has revealed that there is no relationship between success (in terms of business profitability) and the expenses in investment in computers. This study shifts attention from mere management of Information technology to the Governance of Information technology and the related projects.

(Strassmann, 1990) therefore asserts that measuring the efficiency and productivity of IT governance structures referred to as “managerial productivity” is the determinant to establishing how to invest in Information Technologies. (Strassmann, 1990) concludes this assertion by stating that the discussions around business value must not deal with the worth of the IT investment but rather the “Management Value-added” (IT Governance), with or without IT equipment purchased [for institutions]. This assertion in itself is insufficient by itself.

Other factors other than governance structures like policy led processes and relational mechanism are just as critical in establishing success in IT investment for IT projects (Dirk Steuperert, Steven De Haes, Tim Huygh, 2021).

2.4 Information Technology Models and Frameworks

An IT Governance Framework is defined as a scheme of structures, processes and relational mechanisms in an organization that enable both the Information Technology staff and the business workers to execute their work towards the alignment of both IT and business with a view to creating business value from IT enabled business investments (de Haes & van Grembergen, 2009).

Prior research shows that the IT Governance Framework strategic domain as opposed to the operational domain has the highest impact on IT Governance performance in TVET institutions (Khalil & Belitski, 2020). This is an assertion that this study seeks to establish in the context of TVET institutions in Uganda. The subsections below will elaborate more on various frameworks that are reviewed and considered for this study.

2.4.1 Information Technology Infrastructure Library (ITIL) Framework

The Information Technology Infrastructure Library (ITIL) is a concept that was developed by the Central Computer and Telecommunications Agency in the United Kingdom in the 1980's. This Agency, now known as Office of Government Commerce was commissioned to develop a framework with the objective of ensuring efficient and financially responsible use of IT resources for both the British Government and the Private Sector in the United Kingdom (Kempter, 2019; Lopes, 2021).

ITIL Version 4, published by AXELOS in February 2019, is the most recent edition of the Information Technology Infrastructure Library. This new edition embraces the most recent technology trends and service management. Importantly, ITIL ver. 4 provides basic support to organization's that are integrating digital technology into all areas of their business (Kempter, 2019).

ITIL is designed to provide a list that is all inclusive with a list of practices with a leaning on management services (José et al., 2013). Regardless of the organization, the ITIL framework can be implemented in all processes and services in an organization and can be deployed by other frameworks (Moudoubah et al., 2021). ITIL services are classified as; i) Service Strategy, which provides guidance on how to design, develop and implement service management, but also provides direction for an organization to grow as a strategic asset; Service Design, providing guidance for appropriate and innovative IT service designs for both current and future business requirements; ii) Service Transition, providing guidance for services through controlled planning, testing, and minimizing of risks while evaluating every step; iii) Service Operation, providing guidance for activities required to deliver and servicers to both business users and customers; and Continual Service Improvement, that emphasizes learning from lessons learned with time (Nyeko, 2019).

It should be noted that ITIL, however, does not provide guidance for mapping structures, processes and relational mechanisms - IT alignment with business (Wulandari & Buliali, 2019).

2.4.2 COBIT 4.1 Framework and a brief overview of COBIT 2019

Control Objectives for Information and Related Technology COBIT was created and first published in its first version in 1996 by the Information Systems Audit and Control Association (ISACA), and the Information Technology Governance Institute (ITGI). The COBIT framework, which is a set of best practices for IT management was released for use by the IT community and became the accepted framework globally, for IT governance and control (Harguem, 2021).

The IT Governance Institute has a responsibility to help those boards and executive managers have all the tools and information they require to harness Information Technology. COBIT is one of those tools.

COBIT provides a comprehensive framework for a high-level IT governance and control following the harmonization of IT good practices published worldwide by governments, institutions and international standard bodies (José et al., 2013).

The scope of COBIT has evolved over the years as is illustrated in figure 2.4 below.

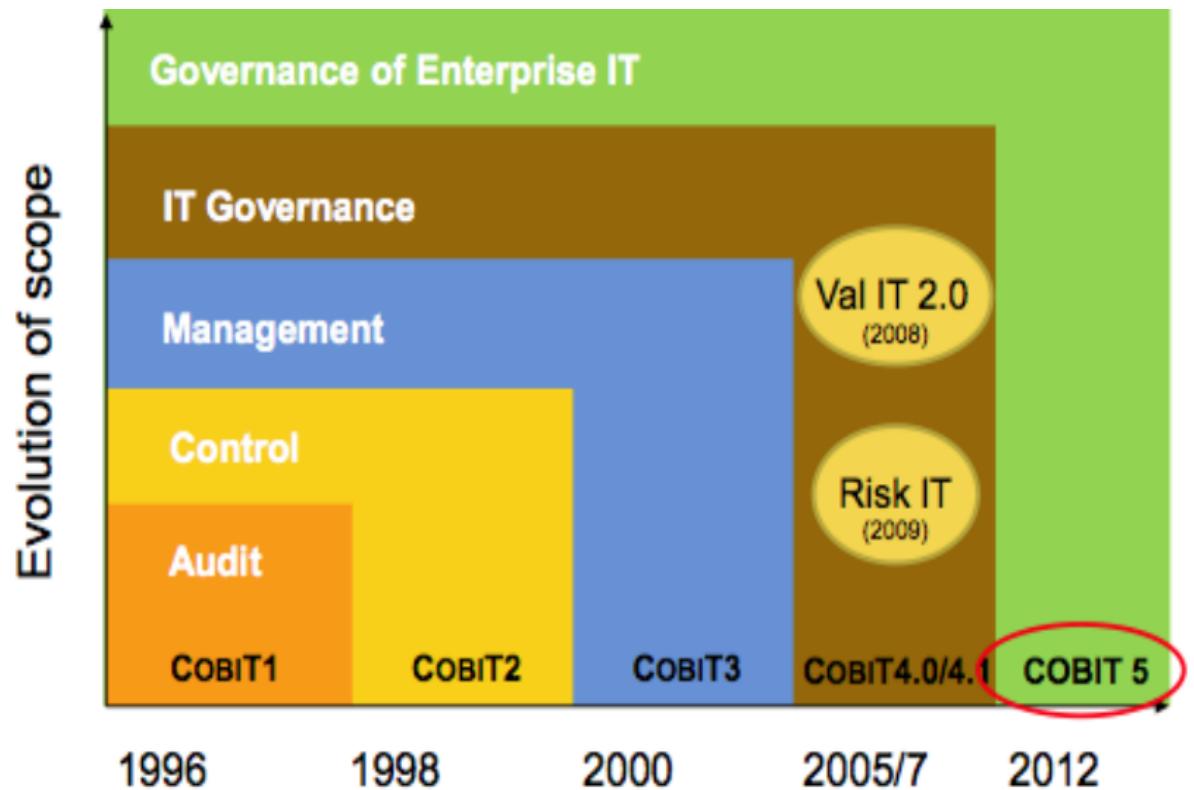


Figure 2.4: Evolution of the COBIT Framework till 2012 before COBIT 2019

The COBIT Framework has since evolved even further. COBIT 2019 replaces the COBIT 5 Framework and specifically includes organizational structures, digital transformation-related goals and new focus area publications including cybersecurity and DevOps.

COBIT 2019 also changes the role of IT Auditors to important players in enterprise governance from being “testers” because there is a growing trend for the need for IT auditors on the audit team, steering and strategic committees to guide Information Technology initiatives (ISACA, 2019). The figure below shows the COBIT Framework Historical Timeline.

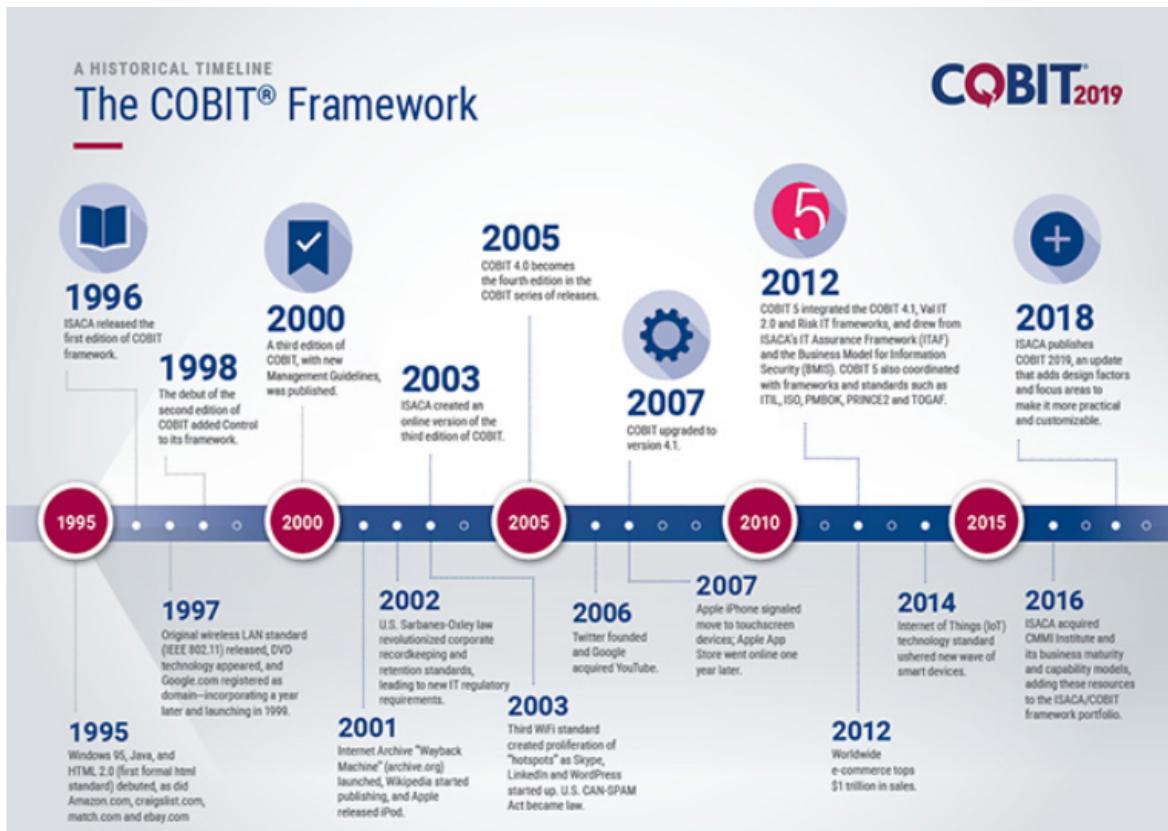


Figure 2.5: The COBIT Framework Historical Timeline

COBIT 19 is the reappearance of the well-known Capability Maturity Model Integration (CMMI) - based process capability levels, just like what COBIT 4.1 as the most valuable innovation in COBIT 2019 (ISACA, 2019).

The COBIT framework is categorized into four domains, each serving specific functions: i) Planning and Organizing: This domain ensures the availability of essential Information Technology infrastructure and IT human resources; ii) Acquisition and Implementation: In this domain, the processes and procedures for identifying and acquiring IT hardware and software (applications) are clearly outlined to align with an organization's strategic goals (Nyeko, 2019); iii) Delivery and Support: This domain emphasizes critical support services that span various areas, including IT user support, IT security, user training, and support to business customers; iv) Monitoring and Evaluation: This domain focuses on responsible and accountable usage of IT resources, ensuring they are used in an acceptable manner. These four domains collectively form the foundation of the COBIT framework, which plays a vital role in governing and managing Information Technology within organizations.

The illustration in Fig 2.6 below attempts to show the components of a Governance system to enable the appreciation of what governance is at a glance.

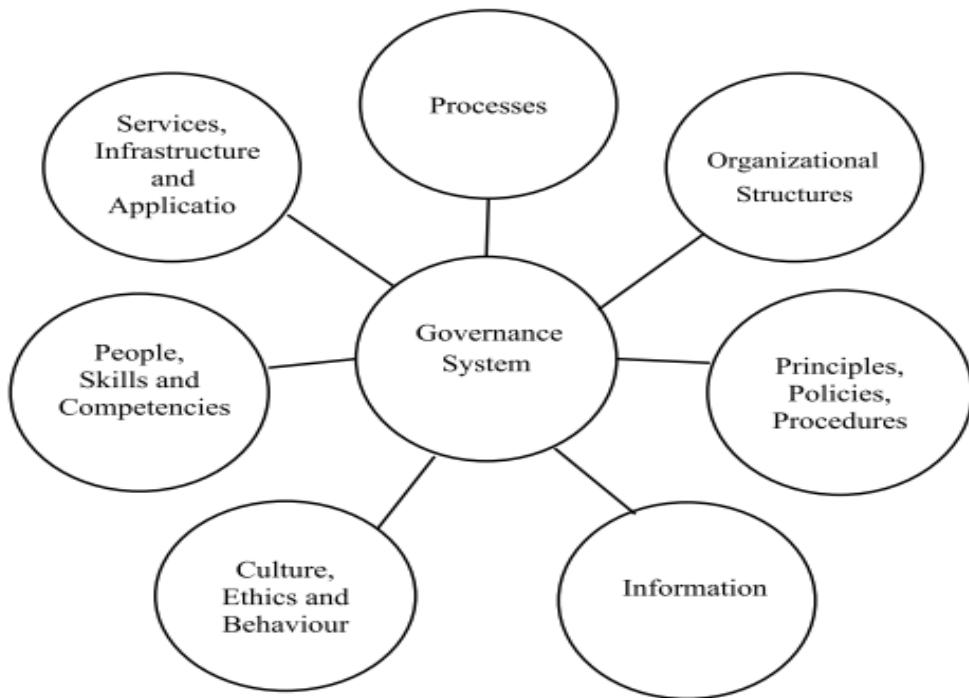


Figure 2.6: COBIT Components of a Governance System (ISACA, 2020)

The COBIT 2019 framework is an improvement of the COBIT 5 Framework. COBIT 2019 integrates over 25 years of development in the field of IT governance and builds on the operationalizing practices, insights and practices from various versions of COBIT (Lanter, 2019).

This study considers COBIT 4.1 as a suitable framework to create a reference point (baseline) for maturity of processes. Moreover, the COBIT framework provides a detailed set of processes that incorporate the Information Technology lifecycle, making COBIT a generally appropriate framework for use (Debreceny & Gray, 2009).

Further, 15 of the processes in the COBIT 4.1, according to literature, are the most essential for guiding the IT investment and management cycle (Guldentops et al., 2002) COBIT 4.1 is also applicable to public sector organizations (Nfuka et al., 2009).

A preliminary review of literature shows that COBIT is not sufficient to meet the requirements of business and IT alignment and coordination and must be carefully applied in combination with (an)other framework(s) (Moudoubah et al., 2021; Zhang & Zhou, 2014).

While COBIT has widely been applied in various IT implementations, it has been found to have the following weaknesses: 1) Its implementation is time consuming at a high cost and; 2) It is a complex process to implement. TVETs in Uganda are not sufficiently resourced to meet the costs for the implementation of COBIT as governance framework for digital transformation projects (Mutebi & Ferej, 2023; Okumu & Bbaale, 2019).

2.4.3 (COSO) Framework – An Enterprise Risk Framework

The Committee of Sponsoring Organizations of the Treadway Commission (COSO) framework was first introduced as a model and was applied to application domains by providers of cloud services to deliver the management of a detailed view of related risks, gains and options for risk mitigation. There is a combination of cloud options. These include business process, deployment and service delivery options (Horwath et al., 2012). There will be concerns on security, risk and compliance that varies on the combination of cloud options.

The focus of this frame work is 1) to harness the way risks and controls are viewed and perceived (Internal Environment); 2) to aligning the objectives of the organization (Objective setting); 3) to Identify events (opportunities or risks); 4) to determine and assess the impact of risks identified; 5) to respond to the risk or mitigate the risk; 6) to assign the responsibility for control to either the organization or cloud service provider; and 7) to ensure and establish channels for information sharing and communication (Horwath et al., 2012).

The COSO framework however emphasizes managerial processes and not the quality of processes attributed to each player (agent) with their specific roles and responsibilities. This framework is weak on the quantitative aspects of governance in a Technical, Vocational and Education training (TVET) institutions.

This framework however can be modified to suit TVET institutions by integrating control (as described in the COSO framework) with Internal quality Assurance can enhance TVET performance leading to better effectiveness in internal control, risk assessment and monitoring and evaluation (Riyadi et al., 2021).

2.4.4 ISO 27000 Framework

The International Standards Organization (ISO 27000) is the best practice standard for systems for Information Security Management. ISO 27000 recommends information security controls that are relevant for cloud computing. This framework is a series of standards that offers tools for cloud risk assessment (Riyadi et al., 2021).

Literature however shows that the ISO 27001 standard, due to its generic nature covers all management, operational and technical aspects with a view to handling vulnerabilities and threats. This framework on the other hand does not cover security system challenges an organization could face if cloud computing is deployed. Further, controls like management of virtualization are required to mitigate risks associated with cloud security (Tariq & Santarcangelo, 2016).

2.4.5 PRINCE 2 Methodology

The PRINCE 2 methodology is a process-based approach for the management of projects. Scalable, tailor-made methods for the management of projects of all kinds are provided in the methodology. This PRINCE2 Methodology is illustrated in Figure 2.7.

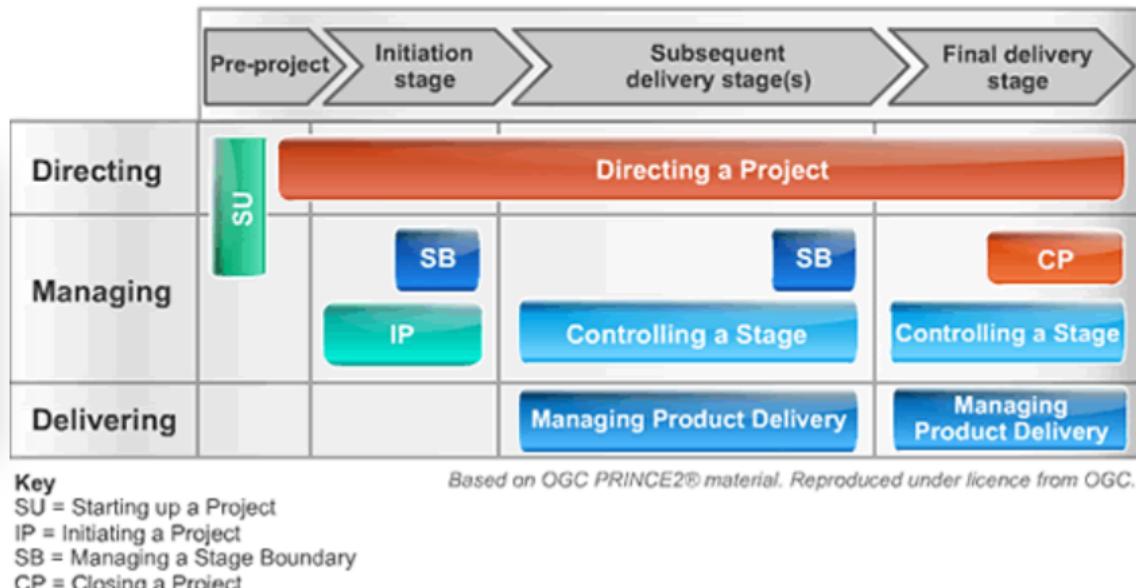


Figure 2.7: An illustration of the PRINCE2 Methodology

This methodology further defines each process with the process key inputs and outputs, and explicitly elaborates the objectives that will be realized for every activity to be carried out (PRINCE2, 2019). The PRINCE2 methodology also integrates user requirements into an all-purpose approach to accommodate the management of any project.

The PRINCE2 methodology however, has a number of shortcomings. PRINCE2 does not define the methodology to be followed by senior management in order to achieve alignment of business process with project goals (which for this study are IT effectiveness goals). The following are the salient shortcomings with this methodology: 1) system requirements are ill defined; 2) definitions of inputs and outputs of the IT implementation are hardly defined; 3) unclear and incorrect system development or IT implementation requirements (Kruger & Rudman, 2013). This study found that these were the very reasons why the recently concluded projects in TVETs suffered several setbacks.

2.4.6 ISO 9000 Framework

The International Standards Organization 9000 is a set of standards for quality and guiding principles for the prevention of defects through planning and application of best compliance [IT Governance] initiatives and standard quality management methodologies.

The ISO 9001 details the definition of characteristics and evaluation criteria for specifying requirements for quality of software products throughout the product life cycle (Bailey & Becker, 2014).

The figure below shows current Information Technology Frameworks. Figure 2.10 illustrates the fact that no single framework or model incorporates all of the Information Technology controls exhaustively. It can however be seen that there is an overlap and duplication of how some of the frameworks are deployed, what specifically they would relevantly be used for and the scope of each framework (B. Nguyen, 2010).

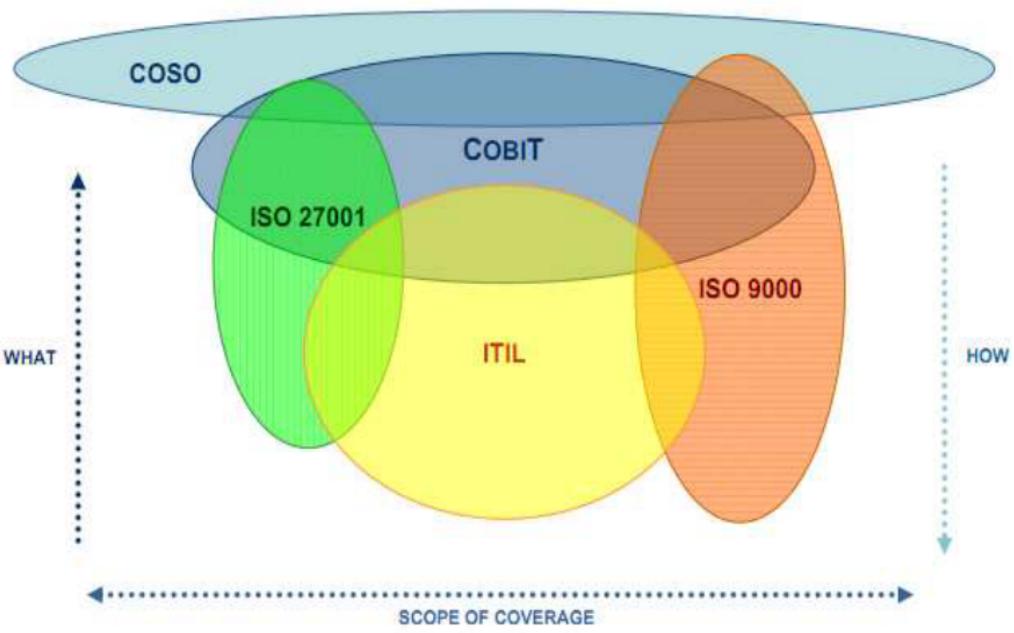


Figure 2.8: How frameworks are deployed, their scope (adopted from (B. Nguyen, 2010)

2.4.7 ISO 38500 Framework on IT Projects

The International Standards Organization 38500 Framework was developed in 2008 by the joint technical committee ISO/IEC JTC1, subcommittee SC 7 to provide broad guidance on the role of top management on how IT is to be harnessed in light of corporate governance. ISO 38500 provides guidance to a governing body to direct, monitor and evaluate the use of Information Technology in an organization (ISO, 2008).

The ISO 38500 framework is applicable to organizations of all sizes including TVET institutions and provides a framework for effective Information Technology governance to particularly provide support to top level management to appreciate and meet their regulatory, ethical and legal obligations in relation to their organizations' application of Information Technology.

Directors, in this model, govern Information and Communication Technology (ICT) through the following main tasks: 1) Evaluation of the use of ICT by examining and making judgements on the current and future use of IT proposals, strategies and procurements both internally and externally. Directors also should consider the business pressures and business needs acting on the business, for instance, economic and social trends, political influences and technological

change; 2) Direct the preparation and the selection of ICT choices and plans by ensuring that project transition to operational status is planned and managed properly; 3) Monitor how ICT conforms to policies and how ICT performs against the plans through appropriate systems of performance measurement (Feltus, 2008). This is in contrast to monitoring the individuals who are responsible for critical and non-critical tasks that lead to successful digital transformation.

While principle-based standards like ISO 38500 allow organizations to adapt their governance practices to fit their unique operational contexts, a major disadvantage lies in the fact that lack of clear, explicit procedures and guidelines can produce unpredictable approaches to governance which makes it hard to compare governance outcomes across various programs and projects (Campbell et al., 2011). Moreover, investigation of the ISO 38500 in prior research has shown that the choice of labels for the tasks (evaluate, direct and monitor) are confusing for the users of this standard.

Further, the ordering of the principles like “responsibility” related to the supply and demand for Information Technology and yet findings in this research show that the second principle, “strategy” was what was found to be given more consideration (Campbell et al., 2011).

Greater reliance on procedures can help reduce on ambiguity at operational level by providing auditable performance measures and valuable data about Information Technology governance in IT Projects (Campbell et al., 2011).

Figure 2.9 illustrates the principle and procedure-based approaches to Information Technology Governance using ISO 38500 as an ITG framework by level of governance.

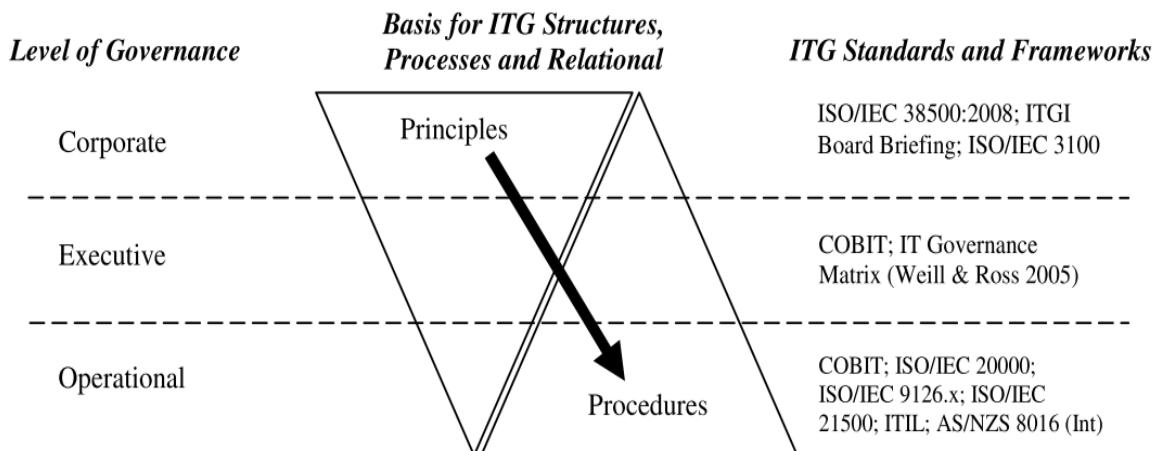


Figure 2.9: Investigation of the Comprehensiveness of the ISO/IEC 38500:2008 Standard in an Inter-organizational Public/Private-sector Context Source is (Campbell et al., 2011)

As illustrated in Figure 2.10 overleaf, IT governance frameworks focus on supporting organizations to govern IT and yet each framework may not be applicable in every circumstance due to varying IT modes in each organization (Bart & Turel, 2010).

(Weill & Ross, 2004) reasoned that those organizations must first have transparent mechanisms that are well designed and well understood to achieve effectiveness in the governance of IT, which they argue, positively influences organizational performance.

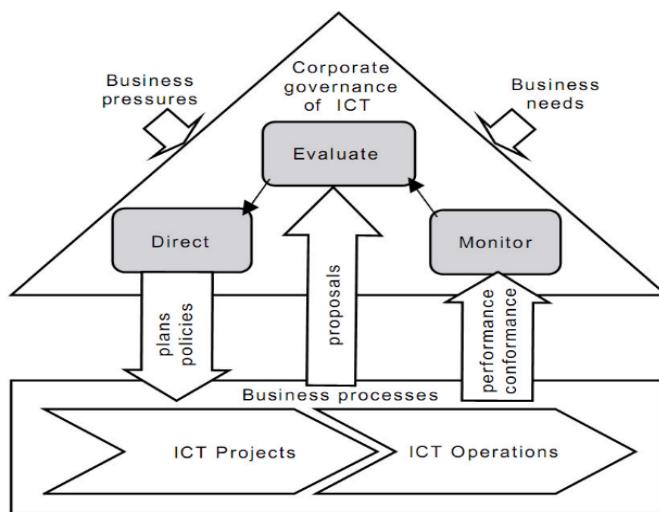


Figure 2.10: A Model for Corporate Governance of ICT (Feltus, 2008)

This argument was arrived at after they interviewed 256 Chief Information Officers and proposed a framework for IT governance with 15 common mechanisms for IT governance. These mechanisms were further categorized into three main types of mechanisms discussed in the next subsection (Weill & Ross, 2004). This model is silent on the control of business processes.

2.4.8 National IT Project Management Methodology

The National IT Project methodology provides a structured tactic to manage IT projects and programmes within the Public Sector. This methodology provides critical components to guide management for planning and management of Information Technology projects while highlighting good practices to be applied through any project life cycle.

The overview of IT Projects Management Concepts in the Environment for MDA's is adopted from ISO 21500:2012. In summary, this methodology specifically highlights the following: 1) guidance on IT project management for Ministries, Departments and Agencies (MDAs) including TVETs; 2) provides guidance for control and monitoring of projects from one stage to another; 3) provides guidance for compliance to security requirements; 4) provides project management templates for standardization of project documentation and, 5) elaborates details on code ethics and professional conduct of stakeholders in Digital Transformation projects (NITA-U, 2013).

Figure 2.11 below shows an overview of IT project Management concepts in the environment for MDA's.

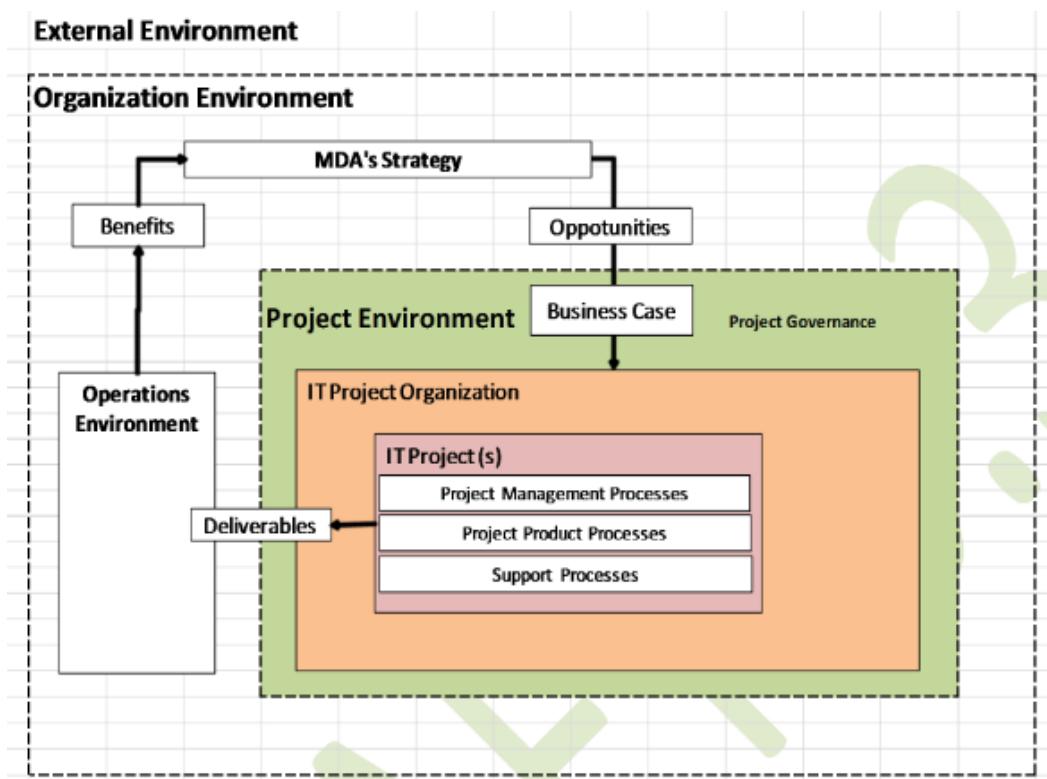


Figure 2.11: An Overview of IT Project Management in MDA's (ISO 21500:2012)

Considering all these factors and acknowledging that this study did not embrace the NITA project management methodology framework due to its perceived lack of relevance to the research at hand, it's important to emphasize that this framework, often referred to as a methodology, provides broad guidelines for managing IT projects in Uganda, with

a primary focus on structural aspects. However, it falls short in elucidating how to govern digital transformation projects within TVET institutions and lacks specific guidance on monitoring process quality at various stages. Additionally, it operates under the assumption that a series of activities can be executed in a single process path to achieve IT governance, which may not align with the practical complexities of governance. Each factor affecting governance can have a distinct impact, making it challenging to address all aspects through a singular path.

2.4.9 IT Governance Conceptual Framework for the Public

The IT Governance conceptual framework for the public is based on the realisation that ICT enabled transformational government requires consistent strategic alignment of Information Technology and business goals to increase public service delivery efficiency and to meet the expectations of every stakeholder (Grembergen, 2011).

This framework delivers general guidelines for IT Governance implementation which may be applied to TVET institutions in Uganda. This framework, however, is generic and cannot, by itself, be relied upon as an ITG framework for TVET institutions. Moreover, there is no explicit support for involvement of IT Management and Senior Managers in Public Organizations (Laita & Belassisoui, 2017). This framework is shown in Figure 2.12.

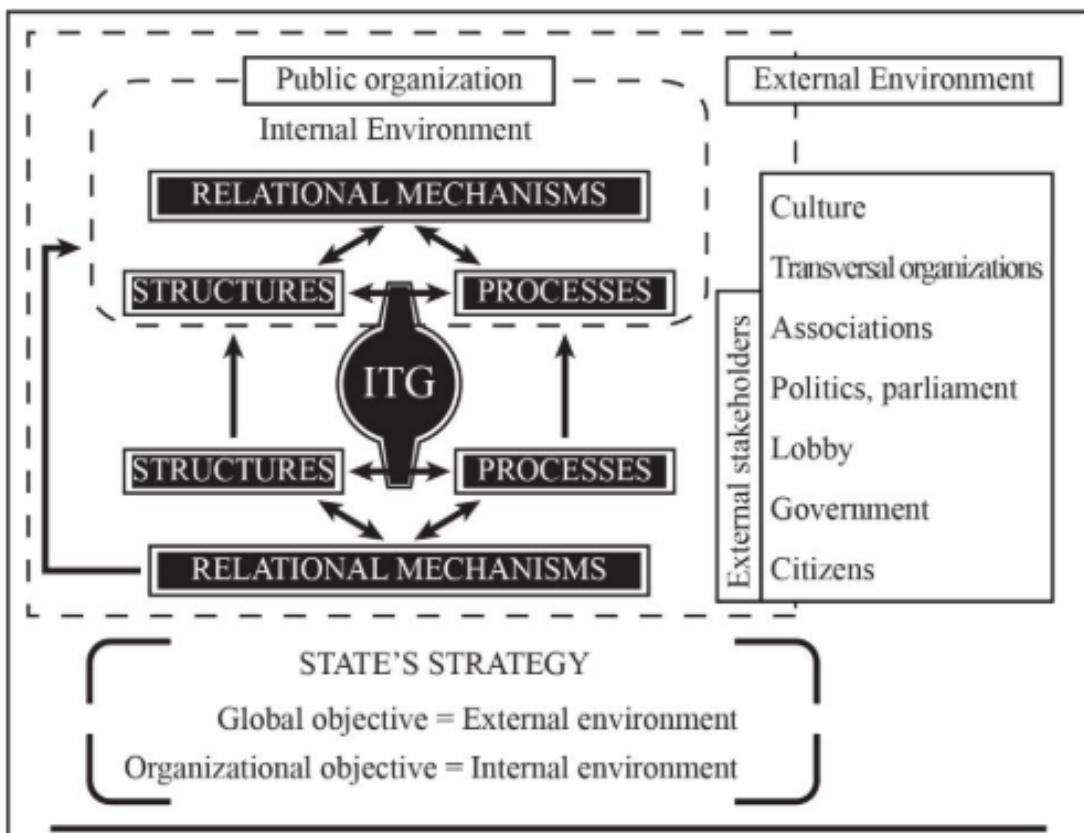


Figure 2.12: A Framework for IT Governance in Practice (Laita & Belassisoui, 2017)

The next subsection in Table 2.4 shows the strengths and weaknesses of reviewed, existing Information Technology Frameworks in a tabular matrix for ease of reference.

2.5 Strengths and weakness of Selected IT Governance Frameworks

No.	Existing Frameworks	Strengths	Weaknesses
1.	Information Technology Infrastructure Library (ITIL) Framework	<ul style="list-style-type: none"> (i) embraces the most recent technology trends and service management. (ii) provides basic support to organization's that are integrating digital technology into all areas of 	ITIL, however, does not provide guidance for mapping structures, processes and relational mechanisms - IT alignment with business (Wulandari & Buliali, 2019).

		<p>their business (Kempter, 2019).</p> <p>(iii) Can be deployed by other frameworks (Moudoubah et al., 2021).</p>	
2.	Control Objectives for Information and Related Technology (COBIT) Framework	<p>COBIT (i) provides a comprehensive framework for high level IT governance and control (José et al., 2013).</p> <p>(ii) Focuses on usage of IT resources in a responsible and acceptable way with accountability (Moudoubah et al., 2021; Zhang & Zhou, 2014).</p>	<p>COBIT however,</p> <p>(i) is not sufficient to meet the requirements of business and IT alignment;</p> <p>(ii) coordination must be carefully applied in combination with (an)other framework(s) (Moudoubah et al., 2021; Zhang & Zhou, 2014).</p>
3.	Committee of Sponsoring Organizations of the Treadway Commission (COSO) Framework	<p>(i) Aligns objectives of the organization (ii) Identifying events (opportunities or risks); (iii) helps determine and assess the impact of risks (iv) helps responding to the risk or mitigating the risk; (v) helps in ensuring and establishing channels for information sharing and communication (Horwath et al., 2012).</p>	<p>COSO emphasizes managerial processes ii) is weak on the quantitative aspects of governance in Technical, Vocational and Education training (TVET) institutions/organizations (Riyadi et al., 2021).</p>

4.	A brief of the ISO 27000 Framework	<p>ISO 27000 recommends information security controls that are relevant for cloud computing. This framework is a series of standards that offers tools for cloud risk assessment (Riyadi et al., 2021).</p>	<p>(ii) generic nature covers all management, operational and technical aspects with a view to handling vulnerabilities and threats; (iii) does not cover security system challenges an organization could face if cloud computing is deployed. (Tariq & Santarcangelo, 2016).</p>
5.	Agency Theory Framework (Mahaney & Lederer, 2003a)	<p>This theory provides a framework to help project managers to improve the success of digital transformation projects (Mahaney & Lederer, 2003a).</p> <p>(ii) This model offers a rich set of testable predictions, and yet the other conventional theories remain silent about predictions that can be tested (Bohren, 1998).</p> <p>(iii) Agency theory has an empirical track record of based on numerous tests for over 9 years with significant</p>	<p>(i) The control mechanisms proposed that are grounded on agency theory are very expensive to implement (Mahaney & Lederer, 2003a);</p> <p>(ii) The mechanisms suggested to protect shareholders' interests may obstruct the realization of strategic decisions. Predictive performance of the agency theory is high but the explanation and ability to describe principal/agent relationships under different circumstances remains low. There needs to be different models with different assumptions about principal and agents with cost effective</p>

		<p>supportive evidence on prediction models about leverage from a financial point of view (Bohren, 1998);</p> <p>(iv) Agency theory is a proven, experimentally valid perspective of how a digital transformation project should be governed for successful outcomes, particularly when triangulated with complementary perspectives and theories (Eisenhardt, 1989).</p>	<p>ways to solve agency problems (Bohren, 1998);</p> <p>(iii) There is no guarantee that agents (project implementers) will always act in the best interest of the principals (top management) (Bohren, 1998).</p>
6.	ISO 38500 Framework	The ISO 38500 framework is applicable to organizations of all sizes including TVET institutions and provides a framework for effective Information Technology governance to particularly provide support to top level management.	<p>(i) weak emphasis and capability to assign roles and responsibility</p> <p>(ii) weak in providing support to for formulation of strategy and plans</p> <p>(iii) Controls not sophisticated enough, not focused enough to provide guidance for effective IT governance (Mohamad & Toomey, 2016).</p>
7.			

	ISO 17799 Framework for Information Security Governance	This framework provides great detail and much more guidance on “how” to get “things” done in much more detail than many other frameworks. IT managers appreciate this framework because of its technical orientation. It is a great tool for Information Security Managers (Von Solms, 2005).	(i) This is heavily an information security framework and only addresses this issue. (ii) The other downside is the fact that IS) 17799 is largely a standalone framework which is not integrated into other framework for information Technology governance.
8.	PRINCE2 (Project in Controlled Environment 2)	(i) The PRINCE2 methodology also integrates user requirements into an all purpose approach to accommodate the management of any project. (ii) This methodology further defines each process with the process key inputs and outputs and explicitly elaborates the objectives that will be realized for every activity to be carried out (PRINCE2, 2019).	(i) PRINCE2 does not define the methodology for senior management to achieve alignment of business process with project goals (IT effectiveness goals). (ii) The following are the salient shortcomings with this methodology: (iii) system requirements are ill defined; (iv) definitions of inputs and outputs of the IT implementation and hardly defined; (v) unclear and incorrect system development or IT

			implementation requirements (Kruger & Rudman, 2013).
9.	National IT Project Methodology V.3 (NITA – U, 2013)	(i) This framework delivers guidelines (structural) on how IT projects in Uganda should be Governed.	(i) This framework is silent on processes and how to ensure quality through the process path; (ii) this framework does not show “HOW” IT Governance in TVET institutions are to be implemented. Mechanisms are not demonstrated as guidance for ITG in TVET institutions; (iii) this framework is based on the assumption that a series of activities can be executed in one process path to achieve IT governance. This in practice may not be realistic.
10.	IT Governance Conceptual Framework for the Public (Laita & Belassisoui, 2017)	(i) This framework delivers general guidelines for IT Governance implementation which may be applied to TVET institutions in Uganda.	(i) The framework is generic and cannot, by itself, be relied upon as an ITG framework for TVET institutions (ii) There is no explicit support for involvement of IT management and Senior managers in Public Organizations.

Table 2.4: Strengths and weaknesses of reviewed, existing Information Technology Frameworks

2.5 Baseline for Enactment of Effective IT Governance and Comparison of Selected IT Governance Frameworks

Research studies show and identify the Strategy and Investment Management Information Technology main areas by practitioners based on both scientific and practitioner points of view (De Haes & Van Grembergen, 2008; Pereira & Mira, 2012). These findings allow for a better understanding of the implementation of Information Technology Governance in TVET institutions.

A baseline, that provides structures, processes and relational mechanisms could be considered for comparing the selected IT Governance Frameworks below (De Haes & Van Grembergen, 2008). Table 2.5, in the next subsection, shows how the selected frameworks compare with each other in selected aspects of ITG mechanisms as per the baseline discussed above.

Table 2.5: Comparison of selected IT governance frameworks

Strength and focus on Project Management	✓	✓	X	✓	X	✓
Strength and focus on IT Project Risk	X	X	X	X	✓	✓
Relational Mechanisms [Approach to Communication]						
Is Senior Management involved (SMT)	✓	✓	X	✓	X	X
Does the framework propose a business/IT partnership	X	X	X	X	X	X
Does the framework support IT leadership in the loop of Communication as a focus	X	X	X	X	X	✓

Structures [Present for decision making]						
IT steering committee present	x	x	x	x	x	x
IT strategy committee	✓	x	✓	✓	x	x
Head of Information Technology in organization	✓	x	✓	x	x	x
Does the Head of IT Report to the CEO	x	x	x	x	x	x
Is there a structure in the organization for decision making	x	✓	x	x	x	x
Processes [Alignment of IT with Business]						
IT Governance Maturity Models	x	x	x	x	x	x
Monitoring	✓	✓	x	✓	x	✓

Accountability	x	x	x	x	x	x
Service Level Agreements (SLA)	x	x	x	✓	x	✓
Extraneous ITG variables catered for in Framework						
Government regulation, industry consideration and customer attention	x	x	x	x	x	x
Framework is sympathetic of Culture of recipients of ITG Service	x	✓	x	x	x	x
Involvement of Stakeholders in ITG Framework	✓	✓	x	x	x	x

Table 2.5: Comparison of Selected IT Governance Frameworks selected for analysis in this study.

In view of the analysis of the existing frameworks above, the following observations are drawn by the researcher. There is a generally weak provision and consideration for processes and the quality of processes in dynamic environments. The frameworks are generally not sympathetic of culture of recipients (e.g. Culture of TVET institutions in Uganda). They are not dynamic enough but are rigid. These frameworks do not take into account the “agency problem” that arises from the employer and the employee “seeing things” different with varying motivations and attitudes towards projects in the context of this study. For all the frameworks proposed, the

CIO does not report to the CEO. This according to reviewed literature weakens the enforcement of Information Technology Governance.

Of all the reviewed ITG frameworks, there was no specific attention provided to process quality for each of the frameworks for IT projects from the start of the project to the end. This study examined why this was so given how important monitoring processes at each step is.

The researcher feels that the salient omissions above could be strong reasons for the challenges faced by implementers of IT projects, specifically in TVET institutions in Uganda.

2.6 A review of IT Governance in practice

Literature on IT Governance is dominated by studies in developed economies such as Finland, the United Kingdom, Denmark, Canada and the United States (Dirk Steuperert, Steven De Haes, Tim Huygh, 2021; Gordon, 2012; Grembergen, 2011). These countries seem to dominate research of Information Technology Governance Principles and their application.

Literature on IT Governance in TVET practice is not very well documented in developing economies. Credible literature on Information Technology Governance in Uganda is very limited. Few studies have evaluated IT governance in sub-Saharan Africa (Eicker et al., 2017; McGrath et al., 2020). Research is needed to address these gaps and generate actionable evidence to inform IT policy and IT practice.

2.6.1 Technical Colleges in Saudi Arabia (Risk, Security and Confidentiality)

The Technical Colleges in the Kingdom of Saudi Arabia (12 in number) have experienced rapid development and growth in the last sixteen years according to (Parveen & Chikhaoui, 2017).

In a study (Parveen & Chikhaoui, 2017), Saudi Arabia embarked on the usage of cloud computing as their IT platform in Technical colleges. In these colleges, the study concluded that for student skills to increase and for the effectiveness of education, cloud computing would help in enabling students keep up with the current trends of life.

(Sareen, 2013) agrees to this saying that tremendous business value may be realized with cloud computing infrastructure. (Sareen, 2013) in conclusion advises that the IT governance process [policies, practices and principles] are relevant to cloud infrastructure management.

(Parveen & Chikhaoui, 2017) suggest that IT Governance of cloud infrastructure must entail Risk Management and compliance issues and in order to mitigate attacks on the confidentiality, integrity and authentication control of the cloud users.

2.6.2 Lilongwe Technical College – Malawi (Lack of Governance Structures)

Lilongwe Technical College (LTC), located in Malawi, in Southern African has a mandate to provide technical or vocational courses aiming at producing an industrious workforce while promoting self-employment by encouraging entrepreneurial mindsets within the youth of Malawi (Lubanga, 2019).

LTC is in its infancy for strategic alignment of ICT with the strategic objectives of the institution. (Lubanga, 2019) states that ICT infrastructure is poor, access to the Internet is limited, there are no policies guiding e-initiatives and that there is no strategy in place to preserve e-resources in the long term.

Further to this, a study by (Lubanga, 2019) highlights the fact that the Information and Communication Technology staff lack the requisite capacity to manage e-resources and to govern Information technology in the Technical College.

In their concluding remarks in a report on the same, (Anunobi & Okoye, 2008) allude to the need for ICT capacity, the need for experts to manage and harness ICT and strategy in these institutions in order to realize business value.

2.6.3 TVET Institutions in Uganda

TVET institutions are mandated to provide appropriate, high quality, available and efficient technical and vocational skills training and education so as to provide, in the long run, a responsive human capital base also by encouraging the participation of various private sectors who are the immediate beneficiaries of this trained and skilled labor force (UNESCO-UNEVOC, 2010).

2.6.4 TVET and ICT

The deliberate introduction of Information Technology and e-learning methodology into TVET delivery has the potential for the realization of technological innovation, improvement of quality of service delivery to citizens by the TVET graduates, which requires curricula with digital content to deliver technology based learning (Afeti, 2018). Investing and revitalizing training infrastructure and teacher development is in the interest of Africa and Uganda in particular (Afeti, 2018).

It is noteworthy to observe that many projects in Technical and Vocational Education and Training (TVET) institutions have made a decision to put in place governance structures for Information and Communication Technology with a view to operationalize their mandate and to achieve the objectives of the institution (Ngondi & Mauwa, 2020a).

The challenges in implementing NITA's guidelines in these institutions like is the case in South Africa, seems to be more in situations where resources for Information and Communication Technology are greatly limited and where structures for Information and Communication

Technology process quality are not clear, are fuzzy, non-adaptive or where IT governance in these institutions is unstructured and fragmented (Ngqondi & Mauwa, 2020b).

2.6.5 Internet Based Delivery Models

A Business model in this context is a plan adhered to by a firm or institution for successfully identifying sources of income, the target customer base (in this case, target student base) and details for knowing how to invest. Such a model is the primary logic for institutions to create distinctive business value (S. Wang, 2021).

An Internet based delivery model therefore, in view of the general description of a model, is a plan that determines performance of a firm or institution that intends to make profits by exploiting technologies such as the Internet in order to know how and when to invest and to target potential customers (Benbunan-Fich, 2000).

Learning and teaching using technology in several Ugandan schools and Education Institutions continues to justify the need for Information Technology governance (Ndagire, 2020). The costs incurred by Ugandan Education Institutions to procure hardware and software for secondary schools is staggering. This being the case, the need for proper governance of digital transformation efforts cannot be over emphasized.

The Government of Uganda (GoU) through the National Information Technology Authority (NITA-U) has set up a national backbone infrastructure with a view to connecting schools and institutions to the National Data Transmission Backbone Infrastructure (NBI) and e-Government Infrastructure by laying 2,294 kilometers of optical fiber cable across the country (BMAU, 2019). The examples of impact of implementing this National backbone infrastructure include the following; i) increased efficiency in Government Service provision to the public; ii) reduction of Internet bandwidth in Uganda (per megabit per second per month) to US \$190 in 2017 from US \$ 1200 in 2010; iii) providing internet bandwidth to 21 education institutions at a subsidized rate; iv) increasing internet penetration in Uganda when free Wi-Fi services were provided in October 2016 (NITA-U, 2017).

The increased use of IT requires focus on implementation of effective IT governance (Amanat, 2018). Poor governance unfortunately led to failure to optimally deploy the National Backbone Infrastructure (Walakira, 2019).

This notwithstanding, prior to the above events, NITA-U developed a methodology (National IT Project Management Methodology V.3) for governance of IT projects for both the public and private sector organizations (NITA-U, 2013). The goal for IT governance in any institution is for IT to align and deliver business value with the right technology in the key areas that will yield impact on outcomes (Laita & Belaissaoui, 2017; Wiedenhoft et al., 2017), and averting of risk (Letiagina & Malov, 2021; Nfuka, 2012) and understanding user requirements (Eason & Harker, 1988).

Weill and Ross (2004) state that there is notable increase in profits and outcomes for institutions like TVETs that practice IT governance of up to 20% of business value.

2.7 Underpinning Theories and Theoretical frameworks

Theories are formulated to simplify and explain life around us by explaining, predicting and understanding phenomena with a view to challenge and extend knowledge that exists within the limits of several assumptions (USC, 2020). In other words, results, subject to a given perspective, may perhaps, as an illustration, consist of descriptions that are general in nature (Nyeko, 2019). A theoretical framework, therefore, is a collection of concepts which together with their definitions and references to relevant literature, are used as a platform for a particular study (USC, 2020).

In this study, the Dynamic Capabilities theory was reviewed. However, two theories will be merged to obtain a deeper understanding of this research. These theories are, the Agency Theory and the DeLone and Mclean Theory.

2.7.1 Dynamic Capabilities Theory

A dynamic capability of a TVET institution is the extent to which it will implement new activities in response to environmental variations (Takahashi et al., 2016a), and this may affect success of digital transformation project performance. The topic of dynamic capabilities is of recent getting the attention of many researchers (Reyes-Santiago et al., 2019).

This study therefore referred to the dynamic capabilities' theory as an underlying mechanism in the relationship of digital transformation and the factors that influence successful project implementation. A recent study has also introduced a novel moderating role of IT adoption to enhance the positive impact of dynamic capabilities on TVETs productivity (Dalle et al., 2020).

The Capabilities Theory was developed by Teece, Pisano and Shuen (Teece et al., 1997) in order to analyze the sources of wealth creation by organizations. The Dynamic Capabilities theory supports this study in realizing the similarities and complementarities among processes, between processes and motivations in an organization (Teece et al., 1997). This is a reality to keep in mind for investigation of the quality of process in this study that could lead to the successful implementation of digital transformation projects in TVET institutions.

In this study we see that TVET institutions are rapidly using collaboration systems amongst themselves (Ebil et al., 2020). Therefore, the dynamic capabilities occasioned by developments in the Internet and World Wide Web, are important. Thus, the capabilities

suggested by (Ebil et al., 2020) are to be considered to understand to process quality aspects of digital transformation projects.

2.7.2 Agency Theory

In projects with varied degrees of risk and reward for either the public entity or the Managers of the entity, the agency theory will explain the behaviour in an organization that may contribute to project failure. The primary actors in this study are the agents (Project Coordination Unit) and the principal (government). The assumption is that both the principal and the agent act in their own self-interest rather than conduct business with a view to make the most of the principal's interest. This is referred to as the agency problem.

Agency theory offers a potential explanation for the high failure rates of Digital Transformation projects (Chulkov & Desai, 2005; Mahaney & Lederer, 2003b). Agency Theory provides a framework for success and improvement of IT/IS projects in organisations for managers. The managers should continually ask questions about the constructs and relationships between the constructs to guide in taking appropriate action to mitigate project failure.

Agency Theory alone, however, may not provide a comprehensive coverage of Digital Transformation project risk factors (Mahaney & Lederer, 2003b).

All organizations have governance structures with a reasonable level of control that enables managers (the agents) to align their interests with the Principals' interest. Where such alignment is not attained, agency conflicts follow (Joshi et al., 2022; Nwidobie, 2013). These conflicts or problems arise when, i) the goals or wishes of the agent and the principal conflict and ii) it becomes difficult to verify whether or not the agent is doing what is expected of him by the principle. The second conflict arises when the agent's attitude toward risk is different from that of the principle.

The principle and the agent tend to have differing actions and attitudes towards risk due to the different risk preferences they both may have (Eisenhardt & Eisenhardt, 2018). In view of this, the agency theory mentions two options to address the agency problem by the principal in order to control the undesired behaviour of the agent.

The first is to have a contract between the principal and the agent. This contract is implemented where matching between principals and agents does not present a moral hazard problem and where there are incentives for the agent (Macho-Stadler & Pérez-Castrillo, 2021).

The second is to implement a governance structure following the agent's behaviour in the contract by implementing incentives for the positive actions of the agent (Macho-Stadler & Pérez-Castrillo, 2021).

In a TVET institution, services rendered are centralized within governance mechanisms and the aim of the institution is not to maximize profits. This will attract agency costs that arise from the inevitability of monitoring and assessing behaviour of the agent (Jensen & Meckling, 1976).

In summary therefore, the Agency Theory supports this study where the Principal (Top Management) assigns duties and responsibilities to the Agent (project implementation team) for digital transformation. The mechanisms for IT governance in this case (processes, relational mechanisms and structures) are enforced through governance committees who act as the principle. These committees monitor how IT management behaves with the aim of overseeing employee behaviour (that should be agreeable with the objectives of management).

Further, IT decisions are delegated by the principal (Top Management) to the Project implementation team (agent) to perform and implement policy (Nyeko, 2019). The framework below is derived from the Agency theory (Davis, 2013; Mahaney & Lederer, 2003a; Nyeko, 2019; William & Ephraim, 2003).

Mahaney and Lederer (2003) propose that both the type of contract and the monitoring of project progress exert influence on project success. Consequently, in line with Agency theory, the success of a digital transformation project is enhanced when the Top Management (the Principal) within the Ministry of Education incentivizes the project implementation team (the Agent) based on their achieved results. This, in turn, motivates Top Management to closely oversee project progress.

However, this study discovered that this scenario did not apply within the context of Uganda. Contrary to the theoretical framework, all contracts for the implementation team were behavioral rather than outcome-oriented. The incentive remained consistent whether the implementation team achieved success in project execution or not. Another study has demonstrated that enhanced project monitoring tends to correlate with heightened project success (Might & Fischer, 1985). Introducing the concept of "Process Quality" in this study

underscores the imperative of improving project monitoring practices. According to agency theory, instances of goal conflict between Top Management and the Project implementation team, coupled with shirking (allocating time to tasks unrelated to project success), and the presence of privately held information by an agent, prompt the principal to favor outcome-oriented contracts over behavior-oriented ones (Mahaney & Lederer, 2003a). In this study, we contended that delving into the impact of communication was more crucial than ascertaining the extent of privately held information, given that Ugandan laws advocate for transparent information sharing.

Task programmability on the other hand is explained as that degree to which correct behaviour by the agent (Project Coordination Unit) can be specified in advance (Eisenhardt, 1989). It is postulated that low task programmability is the possible cause of the agency problem (Eisenhardt, 1988). Further, outcome-based contracts effectively address circumstances occasioned by low task programmability. Where programmability decrease is observed in tasks in a project, the use of outcome-based contracts were preferred to counter the effect of low task programmability (Mahaney & Lederer, 2003a).

Risk factors such as lack of user involvement from the inception of the project, turnover of key personnel, changing technology, a change in the environment in which the business operates, project requirements poorly defined and the lack of a project sponsor can contribute to digital transformation project failure (Mahaney & Lederer, 2003a).

Besides the independent variables mentioned above, literature generally presents a case for processes. One cannot achieve effective IT governance where the processes are disjoint and are of poor “quality”. Processes are very important in achieving governance (Ben Boubaker et al., 2021; Fadler & Legner, 2021; Snipes, 2021b). Process Quality therefore can moderate Roles and Responsibilities to achieve Digital Transformation through IT Governance.

Following a survey in TVET institutions in Uganda, players in the digital transformation space actually seem to have limited knowledge of what to do to achieve project success. If roles and responsibilities were better defined, the researcher believes that IT governance would be strengthened in TVETs thereby leading to improved success of digital transformation projects in the institutions.

It is further hypothesized that when the quality of processes is high, IT governance is strengthened. Excellent process quality in this context is the excellent execution of assigned business processes by personnel who fill various positions.

This study theorizes that the right people, who are self-motivated and competent should fill positions that constitute the process path in the process structure to actualize improved digital transformation processes.

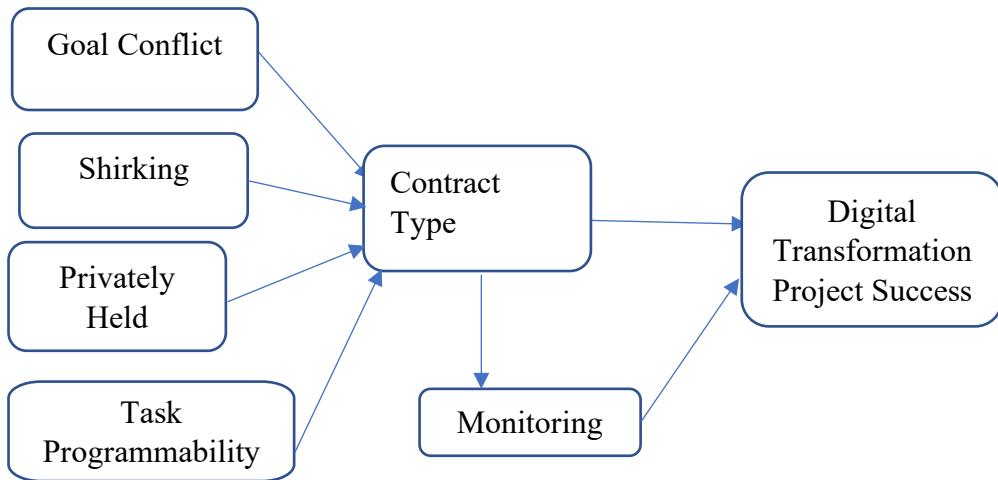
In this study, the significance of process quality has indeed emerged as a critical mediating factor. It introduces a fresh variable into the existing theoretical framework, underscoring its importance. It's important to emphasize that all three theories display limitations in adequately explaining governance, especially in local contexts marked by unstructured processes.

Within the Ugandan context, the execution of a process along a specific path is intricately linked to the individual responsible for a particular business process role. Notably, when an individual demonstrates organizational acumen and expertise, process quality tends to see an upswing. Consequently, the effectiveness of governing digital transformation projects hinges on the capabilities of the individuals participating in each process. This introduces a pivotal variable that enriches our understanding of IT governance, particularly in settings characterized by less structured processes.

In the context of our TVETs, the significance of process quality becomes notably pronounced. TVET institutions heavily depend on individuals for the effective execution of their processes. When these processes are well-defined, complete with clear roles and responsibilities, individuals in their respective positions are better equipped to competently fulfill their tasks. Furthermore, monitoring these processes plays a vital role in ensuring their sustained high quality, especially given the well-defined roles and responsibilities.

The Agency Theory Framework for Project Success

Figure 2.13: A Framework for Project Success by Mahaney and Lederer, 2003



2.7.2.1 Effect of Communication of Quality information

In the discussion of their findings, Mahaney & Lederer (2003) indicated through research that privately held information may increase the agency problem. An agency problem occurs when an agent works in his or hers own self interests and not in the paramount interests of the principal or the institution. Moreover, privately held information as a variable was dropped because Uganda has a law on access to information which is enforced by the respective Accounting Officers in each TVET entity (ACT, 2005).

Privately held information, as a construct was dropped in this study and is now replaced by Communication. This is the communication between the players of the digital transformation processes at top management, the implementation team and in the TVET institution during project implementation. Further, studies show that where project managers execute effective strategies for communication, there is increased success of projects (Snipes, 2021a).

Effective information sharing includes the development of a communication plan which is critical for increased success of digital transformation projects (Aleksejevec, 2020). Moreover, effective communication planning with clear strategies for information sharing prevents project cost overruns, and delays related to stakeholder concerns which are a barrier to project success through possible stakeholder opposition among other reasons (Greenberger, 2016). Preceding research has also shown the need to keep stakeholders informed on project status and other

aspects of the projects through status reports, meeting, emails and collaboration apps (Snipes, 2021a).

2.7.2.3 IT Project Priority Setting

Drucker (2018) emphasizes the importance of leaders and agents involved in digital transformation projects prioritizing their core objectives while refraining from engaging in secondary tasks (Drucker, 2018). The term "shirking" is used in this study to refer to involvement in secondary tasks. Extensive research consistently highlights that a failure to maintain focus on a single project at a time can significantly increase the risk of project failure. Consequently, this study aims to investigate this phenomenon within the specific context of TVET institutions in Uganda.

In this study, our primary terminology will be "shirking" instead of the concept of "IT priority setting," which we employed during the framework's conceptualization (Snipes, 2021a).

2.7.2.4 Roles and Responsibilities

Digital transformation, serving as the dependent variable, is subject to budget constraints (Sims, 2022). Research by Bhika and Pretorius (2017) underscores that insufficient resources represent a primary challenge negatively impacting the success of digital transformation initiatives. However, clearly defined roles and responsibilities have been identified as a means to counter the adverse effects of limited resources on the success of digital transformation projects (Bhika, 2017).

Effective management of roles and responsibilities plays a critical role in enhancing the success of digital transformation projects (Nyameke et al., 2020). This is especially evident when utilizing a role and responsibility matrix to identify and assign individuals responsible for executing specific tasks within a digital transformation project (Snipes, 2021a).

In the context of this study, a theoretical perspective is advanced, suggesting that the relationship between all the independent variables and the success of digital transformation is mediated by IT process quality. This mediation occurs from the initiation of the digital transformation project through to its logical conclusion.

2.7.2.5 IT Process Monitoring

Processes to monitor digital transformation projects are required to reduce inefficiencies in process quality, avoid operational failures in digital transformation implementation, improve credibility of TVET institutions and to strengthen the business and IT relationship in the institutions (Joshi et al., 2022; Mahaney & Lederer, 2003c). The quality of the monitoring process is critical too.

2.7.2.6 IT Processes Quality

In the realm of IT governance, especially in environments where processes lack clear structure, a crucial variable called "process quality" is introduced. As previously discussed, the existing trio of theories fails to effectively explain IT governance within local contexts characterized by unclear and inefficient processes.

In the Ugandan context, particularly in TVETs, the success of digital transformation hinges on the individuals occupying key positions within the organizational structure. When these individuals are well-organized, the quality of each critical process necessary for achieving digital transformation becomes apparent (Sindre, 1996).

Moreover, processes and the execution of strategic initiatives are intricately linked. Inefficient, unclear, or outdated processes can serve as significant barriers to an institution's growth. It's estimated that inefficient processes have the potential to reduce an organization's revenue by as much as a third (Atrash, 2022). This, in turn, suggests that inefficient processes may contribute to the growing number of digital transformation project failures in developing economies.

It's important to note that this study does not aim to provide an exhaustive analysis of digital transformation project risk factors. Instead, the theories employed in this study underscore the importance of effective monitoring by management and advisory roles, incorporating elements of dynamic capabilities. Within this study, digital transformation in Ugandan TVETs is understood as a dynamic capability (Harguem, 2021). In the context of process quality within TVETs in Uganda, digital transformation can indeed be regarded as a dynamic capability. This perspective emphasizes the importance of continuous adaptation and innovation in leveraging digital technologies to ensure effective communication, task definition, and the alignment of goals between agents and principals. It also underscores the need to prevent "shirking" by

avoiding the diversion of efforts toward non-essential tasks that could undermine the progress of the project. In essence, digital transformation serves as a dynamic capability in TVETs by enabling these institutions to continuously evolve and excel in their digital strategies while maintaining focus on essential project objectives (Harguem, 2021).

2.7.3 The DeLone and Mclean Theory

Attempts to explain the acceptance of some information systems over others is not equivalent to success, since an information system must be accepted first before it is considered successful (Petter et al., 2008). Several researchers have attempted to define information system success quite unsuccessfully because of the complex, multi-dimensional and interdependent nature of Information Systems success.

In 1992, a classification of Information Systems success based on a review of research published during the period 1981-1987 was created. In their 1992 paper, DeLone and Mclean (1992) identified six variables of Information System Success: Information quality, use, system quality, user satisfaction, organizational impact and individual impact (W. H. DeLone & McLean, 1992).

Remarkably, Seddon (1997) argued for the elimination of “system use” as a variable for success. He claimed that system *use* is a behaviour and therefore cannot be a variable in the causal success model.

Seddon further said that *use* must precede impact and benefits and that use is not the reason for them (Seddon, 1997). DeLone and McLean in a rebuttal disagreed with this argument because they believe that system usage is a suitable measure of success in most cases (William & Ephraim, 2003).

This study therefore was careful to note at each point that simply using a system more does not yield benefits without putting into consideration the nature of the use of the system. This research study therefore regarded the extent and nature of use in order to appropriately capture the relationship between usage and the realization of expected results.

DeLone and McLean further argued that the declining usage of an information system was a significant indication that the expected benefits are not being realized (William & Ephraim, 2003). This study found this to be true. System usage continues to be used, developed and

tested in several studies as a dependent variable by Information Systems Researchers (Amalina & Suryani, 2022; Daraghmi, 2023; Gelderman, 1998).

The *use* of assets after digital transformation projects is ensured through the “monitoring” of the activities during and after the project.

2.8 Bimodal Development Processes and the C-Suite

The effective Governance of Information Technology is critical to business because it ensures that IT is used effectively. In the context of this study, many institutions are investing in digital transformation projects and programmes (Matta et al., 2022). Significant IT risk as a consequence has become inevitable requiring both management and governance to institutionalize mechanisms to mitigate this risk (Caluwe et al., 2021).

IT Governance literature suggests that governance of Information Technology in digital transformation comprises of formal process, relational mechanisms and structures (De Haes, Van Grembergen, et al., 2020b). This study further proposed the need for ensuring the quality of each of these processes. Process quality will be discussed more in this chapter.

Another key area in this study is the social alignment between the CEO and the CIO which to date has not been distinguished as either an active or passive relationship that could have a significant outcome on digital transformation project success.

A study has shown how crucial it is for the CIO to understand the CEO and not the CEO understanding the CIO. This understanding, according to a study, is what matters for improved quality for the digital transformation process (Haffke, 2017). Building on the concept of dynamic capabilities, digital transformation projects are executed in dynamic environments which build pressure to adapt to behavioral, technical and cultural changes in the organization. These changes call for the need for an organization to hire a CIO to relieve organizational stress and pressure that follows adaptation of new ways of work (Bendig et al., 2022).

Further, driving strategic change in TVET organizations in Uganda will require tactical execution and optimization of IT performance within Bimodal IT environments for start-up, established and turnaround environments. In this case, the focus is first on the capabilities and experiences to be delivered by the digital transformation process by creating the desired future state that meets the needs of TVET institutions by delivering the value required (King, 2023).

This study proposed the triangulation of an Information Technology Governance (ITG) framework, agency theory and the DeLone and McLean model through the lens of Dynamic Capabilities since all the reviewed IT project management efforts alone presented in literature do not provide a solution to the problem of failure of Digital Transformation Project Implementation (Bans-Akutey & Tiimub, 2021). The researcher made use of different theories and methods in this study so that the deficiencies in one theory or method is reduced by the strengths in another.

2.9 Theoretical Frameworks

This section presents a synopsis of the various frameworks that were reviewed earlier in this chapter. Only the main characteristics of each framework is highlighted and the gaps that point to the need to derive a new framework for increased success of digital transformation projects is explained. The details of the reviewed frameworks are presented in table overleaf.

No.	Frameworks	Strengths	Weaknesses
1.	Information Technology Infrastructure Library (ITIL) Framework	Provides support to organization's that are integrating digital technology into all areas of their business	ITIL, however, does not provide guidance for mapping structures, processes and relational mechanisms - IT alignment with business
2.	Control Objectives for Information and Related Technology (COBIT) Framework	COBIT provides a comprehensive framework for high level IT governance and control and acceptable way with accountability	Great coordination must be carefully applied in combination with (an)other framework(s)

3.	Committee of Sponsoring Organizations of the Treadway Commission (COSO) Framework	i) Aligns objectives of the organization and helps in ensuring and establishing channels for information sharing and communication.	Breakdowns and failures occur as long as people are those who are operating internal control systems, this can include basic errors.
4.	ISO 27000 Framework	This framework is a series of standards that offers tools for cloud risk assessment	Does not cover security system challenges an organization could face if cloud computing is deployed.
5.	Agency Theory Framework (Mahaney & Lederer, 2003a)	This theory provides a framework to help project managers to improve the success of digital transformation projects	There is no guarantee that agents (project implementers) will always act in the best interest of the principals (top management)
6.	ISO 38500 Framework	The ISO 38500 framework provides a framework for effective Information Technology governance.	Weak emphasis and capability to assign roles and responsibility.
7	ISO 17799 Framework for Information Security Governance	It is a great tool for Information Security Managers (Von Solms, 2005).	This is heavily an information security framework which is not integrated into other frameworks.

8	PRINCE2 (Project IN Controlled Environment 2)	PRINCE2 defines each process with the process key inputs and outputs that will be realized for every activity to be carried out	Definitions of inputs and outputs of the IT implementation are hardly defined
9	National IT Project Methodology V.3 (NITA – U, 2013)	i) This framework delivers guidelines (structural) on how IT projects in Uganda should be Governed.	This framework is silent on processes and how to ensure quality through the process path;
10	IT Governance Conceptual Framework for the Public (Laita & Belassisoui, 2017)	This framework delivers general guidelines for IT Governance implementation which may be applied to TVET institutions in Uganda.	The framework is generic and cannot, by itself, be relied upon as an ITG framework for TVET institutions for process quality

Table 2.6: Summary of the Reviewed Frameworks

Driven by the under explored relationship between IT governance processes and digital transformation project success (Joshi et al., 2022), this study draws from the IT-enabled capabilities of a TVET institution, IT capabilities and findings in studies on IT governance frameworks to introduce, measure and test the theoretical concept of *IT governance process quality*.

Findings in various studies on IT governance show and focus efforts on the role that IT governance structures plays on the outcome of digital transformation projects (Joshi et al., 2022).

In this study, the construct *IT governance process quality* centres on IT processes and the effects of who in the structure affects and provides feedback on IT process identification, IT process design and IT process implementation.

Prior literature in the field of Information systems has progressed the understanding on how TVET institutions would implement *IT governance processes* (De Haes, Caluwe, et al., 2020; De Magalhães et al., 2020; van grembergen et al., 2007). The concept of IT Governance Process quality in this study is the ability of the TVET institution to identify, design, and implement the process and to select the IT resource and to allocate them appropriately for IT decision making, IT planning, IT services delivery, IT infrastructure modernization and IT monitoring (Joshi et al., 2022).

This study theorizes that the relationship between the contract type and Digital transformation success in a TVET institution and digital transformation project success is mediated by Monitoring (Process Quality). Moreover, the combined understanding between IT and business shows that it is necessary to speed up and automate decision making as researchers suggest that ITG's traditional view may no longer hold as true (De Magalhães et al., 2020).

Other scholars also found that the traditional view of IT governance on its own may be outdated in today's digital transformation efforts in organizations requiring additional research on the subject (W. DeLone et al., 2018). Moreover, inefficient and outdated processes negatively impact IT Governance of digital transformation projects (Atrash, 2022). The quality of the processes as illustrated in figure 2.17 mediates the independent variables and digital transformation.

Agency theory posits that there could be goal conflict between the top management and the implementation of IT processes towards digital transformation. This is manifested in how projects are formulated with insufficient involvement of the IT department in the formulation of digital transformation project formation and execution. More importantly, The CIO/IT Managers become involved in IT project implementation after the commissioning of IT projects.

At the contract signing stage, all the preliminary activities for the foundation of the project are concluded. The oversight of not involving IT Managers from the onset of such an undertaking constitutes risks for the project. Each process is very important in ensuring IT governance for improved success of digital transformation projects.

In this study, the researcher tested various hypotheses to establish the relationship (i.e. good, fair or not very good) between the CIO and CEO as an independent variable. The researcher believed that this relationship was critical for support by the top executive for success of any project. A new construct, “Process Quality” was introduced to mediate “Contract type” in a bid to realise improved success of digital transformation projects in TVETs in the Ugandan context.

2.10 Conceptual Framework for Digital Transformation Projects in TVETs

In this section, a conceptual framework for improved success of Digital Transformation projects (SDTP) is presented. The conceptual framework for SDTP, shown in figure 2.1, uses the Agency Theory as the base theory. It integrates constructs and aspects from Agency Theory, the DeLone and McLean Theory and Dynamic Capabilities to provide a robust framework for analyzing the effect of key variables from literature mediated by the quality of processes that lead to improved digital transformation projects in TVETs in Uganda. The conceptual framework for SDTP is based on the framework for project success developed by Mahaney and Lederer (2013). This conceptual framework is also motivated by the under explored relationship between IT governance processes and digital transformation project success (Joshi et al., 2022).

As may have been observed by now, originating a new framework was necessary because none of the frameworks discussed in the review, in this chapter, was found to have all the characteristics necessary for investigating digital transformation and the factors that lead to the improved success of digital transformation projects. The approach of integrating existing frameworks to derive a strong and comprehensive framework was supported by Berthon et al. (2002) who suggested the replication and enhancing of existing research frameworks in Information Systems research. The constructs and aspects that form the conceptual framework are as follows:

- i. Goal conflict and all its dimensions: Here we measure the difference between the goal expectation of Top Management (Principal) and the Project Coordination Unit (Agent).
- ii. Privately held information as a construct was dropped and replaced with communication because Uganda has a law on access to information. This law is enforced by all accounting officers.

- iii. The shirking construct describes what drucker (2018) suggested concerning doing first things first and never at all doing second things.
- iv. The task Programmability construct is explained as the degree to which correct behaviour by the agent can be itemized by the principal, in advance for clarity in the execution of tasks by the agent.
- v. The Process Quality construct mediates all the independent variables and digital transformation. This construct is hypothesized to be an influence on quality of processes for digital transformation project success.

The Contract type construct moderates Process Quality and digital transformation project success. Contract Type is hypothesized to increase digital transformation project success. The structural form of theModel by Mahaney and Lederer, (2003) was slightly modified to cater for the fact that this study did not encounter anyone with and outcome oriented contract (Ozili, 2023).

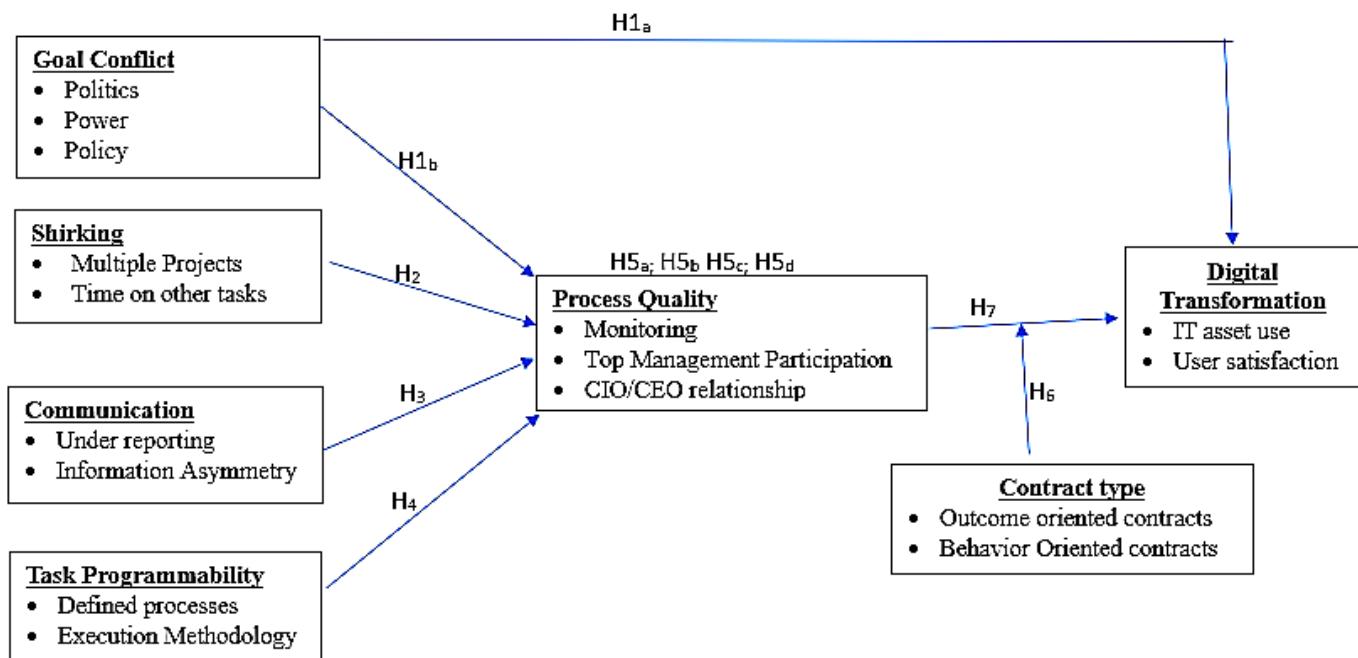


Figure 2.14: Conceptual Model for success of Digital Transformation Projects based on Agency theory; DeLone & McLean theory (Davis, 2013; Mahaney and Lederer, 2003); Nyeko, (2019); Joshi et al, (2022)).

The model above shows the conceptual model design for improved Digital Transformation Projects through effective IT governance processes in the context of TVETs in Uganda. The model also describes how the Hypotheses to be applied to this study have been developed.

2.11 Framework Usability Criteria of each adopted model.

Table 2.7: Framework usability criteria of each adopted model

Criteria Dimensions	Usability Criteria Models		
	Agency Theory (Mahaney & Lederer, 2003b; Nyeko, 2019)	DeLone and McLean	Joshi et al. (2021) (IT Governance Framework)
Goal Conflict	x		
Communication	x		
Shirking	x		
Information Completeness		x	
Information Relevance		x	
Roles and Responsibilities	x		
IT Governance			x
IT Investment Value			x
IT Structure			x
IT Asset use		x	
Task Programmability	x		
Contract type	x		
Monitoring	x		

The conceptual framework for improved success of Digital Transformation Projects (SDTP) is comprised of six key constructs derived from aspects of the models by Mahaney and Lederer (2013) together with Joshi et al, (2022). Process quality is a construct was introduced following literature review of its importance in the success of digital transformation. The six constructs include “Goal Conflict”, “Communication”, “Shirking”, “Task Programmability”, “Contract Type”, and “Process Quality”. This conceptual framework is shown in figure 2.17.

The conceptual framework for improved success of digital transformation project success (Figure 2.17) posits that when undertaking a digital transformation Project, the Principal must ensure that the quality of each process is at its highest. Decisions through each process are being made at every stage of digital transformation. Communication of related information about each process is vital. Good communication will ensure that there is reduced goal conflict. Further Task Programmability ensures that the tasks will now be outlined for implementation beforehand in the planning phase.

Details of constructs for the conceptual framework for improved success of digital transformation projects (SDTP) are discussed in the next section.

2.12 Hypothesis Development

Based on the conceptual framework in figure 2.17, seven variables are tested in the conceptual framework for SDTP. These include Goal conflict, Shirking, Communication, Task Programmability, Contract Type, Process Quality and Digital Transformation. The definition of each variable, its measurement and proposed relationship with the other variables is given below.

Goal Conflict: Might and Fischer, (1985) have shown in their study that the more the principal receives feedback on the status of processes in the project, the more the project implementation strategy will align the goals between the principal and the agent. Therefore, reducing Goal conflict leads to higher process quality. This increase in higher process quality therefore leads to improved success of digital transformation projects in TVETs.

Communication: Snipes (2021), in a study has shown that where project managers execute effective strategies for communication, there is increased success of projects. Effective

information sharing includes the development of a communication plan which is critical for increased success of digital transformation projects according to Aleksejevec, (2020).

Shirking: When project team members (agents) spend more time and effort working towards their own goals and not the goals of top management, such a state is referred to as shirking of responsibility of the agents which increases the Agency Problem as described earlier (Baiman, 1982).

Task programmability: Task programmability refers to the degree to which proper behavior and execution of duty by the project implementation team (the agent) can be accurately defined in advance (Eisenhardt, 1989; Eisenhardt & Eisenhardt, 2018). The more complex and the less structured the processes and activities in the digital transformation project, the more difficult it will be for the Top Management (the principal) to judge and determine whether the agent is shirking their responsibilities or not. Monitoring and evaluation of success becomes easier with increased task programmability.

Process Quality: This is a mechanism that ensures and spells out who in the structure affects and provides feedback on IT process identification, IT process design and IT process implementation to top management. Process quality also ‘checks’ to see that the roles and responsibilities for each activity are executed by competent players and that these players perform to the best of their ability while adhering to the Terms of Reference of the project.

There needs to be a mechanism that provides feedback or information to top management (the principal) regarding the actions of the project implementation team (the agent) in order to minimize the agency problem (Bergen et al., 1992).

Contract Type: Agency theory postulates that the type of contract between the Top Management (Principal) and the Project implementers working on behalf of the Principal (the agent) has an effect on the quality of the project outcome (Eisenhardt & Eisenhardt, 2018). The project implementation team is compensated for behaving in a certain way regardless of the outcome in a behaviour-based contract. In this this study, Contract Type Moderated Process Quality and Digital Transformation because we observed that there was no outcome oriented contract issued to any of the respondents in this study.

In the instance of Agency theory by Mahaney and Lederer, (2003), the project implementation team (the agents) are compensated for achieving certain goals in an outcome-based contract. This may take the form of praise from superiors, future promotion opportunities, a sense of self-esteem, a commission, public recognition and the like (Baker et al., 1988). In a separate study, students as the subjects were found to show a positive relationship between contract type and successful outcomes in lab experiments (Cocco, 1995). This study only captured the fact that the implementation team (agents) were compensated for achieving their goals in a behavioral-based contract.

The Project Implementation team (the agents) may have goals that conflict with those goals of the Top management (the principal) according to Agency Theory (Eisenhardt, 1989). Therefore agents (the project implementation team for digital transformation) may strive to achieve their own goals instead of striving to achieve the goals of the Top Management (Principal). This has been found to lead to poorer results of the project (Mahaney & Lederer, 2003a). This therefore puts forward the following Hypotheses.

Hypotheses

H1_a: Goal conflict has a negative significant effect on Digital transformation projects in Ugandan TVET institutions.

Goal conflict can result into poorer overall outcomes fo digital transformation projects. This is primarily because agents at times may have goals that conflict with the goals of the principal according to Agency Theory Eisenhardt, (1989).

In another study, the more the project implementation strategy aligns the goals between the principal and the agent the smaller goal conflict will be, thereby increasing process quality for improved success in digital transformation (Might & Fischer, 1985).

H1_b: Goal conflict has a negative significant effect on Process Quality in digital transformation projects in Ugandan TVET institutions

In a study, it was established that Goal conflict was negatively associated to success of an undertaking when controlling for quality of processes. As projected in the same study, process quality was related to project success. Project success was positively related to positive outcome of well executed processes (Slocum et al., 2002).

Moreover, Sindre, (1996) postulates that quality process produces a high-quality product and therefore quality processes in a project lead to success in project outcomes. Further, process quality is affected by how quality is perceived. This could lead to differences in what the goal of the project is as may be perceived by the agent or the principal thereby resulting into goal conflict which has a negative effect on Process Quality (Sindre & Sørumgård, 1996; Slocum et al., 2002).

.H₂: Shirking has a negative significant effect on Process Quality in digital transformation project in Ugandan TVETs.

Process quality is a measure of excellence of interrelated work items (tasks, procedures, steps). This measurement characteristic shows whether a given process is done correctly within prescribed tolerance ranges, minimizing deficiencies and ensuring insignificant variations. Shirking on the other hand is defined as a lack of employee work effort or a tendency on the part of workers to give less than full effort on the job (Judge & Chandler, 1990). Shirking in several studies has been seen as an impediment to process quality since a lot of poor processes may pass unnoticed because of agent shirking.

At times, members of the project implementation team (agent) may not spend effort working towards the goal of Top Management (Principal), but may instead shirk their responsibilities which increases the Agency Problem (Baiman, 1982). Therefore, digital transformation project process quality may register higher rankings with less shirking in TVETs in Uganda.

H₃: Communication has a positive significant effect on Process Quality in digital transformation in Ugandan TVET institutions.

The Agency problem is made bigger when the project implementation team (the agents) privately hold information from Top Management (the principal). The Project Implementation team or a member in the team (Agent) may misrepresent such information or even provide information that is false to Top Management (the principal) (Eisenhardt, 1989; Eisenhardt & Eisenhardt, 2018).

Studies have shown that where the project implementation team (agents) privately hold information and do not communicate were more likely to act in ways that were conflicting with the best interests of Top Management (the principal) thereby having a negative impact on process quality (Guinan et al., 1998). As such, it is postulated that good Communication should

have a positive significant effect on Process Quality in digital transformation in Ugandan TVET institutions.

H4: Task Programmability has a positive significant effect on Process Quality in digital transformation projects in Ugandan TVET institutions

Task programmability refers to the degree to which proper behaviour by the project implementation team (the agent) can be accurately defined in advance (Eisenhardt, 1989; Eisenhardt & Eisenhardt, 2018). The more complex and the less structured the processes and activities in the digital transformation project, the more difficult it will be for the Top Management (the principal) to judge and determine whether the agent is shirking their responsibilities. Studies have shown that there is a significant relationship and correlation between task programmability and Process quality of digital transformation projects.

Tak programmability enables project managers to control task-based processes and operations. As such, we hypothesize that task programmability has a positive significant effect on Process Quality in digital transformation projects in Ugandan TVET institutions (Eisenhardt & Eisenhardt, 2018).

H5a: Process Quality mediates the relationship between Goal Conflict and Digital Transformation in Ugandan TVETs

Goal conflict may have several undesirable effects on process quality. The causes of such conflicts in projects may arise from a poor goal or priority definition, personality, poor communication, politics and administrative procedures (Kezsbom, 1992). Conflicts are classified as task conflicts, relationship conflicts and process conflicts which all have varying modes of occurrence. Each conflict is unique everytime it occurs at various points through the digital transformation project lefe cycle (Wu et al., 2018).

Since processes quality can be undermined by Goal conflict, we see here that both digital transformation and goal conflict may be mediated by process quality.

H5b: Process Quality mediates the relationship between Shirking and Digital Transformation in Ugandan TVETs

When shirking occurs, there will be lower attention to detail and a decreased focus on the complexity of given processes resulting into oversights and inaccuracies that adversely impact the quality and success of digital transformation (Rosse & Miller, 1984).

Further, poor process quality as a result of shirking by the agents may lead to increased costs of the project which ultimately leads to incomplete and poorly executed tasks that results into dissatisfaction of the principal and the customers who are the direct beneficiary of the digital transformation project (Marin-Garcia & Lloret, 2008; B. Wang et al., 2023).

H5c: Process Quality mediates the relationship between Communication and Digital Transformation in Ugandan TVETs;

Like in every organization, effective communication plays a significant role in strengthening and maintaining process quality by ensuring that instructions, guidelines and expectations related to each process leading to digital transformation projects in Ugandan TVETs are understood by both the principal and the agent (Kozhakhmetova et al., 2019).

Clear communication creates an environment where smooth coordination and collaboration thrives among the project team members. By so doing, with prompt and accurate communication, processes will be executed leading to improved success of digital transformation projects in Ugandan TVETs (Carvalho, 2014; L. H. Nguyen & Watanabe, 2017).

H5d: Process Quality mediates the relationship between Task Programmability and Digital Transformation in Ugandan TVETs

When task programmability is effectively implemented, process quality is enhanced by improving efficiency among team members, reducing of errors, enabling better resource allocation and compliance and standardization. In this case, task programmability helps to ensure that there is adherence to the set standards and compliance requirements (Grabner & Speckbacher, 2010).

Further, the tasks to be executed in the project are executed with a high degree of consistency since tasks are executed while following predefined instructions, rules and guidelines (Mahaney and Lederer, 2003). Variability, a human factor, is therefore greatly reduced which

in turn leads to more reliable outcomes for Process Quality and therefore digital transformation in Ugandan TVETs.

H6: Contract Type moderates the relationship between Process Quality and Digital Transformation in Ugandan TVETs

The agency problem and its associated risks may be mitigated by using outcome-based contracts (Gomez-Mejia & Balkin, 1992). As such, the following hypothesis is put forward.

According to Agency theory, outcome-based contracts curb the need to monitor project implementation teams' (agents) activities compared to when behaviour-based contracts are given between top management and the implementation team (Eisenhardt, 1989). When pay is tied to successful outcomes, it may become less necessary to closely monitor for process quality to achieve successful outcomes. In other words, it becomes necessary to monitor the work of the project implementation team more closely when the team (agent) receives a fixed salary or daily rate, without incentives for successful project completion. As such, we posit that Contract Type moderates the relationship between Process Quality and Digital Transformation in Ugandan TVETs (Eisenhardt, 1989).

H7: Process Quality positively affects Digital Transformation projects in Ugandan TVETs

Improved success of digital transformation projects depends on high process (Lappi, 2019; Vendraminelli et al., 2023) which ensures that the existing processes from the inception of the project to the end are well defined, streamlined and are efficient (Vendraminelli et al., 2023). When TVET institutions in Uganda embarked on digital transformation, they tended towards automating and digitizing their processes. Where the process quality is already high, the digital transformation effort is able to further optimize the processes (Marcellus & Dada, 1991).

The Users of the technology after digital transformation play a crucial role in digital transformation. Process quality acts as a foundation for improved success of digital transformation. It is necessary to note that lack of process quality could lead to inefficiencies or outright project failure (Dąbrowska et al., 2022).

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the research philosophy, research approach, research method and techniques used in the development of a framework for improved success of digital transformation projects in TVETs. The research methodology is the plan of action or strategy behind the choice and use of methods that lead to the desired research outcomes (Al-Ababneh, 2020).

According to Creswell, (2013), the proper research philosophy, approach, and the research methods guide the research process to all outcomes desired by the researcher. This chapter will therefore discuss the underpinning research philosophy for this study (Section 3.2), the approach (Section 3.3) and the methods employed in this study (Section 3.4). The empirical techniques applied in this research are explained in Sections 3.5 to 3.11. Figure 3.1 below outlines the elements of research methodology used in this study.

Elements of the Research Methodology used in this study

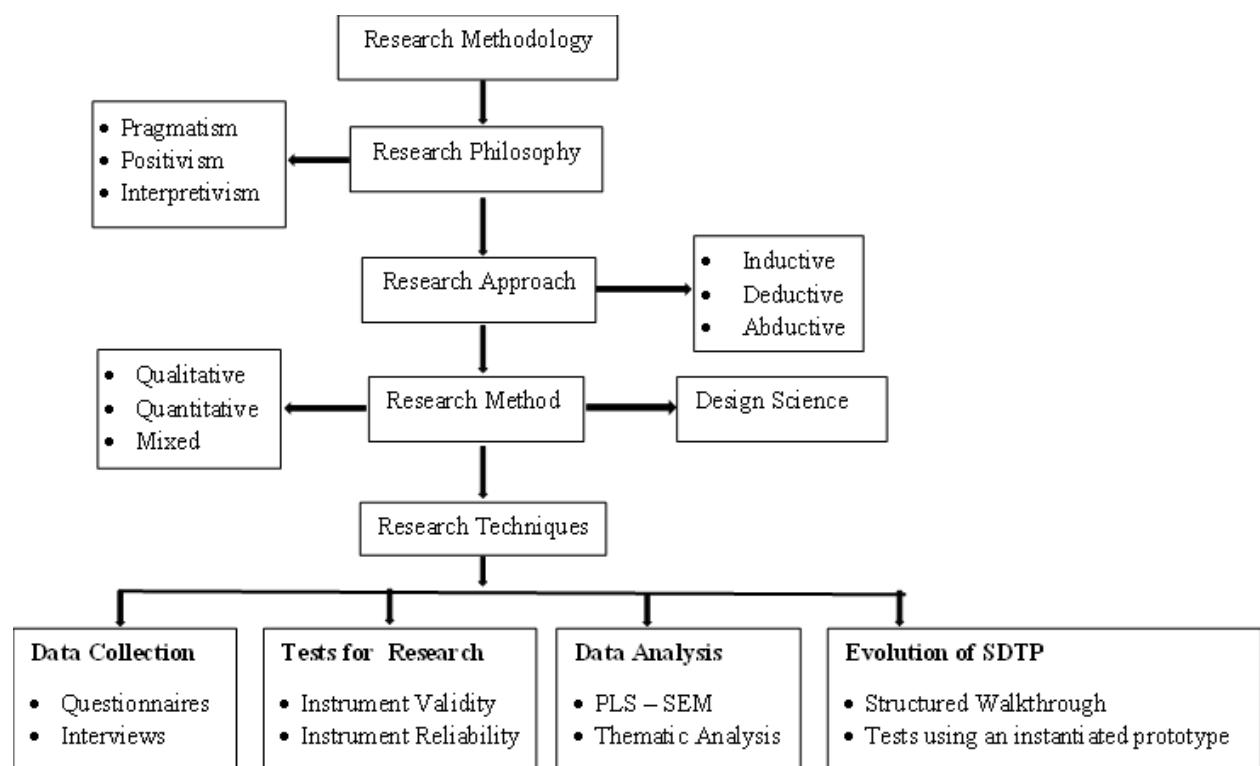


Figure 3.1: An outline of the Research Methodology used in this study

3.2 Research Philosophy

The term “common sense” refers to what one believes the world looks like from other people’s perspective. In reality though, one person’s common sense is not automatically the same as another’s common sense. There are divergent views of the world. There are also processes that operate within the world that form part of what this section explains as philosophy (Danson et al., 2018). An interesting analogy is the way different cultures see or view a grasshopper. In Uganda, a grasshopper is eaten as a snack; in Japan, a grasshopper is known as a pet for centuries. In the United Kingdom, some grasshoppers are viewed as common garden pests. This therefore means that the way one sees this insect varies greatly from one culture to another, one country to another and therefore the perception of what a grasshopper is will greatly depend on an individual’s view of the world, in this respect (Danson et al., 2018).

Research philosophy in this context, therefore, is a belief about how data about a given occurrence or phenomenon is to be collected, analysed or applied. The word Epistemology therefore, which refers to what is “known to be true” as opposed to what is “believed to be true” embraces philosophies of research. The word “doxology” is the term used to describe what is believed to be true. The aim of science, therefore, is to engage the transformative process from things “believed” to things “known”: doxa to episteme (Uusitalo, 2014).

There are three research philosophies commonly applied to tradition of science, specifically Pragmatism, Positivism and Interpretivist (Alharahsheh & Pius, 2020). Research Philosophy therefore refers to the combination of these three things: development of knowledge, source of knowledge, and the nature of knowledge (Saunders et al., 2019b).

3.2.1 Positivism

The belief that reality is stable and that it can be observed as a single objective truth is what is referred to as Positivism. Such people, “positivists” believe that there are universal truths that await to be discovered. Positivists postulate that occurrences or phenomena ought to be isolated and that for each observation made, a same observation is expected if the phenomena were to re-occur by manipulating reality by varying only a single variable so as to recognize and classify consistencies in relationships between elements of the world in view and to also form relationships between elements in the same social world (Danson et al., 2018; Uusitalo, 2014).

In other words, Positivist research is an attempt to increase the predictive understanding of occurrences through dependent and independent variables and the relationship between those variables (Popper, 1959; Straub et al., 2005).

3.2.2 Interpretivism

This is a philosophical assumption that argues that it is only through interpretation of reality and the intervention in reality, subjectively, that reality can be fully understood. Here, occurrences, in their natural environment is critical to the interpretivist philosophy. Moreover, it is understood and acknowledged that researchers cannot avoid having an effect on the occurrences (in their natural environment) that they study (Uusitalo, 2014).

Interpretivists concur that there could be several interpretations of reality but consistently postulate that these interpretations are, in themselves, a constituent part of the knowledge that they are pursuing while researching. It is believed that numeric measurement is not always desirable or possible and that words would bring out clearer meaning to unclear concepts or nuances more precisely (Danson et al., 2018; Uusitalo, 2014).

3.2.3 Pragmatism

Pragmatism is a philosophical paradigm that recognizes that there are several ways in which research may be carried out and many ways in which the world is interpreted. This research philosophical paradigm originated between the end of the 19th Century and the start of the 20th Century by William James, Charles Pierce and John Dewey who were philosophers (Saunders et al., 2019a). A pragmatist does not believe in a theory that exists. They do not even believe in ideas or rules because of the belief that truth holds only at a given moment in time (Creswell, 2013).

Pragmatism attempts to reconcile accurate and rigorous knowledge, objectivism and subjectivism, and different experiences in context. Pragmatists argue that there may be multiple realities and therefore it is acceptable and possible to work with different types of methods and knowledge while carrying out research (Kelemen & Rumens, 2008; Saunders et al., 2019a). Moreover, this philosophical paradigm guides the researcher to clearly distinguish between what is real and what is true thereby avoiding debates on concepts around reality and truth (Tashakkori et al., 1998).

In this study, a pragmatic approach was adopted because Pragmatism attempts to reconcile accurate and rigorous knowledge, objectivism and subjectivism, and different experiences in context. Pragmatists argue that there may be multiple realities and therefore it is acceptable and possible to work with different types of methods and knowledge while carrying out research.

3.2.4 Ontology, Axiology and Epistemology as Research Paradigms

Ontology is the *logos* or study of reality or being (Crotty, 2020). On the other hand, Epistemology pays attention to the forms and nature of knowledge and outlines assumptions about how knowledge may be acquired, created and made known to others (Cohen et al., 2009; Scotland, 2012).

Ontological assumptions ask the question “*What is...*”. Researchers are interested in establishing how things really are and how those things really work. These two paradigms are based on assumptions that can never empirically be proven or disproven. They therefore have differing ontological or epistemological views and assumptions of knowledge and reality that underpin their specific approach to research as will be seen reflected in the research methods (Scotland, 2012).

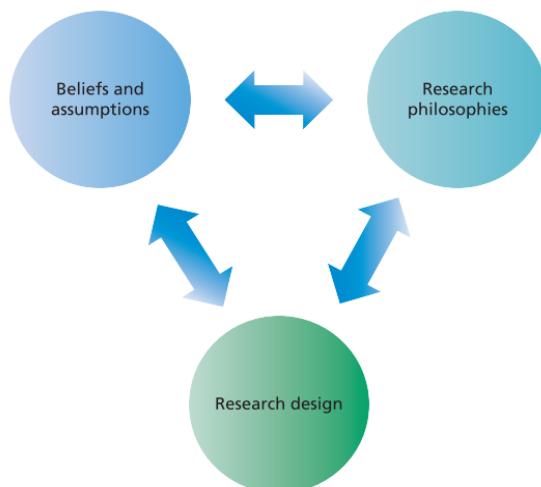


Figure 3.2: Research design, beliefs, assumptions and philosophies (Bristow & Saunders, 2008)

In contrast to the above, the extent and ways one's own values influence their research process is what is referred to as axiology. This research paradigm therefore assumes that the outcome and conclusion of any given research were a reflection of the researcher's values, even in the

researcher's findings. This study however embraced independence from the researcher's perspective with objectivity while examining variables that affect quality of processes to achieve digital transformation in TVET institutions in Uganda. The interrelationship between Research Design, Epistemology and Axiology are illustrated in figure 3.1. In light of the above, this study will analytically look into the involvement of IT management in Project Design and execution.

An analysis of CIO participation in contract formulation together with an analysis of the effect of shirking (the choice by a worker to do other tasks of more interest at the expense of the task for success of the project) was done. A critical examination of the relationship between the CIO and the CEO was carried out as well.

Further, an in-depth study of the effect of communication, task programmability and goal conflict were conducted. The data collected was subjected to both exploratory factor analysis and confirmation factor analysis. All these were done while applying a pragmatist epistemological approach with a view to predicting the realities in attaining improved success of digital transformation projects in Ugandan TVETs. These realities or variables were fused into a framework for improved digital transformation. These assumptions were made because known facts in IT governance and specifically digital transformation implementation comprise of independent and distinct facts (Nyeko, 2019).

3.2.5 Selected Research Philosophy

This study adopted Pragmatism as the underpinning philosophical paradigm. The reason for this is, in pragmatism as a research philosophy, the research question guides the pursuit for knowledge and its generation (Saunders et al., 2007).

Further, pragmatism is not devoted to a particular reality or research paradigm and the researcher in this study had the freedom to choose the methods, techniques or procedures that the researcher feels best met the research requirements and purpose rather than applying only one way for the outcome of this study (J. Creswell, 2012).

3.3 Research Approach to this study

The development of a Framework for improved success of digital transformation in this study was approached from two methods of reasoning or thinking. These approaches are deductive reasoning and inductive reasoning. This is so because this study combined both the deductive and inductive approaches (Trochim & Donnelly, 2006).

The first approach (deductive) has to do with qualitative research, where, for instance, a theory supporting successful project implementation is developed from a postulation.

The second approach (inductive) was done through quantitative research by observing an empirical reality through interviews and the administration of a questionnaire to selected respondents.

3.3.1 Deductive Reasoning as an approach

An argument whose conclusions follow logically are referred to as Deductive arguments. For instance; i) all comedians are hilarious; ii) Martin is a comedian; therefore, Martin is funny. The second half of Figure 3.2 further illustrates this approach to research.

Deductive research therefore is an investigation in which theory is tested by empirical observations (Aliyu et al., 2015). This kind of research approach is comparable to moving from general knowledge to particular knowledge and is concerned with first developing a hypothesis or several hypotheses based on existing theory. This leads to the design of a research strategy to test the hypothesis (Wilson, 2014). This study will use this approach because of the qualitative nature of the data that will be collected and analyzed.

3.3.2 Inductive Reasoning as an approach

On the other hand, an inductive argument is one whose conclusions follow probably. For example, 89% of comedians are hilarious. Since Martin is a Comedian, Martin is hilarious. The first half of figure 3.2 shows this approach to research.

In inductive research, a theory is established by observing a practical reality that form a pattern. These patterns then lead the researcher to form hypotheses which if confirmed, form a theory (Hussy & Hussy, 1997). An inductive approach to research will require the researcher to collect data then develop theory following data analysis (Wilson, 2014).

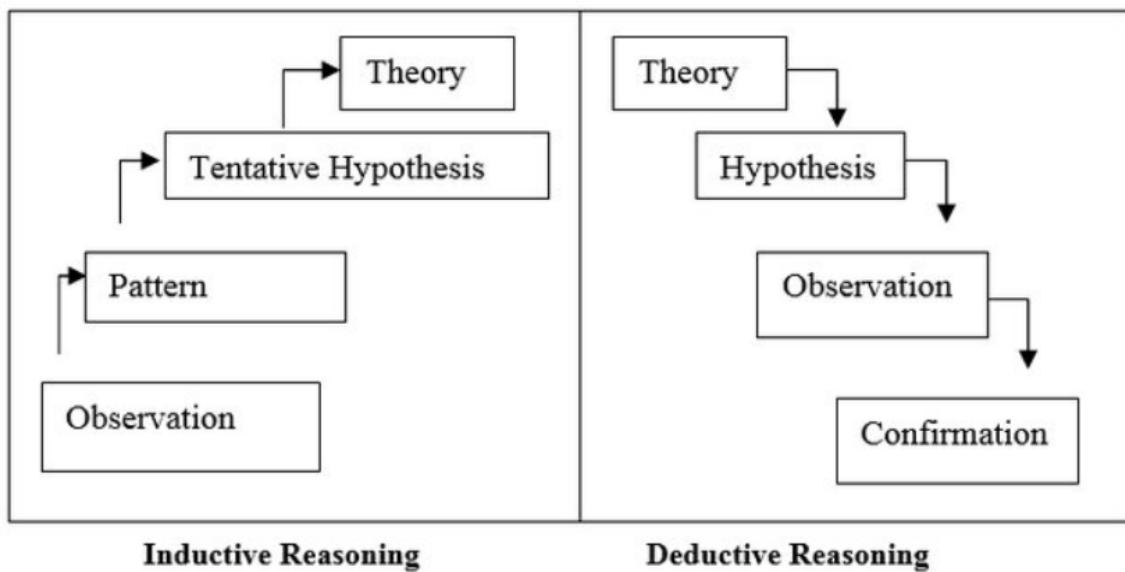


Figure 3.3: Inductive and Deductive Research Approaches (Trochim, 2006)

3.3.3 Abductive research approach

The abductive approach to research is the amalgamation of the deductive approach and the inductive approach to research (Saunders et al., 2019b). This amalgamation is justified by the fact that the inductive and deductive approaches have weaknesses by themselves alone (Dudovskiy, 2016).

The deductive reasoning is weak on clearly spelling out guidelines on theory selection and testing using a hypothesis or hypotheses. The inductive reasoning is weak on the aspect of generation of sufficient data to enable a researcher to build a theory (Dudovskiy, 2016). The abductive research is described as that research approach point “in between” deduction and induction that enables a researcher to explain and to describe innovation and creativity scientifically (Patokorpi & Ahvenainen, 2009).

In this study, hypotheses were developed from literature which lead to confirmation of some aspects of the initial conceptualization of the research model. This confirmation lead to the induction of general inferences which were further tested and treated statistically. The outcome of both the deductive approach and inductive approach to this study pointed this research towards reconciling accurate and rigorous knowledge, objectivism and subjectivism, and different experiences in the context of digital transformation (Trochim & Donnelly, 2006).

The researcher proposed to use this approach by collecting data from the selected Centres of Excellence in order to understand analyse the quantitative data with a view to understand why

digital transformation projects fail in Ugandan TVET institutions. Themes and patterns in the qualitative data collected were identified and explained to create and modify the existing theory which the researcher subsequently tested through triangulation of data from both the quantitative and qualitative data analysis (Saunders et al., 2019b).

3.3.4 Selected Research Approach

This study was grounded in the abductive approach to research. This approach combines aspects of both the deductive and inductive approaches to research. Further, the researcher collected exhaustive information that informed all the necessary requirements for the development a model from which a framework for improved success of digital transformation projects was developed (Saunders, 2007).

The deductive approach was used to test the hypotheses and to confirm validity of the framework following rigorous analysis of the quantitative data. The developed framework adapted concepts of both the DeLone & McLean theory together with the Agency theory.

The insights gained from the qualitative data collected during the field study were employed to guide adjustments to the conceptual framework, ensuring it was well-suited to develop a framework aimed at enhancing the success of digital transformation projects.

3.4 Research Methods

The strategy of enquiry in this field study relied on the underlying philosophical assumptions to research design and data collection (Myers, 1997; Di Napoli et al., 2023). This study adopted a Sequential Mixed Method approach because this method of research is increasingly being recognised as another major category of research methods (Johnson et al., 2007). Myers (1997) recognises that most researchers do either quantitative or qualitative research work. He further notes that some researchers have suggested combining one or more research methods in a single one study to achieve higher quality research outcomes. This study therefore adopted a sequential explanatory mixed method approach in order to reconcile accurate and rigorous knowledge, objectivism and subjectivism with a view to having a rich understanding of the factors that affect success of digital transformation projects. The next subsections will discuss the three research methods as they were applied to this field study.

3.4.1 Qualitative Research

Qualitative research, which underscores research studies in a natural environment (Yin, 2009) is helpful in analysing responses from interviews when interpreting the interview text by the researcher (Myers, 2019). Qualitative research helps to discover ideas from the participants in the field study in an unstructured free form. The qualitative research carried out was intimately conducted. The returned results collected were subjective. The participants were in small groups ranging from 6 to 11 people. The groups were small, taken from their natural setting which was the TVET institution.

The approach to qualitative research was through asking questions, recording the responses to the questions and observation every aspect of the respondent as they provided an answer to the question from the interview guide. Further, interpretation of gestures and any other behaviour was noted and captured in this thesis (Othman, 2011).

3.4.2 Quantitative Research

The quantitative field study involved data collection using questionnaires (Balnaves & Caputi, 2001). Here, hypotheses were tested and specific research questions were confirmed. The approach to quantitative research was to measure and test data that was collected through structured response categories provided in the questionnaire.

The researcher ensured that the participants were allowed enough time and room to provide their responses. The results were objective. Further, sample adequacy was achieved to produce generalizable results that apply to other situations of a similar nature as well (Othman, 2011).

3.4.3 Sequential Explanatory Mixed Methods Research

In the context of this study, the sequential explanatory mixed methods approach was adopted (Creswell & Clark, 2017), involving the systematic gathering and analysis of quantitative data followed by qualitative data (Rupani & Vyas, 2023). A series of critical determinations were made concerning the importance assigned to each phase of data collection and analysis, the order in which these phases unfolded, and the precise points within the research process where the merging of quantitative and qualitative data occurred. This strategic approach greatly enhanced the depth of understanding of the research topic, seamlessly blending numerical data with narrative insights (Rupani & Vyas, 2023). The decisions included data analysis procedures, sampling methodologies, the importance of data types, the sequencing of data collection, and the strategic timing of data integration. (Greene & Caracelli, 1997). The mixed methods research considered testing the consistency of findings obtained through a questionnaire as a research instrument with the aim of clarifying and building on the findings of the quantitative study findings with the qualitative research method. By doing this, the sequential explanatory mixed method approach showed how the results from both the quantitative and qualitative findings shaped and determined the subsequent research decisions (Wheeldon, 2010).

There are four major types of mixed methods designs that are in use. These are, the triangulation design, embedded design, the exploratory design and the sequential explanatory design (Creswell & Clark, 2017). This study deployed the triangulation design thereby focusing on finding solutions to increasing digital transformation project failure. It was interesting to note how the value of subjective perceptions, can be put to good use in finding solutions to real problems (Wheeldon, 2010).

3.4.5 Quantitative vs Qualitative Research

Philosophical assumptions when carrying out research, whether Quantitative or Qualitative were kept in view throughout this field study. These assumptions were discussed in subsection 3.2 in detail. The conducted qualitative research underscored the study in a natural environment which is the TVET Institution (Yin, 2009). The conducted qualitative research was helpful in

analyzing responses from interviews when interpreting the interview text extracted by transcribing recorded voices from a voice recorder (Myers, 2019).

The quantitative research on the other hand involved data collection using questionnaires (Balnaves & Caputi, 2001).

Table 3.1 shows the comparison between Qualitative and Quantitative Research in view of five aspects discussed therein.

Qualitative Research	Research Aspect	Quantitative Research
Discover Ideas, with General Research Objectives	COMMON PURPOSE	Test Hypotheses or Specific Research Questions
Observe and interpret	APPROACH	Measure and Test
Unstructured, Free Form	DATA COLLECTION	Structured Response Categories Provided
Research is intimately involved. Results are subjective	RESEARCHER INDEPENDENCE	Researcher uninvolved. Observer. Results are objective
Small samples – Often in Natural Setting	SAMPLES	Large samples to Produce Generalizable Results [Results that Apply to other Situations)

Table 3.1: The Comparison between Qualitative and Quantitative Research (Othman, 2011)

3.4.6 Adoption of Sequential Explanatory Mixed Methods

The sequential explanatory mixed methods approach was used because this study involved both designing and evaluating the framework for amplified Success of Digital Transformation Projects, (SDTP). In this study, qualitative data analysis techniques returned themes and patterns that were used in sequence to explain the results following the quantitative analysis.

The SDTP conceptual framework was tested after a detailed descriptive field study which was conducted using quantitative techniques. In this case, a questionnaire was administered. The questionnaire had questions formed from the relationships of the variables in the SDTP conceptual framework.

3.5 Research Methods used in Information Systems

According to (Boland Jr & Hirschheim, 1987) Information Systems being a multi-perspective study discipline, should have a pluralistic approach to information systems research. In

Information Systems research, one important reality is the need for a variety of approaches since no one approach can provide the richness that information systems, as a scholarly discipline, requires for further advancement (Kaplan & Duchon, 1988). The main methods used in this Information Systems research were the administration of a questionnaire and interviews through Focus Group Discussions (Saunders et al., 2019a).

3.5.1 Adoption of Design Science as the Research Method

Design science was adopted as a research methodology as the guiding approach to this research. The rationale for choosing design science as the research method is grounded in the objective of this study.

The General Objective of this study is to develop a framework for improved success of Digital Transformation Projects in the TVET subsector. Therefore, design science is a paradigm in which questions important to problems encountered in digital transformation are answered by a designer (of an artefact). These answers were acquired through the establishment of inventively designed framework that is both essential and useful in understanding the problems in digital transformation projects (Hevner & Chatterjee, 2021).

This study aimed at developing a framework which provides a supporting structure around which constructs constitute the building blocks of this solution (Hevner et al., 2004). The output in this study is a frame work to improve the success of digital transformation projects in Ugandan TVET institutions.

The following steps were taken systematically to accomplish this research: a) the researcher compared Design Science Research with other similar research methodologies to confirm design science as the most suitable method; b) elaboration on the philosophy of Design Science Research was done; c) a demonstration on how Design Science Research can be used to accomplish this study was done; and d) a deduction, conclusion and communication of the outcome of this research has been made and completed.

3.6 Design Science Research method

Design science research (DSR) is a problem-solving paradigm of three inter-related cycles of activities, namely: the relevance cycle, the rigour cycle, and the design cycle (Hevner, 2007), that seeks to enhance human knowledge through creating innovative artifacts (Vom Brocke et

al., 2020). As the figure below shows, the relevance cycle, which is the first cycle, consists of input requirements required to implement the design and to evaluate the research processes.

The second cycle is the relevance cycle that arises when a specific problem has been identified and prompts contextual requirements for the design of the artifact. It is in this cycle that evaluation of the framework was done to ensure its usefulness and effectiveness. It is in the relevance cycle that the requirements for improved success of digital transformation projects (SDTP) and the relevance of the artifact were evaluated.

The third cycle is the rigor cycle that the underpinning theories and methodologies that were applied and embraced in the design and evaluation process. This process led to the contribution of new knowledge. The rigour cycle in this study included the application of the Agency theory, the DeLone and McLean Theory and the Dynamic Capabilities Theory (W. DeLone & McLean, 2003; Mahaney & Lederer, 2003c; Takahashi et al., 2016b).

Further rigor in this cycle included extensive appreciation of existing frameworks for digital transformation project success (Mahaney & Lederer, 2003c; Moudoubah et al., 2021; Wulandari & Buliali, 2019) and the National IT Project Methodology (NITA-U, 2016). These models, theories, frameworks and methodology were elaborately discussed in detail in sections 2.4 which articulates Information Technology Models and Frameworks.

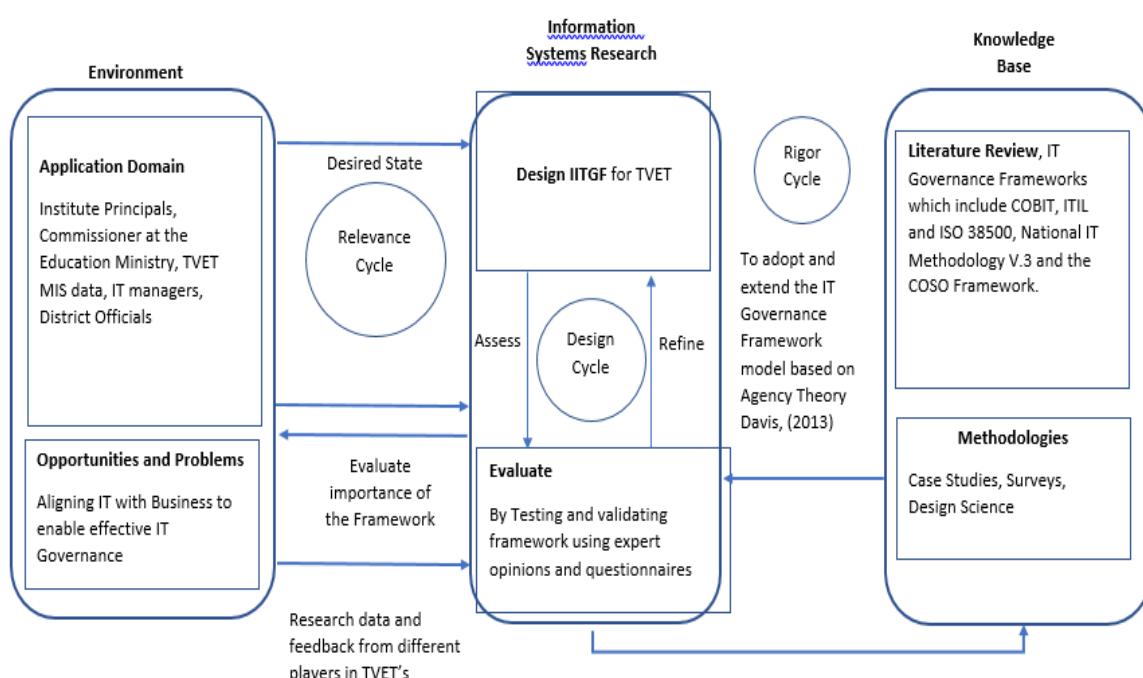


Figure 3.4: The Design science research framework adopted from (Hevner et al., 2003; Hevner et al.,2004)

In the context of this study, we see an instantiation of the three-cycle model of design science shown by the three sections in figure 3.3 above. The left compartment signifies the problem domain of the study. It is comprised of the individuals affected by the problem. The issue at hand is indicated here as well as the process of interest – improved success of digital transformation projects.

The middle section represents the two major phases in Information systems research. Design science in Information Systems focuses on two processes i.e., build and evaluate (Hevner et al.,2004). These two processes are essential for the design of the framework for improved success of digital transformation and the evaluation of the framework through the field study and structured walkthrough techniques.

The section on the right represents the knowledge base from which the study obtained its theoretical foundation, the concepts, and methodologies that were used to execute the Information Systems research processes to build and evaluate an artefact in design science. This study contributes to knowledge in the area of Information System Project research in Ugandan TVETs.

3.6.2 Guidelines for Conducting and Evaluating Design Science Research

In the field of Information System, the activities for a field study are described through a clear set of guidelines or principles that are laid down for conducting and evaluating well done design science research (Hevner & Chatterjee, 2010). A set of these guidelines are shown below to understand the requirements for effective design science research (Hevner et al. (2004). The guidelines used in this study are as follows: (i) Design an artefact, (ii) Problem relevance, (iii) design evaluation, (iv) Research contributions, (v) research Rigor, (vi) Design of the Framework and, (vii) Communication of the Research findings (Hevner et al., 2004). In this study the guidelines for design science research were adopted from start to finish, as shown below.

Table 3.2: Guidelines for conducting and evaluating design science research

Design Science Guideline	Guideline description	Guidelines for Instantiation of the artefact

#1 Design as an Artefact	A viable artefact in the form of a construct, a model, a method, or an instantiation must be produced in design science.	<ul style="list-style-type: none"> The SDTP framework was developed on the strength of existing theories, frameworks and methods.
#2 Problem relevance	The aim of design science research is to develop solutions to relevant business problems. These problems must be important with relevant, significant magnitude.	<ul style="list-style-type: none"> The objective of this study is to develop a framework for Digital Transformation in Technical, Vocational Education and Training Institutions in Uganda to support improved success through project implementation. The problem environment includes the regulatory bodies such as NITA, parents, students, project implementors, Information System experts and the business owners.
#3 Design evaluation	In design science research, a rigorous demonstration of the designed artefact must be demonstrated well through established evaluation methods to ensure process quality and efficiency.	<ul style="list-style-type: none"> SDTP was evaluated using structured walkthrough, expert evaluations and experiment techniques.

#4 Research contributions	In design science research, clear and verifiable contributions after the design of the artefact must be provided. This verification must be in the areas of the design artefact, design foundations, and/or design methodologies	<ul style="list-style-type: none"> • Development of the framework for SDTP • Methodological contribution accruing from the use of partial least squares (Smart-PLS) method of Structured Equation Modelling, NVIVO for qualitative data analysis to generate themes within the data, structured walkthrough, and prototyping the artefact.
#5 Research rigor	In design science research, the application of rigorous methods in both the construction and evaluation of the design artefact is relied upon.	<ul style="list-style-type: none"> • A conceptual framework for SDTP was designed based on existing theories and frameworks (W. DeLone & McLean, 2003; Mahaney & Lederer, 2003c; Takahashi et al., 2016b). • A field study was carried out to test the Conceptual framework for SDTP • Results of Structural equation modelling helped to refine the conceptual framework using Exploratory Factor Analysis then by

		Confirmatory Factor Analysis in order to derive the final framework.
#6 Design as a search process	Design science research demands utilizing available means to reach desired ends while complying with laws in the problem environment in the quest for an effective artefact	<ul style="list-style-type: none"> • A descriptive field study was conducted to test a conceptual framework for SDTP. • SDTP was evaluated using a structured walkthrough and expert analysis.
#7 Communication of research	Design science research must be reported and presented in such a way that both technology-oriented audiences and management-oriented audiences understand the content for this process to be complete.	<ul style="list-style-type: none"> • Seminars were conducted to communicate research findings. • The researcher published two journal articles and shared findings of this research with the TVET department at the Ministry of Education, which in turn shared the same findings with the Principals of the colleges where this research was conducted.

3.7 Mapping study activities to Design Science as a Search Process

In design science research, the seven guidelines shown in the table above were followed. Design Science research as a process was achieved by, 1) reviewing existing theories and methodologies, 2) designing and evaluating the artifact that solves the problem of increasing failure of digital transformation projects. For this study, a descriptive field study was conducted as described in subsection 3.7.1.

3.7.1 Field Study Research

The field research method used in this study aimed at accurately and systematically describing interactions between behavioral and environmental events (Bijou et al, (1968); Kpebo et al., 2022). This field survey employed both qualitative and quantitative research methods for data collection (Bijou et al., 1968; Saunders et al., 2019a). This field study was conducted using observations and administering questionnaires as survey techniques (Saunders et al., 2009). Specifically, survey research was done using techniques to collect data from the population and yet the anonymity of the respondents was maintained (Saunders et al., 2009).

Prior to conducting this field survey, clearance for research was obtained from the Research Ethics Committee. Specifically, the following was done: 1) confirming the sample size, 2) confirming the target audience, and 3) fine tuning the data collection instruments for both the quantitative and qualitative data collection. 4) pretesting the data collection tools by going through them with potential respondents to collect feedback on whether or not the questions in the tools were not ambiguous, unclear or difficult to answer.

a) Aim of Field Survey

The primary aim of the field survey was to explore the interactions among behavioral and environmental variables and assess their relationships within the conceptual framework designed for Successful Digital Transformation Projects (SDTP). This investigation focused on specific variables, namely goal conflict, contract type, communication, originally labeled as "privately held information", and task programmability. These variables were initially identified in the research conducted by Mahaney and Lederer in 2003. Additionally, this study introduced an innovative element, process quality, following an extensive literature review.

This research was undertaken following a thorough examination of established frameworks and models for gauging project success, ultimately leading to the formulation of the comprehensive conceptual framework detailed in Chapter 2. The survey also aimed to quantify the extent of relationships among these variables and their influence on the dependent variable, which, in this context, is digital transformation. To accomplish this, a statistical technique known as Factor Analysis was employed, yielding valuable insights into the intricate dynamics of digital transformation projects.

Further, the statistics from both the quantitative and qualitative data collection were analyzed using Structured Equation Modelling and Thematic analysis respectively, for drawing conclusions about digital transformation projects in Ugandan TVETs by examining both random samples and purposefully selected samples. The outcome of this survey research helped to validate most of the constructs of the conceptual framework for SDTP.

b) Target Respondents

The population targeted for this study included key players and stakeholders in TVET institutions. These included Principals of Technical Colleges, Digital Transformation project coordination staff, ICT staff at the TVET institutions, IT staff at the Ministry of Education Headquarters, TVET and Planning Commissioners, Administrators of technical colleges and institutions, and students in the TVET institutions who were also beneficiaries of the digital transformation efforts. The scope of this study spanned the four regions of Uganda. These regions are, Northern Region, Eastern Region, Western Region and the Central Region. There are 140 public TVET institutions, most of which have no infrastructure.

Government through a World Bank Project selected six (6) of these colleges to be Centres of Excellence (CoE). The remaining 134 public TVET institutions will continue to use the Centres of Excellence as their reference for digital transformation since digital transformation at the Centre's of Excellence is nearly complete. Each of these CoE's has three (3) Vocational Training Institutions (VTIs) attached to them. The field research had its focus on the CoE's only. The researcher therefore employed Critical Case Sampling as a type of Purposive or deliberate sampling. Here, cases that were most likely to give the most information about digital transformation were considered for study in this field survey research.

It was decided by Government that the Centres of Excellence (CoEs) would be the reference for the rest of the public and private TVET institutions in implementing digital transformation because funds were only allocated to the selected institutions (CoEs) for digital transformation (MoES, 2013; TheDailyMonitor, 2018).

The selected TVET institutions designated as Centres of Excellence according to the Uganda Ministry of Education are listed as follows: (i) Uganda Technical College, Elgon – Specializing in Building and Construction, (ii) Uganda Technical College Lira – Enrolls students in Roads and Construction, (iii) Uganda Technical College Bushenyi – Enrolls manufacturing students, (iv) Bukalasa Agricultural College – Specializes in Agriculture, (v) Kichwamba – Enrolls students for Construction, and (vi) Uganda Petroleum Institute Kigumba – Enrolls students in Oil and Gas.

c) Sampling Method

Purposive sampling was applied for the quantitative data collection while Random Sampling was the sampling method used in Focus group discussion for this study. As a recap, the government of Uganda, on the 9th February 2018, selected 12 vocational technical institutes in addition to the 6 Centres of Excellence (Technical Colleges) to benefit from digital transformation among other areas of improvement for service delivery. This was on the understanding that the Centres of Excellence would provide high quality, demand driven, employer led technical skills programmes for Uganda. This was announced at a signing ceremony of a Memorandum of Understanding between the Principals of the Vocational Technical Institutes (VTI's) and the Ministry of Education and Sports (TheNewVision, 2018).

The students who participated in this study were randomly sampled because the researcher needed to ensure that the results obtained from this sample approximates what could have been obtained if it was decided to measure the entire population (Morgan & Harmon, 2001). The participants in the Focus group discussion were purposively selected because they were most likely to give the most information about the digital transformation efforts in the various institutions.

d) Sample Data Analyses

This study used smart PLS to carry out structured equation modelling to analyze the collected data from the field. This choice was informed by the fact that this study was a survey and that

the research was predictive (Hair et al., 2021). This statistical methodology helps researchers to collect inferential statistics from a population while also relying on observations from a sample which is a smaller subset of the population (Helberg, 1996). The requirements of the data analysis technique that was deployed and used in this survey determined the selection of a given sample given the population for this study (Fowler, 2012).

In this survey research, lecturers, students and administrative staff were selected from the population at random, with each member of the population having the same chance of being selected (Helberg, 1996). When using structured equation modelling in this survey, there were four rules that guided this survey research on the sample size that was selected (Roscoe, 1975). Roscoe theorizes the ‘rule of thumb’ for determining sample size. These rules are follows, (i) Where there is absolute control over the behavior of the respondents, a sample size of 10 to 20 respondents is sufficient for experimental research; (ii) Where the sample must be split into smaller samples from the main sample, a minimum sample size of 30 for each category is appropriate; (iii) The sample size must be at least ten times the number of variables in a framework in multivariate analysis; (iv) A sample size n , that is between $n=70$ and $n=500$ is appropriate for most research. This Field Survey Research complied with these rules.

e) Questionnaire Design and Administration

In the preparation of this field study, the data collection instruments were designed, pretested and submitted for approval to the Mildmay Research Ethics Committee. It was critical to ensure that the of the data collection instrument was selected and designed correctly if the aim and objectives of the research was to be realized. (Zikmund, 2003). The design of the instrument took into account construct validity so that participants during the survey answered each research question in a precise way.

Further, the designed instrument also ensured construct reliability, so that there was a definite way of measuring the findings as a possible outcome (Sekaran, 2003). The field survey followed the guidance by Mahaney and Lederer, (2003) to design a suitable research tool for both the qualitative and quantitative data collection. Special emphasis was made on the general appearance of the tool, determining the 5-point Likert scale and determining the appropriate wording to achieve both reliability and validity of the research instruments.

In this survey, the Agency theory was the underlying theory that guided that development of the questions asked in the data collection tools for both the qualitative and quantitative research questions.

Further, the literature about the different frameworks used to govern digital transformation was also used to develop the questionnaire. This questionnaire was developed based on a five-point Likert scale design. Each of the questions in the questionnaire were arranged based on the constructs discussed in chapter 2 in the conceptual framework for improved success of digital transformation projects in TVETs. Both self-administered questionnaires and focus group discussions as data collection methods were used in this study.

A total of 177 participants responded. After the data cleanup exercise, only 100 questionnaires were found to be complete and fit for analysis of the data. This could be attributed to the possibility that some of the new students did not have sufficient knowledge about the ongoing and recently concluded projects at the time of this field survey research.

According to Zikmund, (2003), when conducting survey research with (i) coverage over a fairly large population, (ii) collecting data in a way that is convenient to respondents, and (iii) when trying to fit within limited resources, a self-administrated questionnaires that is printed on paper or one that is sent by email to the respondents is suggested to be a good approach (Zikmund (2003). This field survey complied with these guidelines.

f) Testing of the Research Tools

After developing the research tools for this study, the next stage was to refine each question within the research survey instrument to fit the context of TVET institutions in Uganda. According to Zikmund, (2003) it was necessary to pretest the research tools before collecting primary data from the CoEs.

The pretesting was carried out by peers at the University and by possible respondents of these questions at the Ssese farm Institute in Kalangala. This helped to ensure that the reliability and the validity of the data collection tools was upheld. Pre-testing the data collection instrument helped to eliminate possible weaknesses, omissions and defects in the research tools (Martelli & Greener, 2018). The flaws discovered were rectified by verifying the wording in each question, checking the question sequence, checking the question lay out, and establishing how easily the respondents would appreciate each question. The response rate, completion time of

the questionnaire, and the time it took to analyze the research tool was observed before administering the research instrument.

According to Perneger et al., (2015), when pretesting a study questionnaire, the participants in such a test should range between 8 to 30 respondents based on the index of ambiguity or other difficulties a participant may encounter with the research tool. In this Field study, the research tools were pretested on 11 participants since it was unlikely that the participants, who are literate and educated would misunderstand the questions in the questionnaire. Improvements to the questionnaire were made following the comments and suggestions received from the participants after the pre-testing exercise.

The tools for both qualitative and quantitative data collection were thereafter administered from Institute to institute after confirming that the questions in the survey tools were clearly understood at the first institute where this research begun at Ssese Farm Institute in Kalangala.

3.8 Reliability and Validity of Data Collection Instruments

As already mentioned, before carrying out the descriptive field study, both data collection instruments for the Focus Group Discussions and the questionnaire for quantitative data were tested for reliability and validity with a view to ensure that the quality of data collected is satisfactory. Tests were conducted for each tool. The two sub-sections (3.8.1 and 3.8.2) below present the details of how validity and reliability.

3.8.1 Validity of Data Collection Tools

A validity test refers to the extent to which a research tool measures what it intends to measure (Taherdoost, 2016). Validity explain how well the research tool will collect data to cover the true area of investigation in a research study. Taherdoost, (2016) further categorizes validity into four primary categories, namely: (i) content validity, (ii) face validity, (iii) criterion validity and (iv) construct validity. This descriptive study only tested the tools for content validity and construct validity. Content validity is the extent to which a research data collection tool measures a specific construct in a framework (Straub & Gefen, 2004).

11 respondents assessed the questionnaire used in this study through a pre-test session. This was with a view to identify vague constructs and make appropriate adjustments to ensure that appropriate data is collected to answer the research questions.

On the other hand, construct validity was done to ensure that the questionnaire measures the particular cause and effect behaviours involved in a relationship between, concepts, ideas or behaviours into operating reality (Taherdoost, 2016). Construct validity was analysed by determining both discriminant and convergent validity. While establishing convergent validity analysis, the extent to which two different indicators of a latent variable (a variable that cannot be observed) confirm one another was established (Hamann et al., 2015). Here the researcher kept in mind the fact that dimensions are understood to be specific aspects of a construct while indicators are a set of dimensions. The established discriminant validity compared the squared correlation between the two constructs with the variance extracted between these constructs.

The squared correlations R^2 and the Average Variance Extracted (AVE) was used to test for convergent validity. The assessment of a conceptual framework from which a research tool was derived was a prerequisite for conducting any further analysis in this study, with a view to establish the fact that the components of the framework were expected to be homogenous and yet distinct from each other (Hilkenmeier et al., 2020).

3.8.2 Reliability Analysis

Reliability was measured in this study to show the consistency of results from the questionnaire that was administered (Nofrida et al., 2022). The investigator through this study was aware that the administration of a reliable data collection instrument does not guarantee the validity of the same instrument. This explains why it was necessary to conduct both validity and reliability tests of the questionnaire (Nofrida et al., 2022) by applying the Cronbach's Alpha test.

3.9 Data Analysis and Interpretation of Results

In this section, we present the data analysis methods or procedures used in the descriptive field study, and the evaluation of the SDTP framework. This study applied both an analysis of themes for the qualitative analysis of the transcribed data and Structured Equation Modelling (SEM) techniques for data that was quantitative in nature, using the Partial Least Squares as the approach. Both analyses are explained in the next subsections 3.9.1 and 3.9.2.

3.9.1 Thematic Analysis

Thematic Analysis is a widely used qualitative analytic method (Boyatzis, 1998) or group of methods used to identify patterns of meaning through qualitative data sets (Braun et al., 2023). Thematic Analysis was applied in this field survey because it is widely used in studies across

the scholarly spectrum by researchers after conducting stakeholder interviews and focus group discussions (Maguire & Delahunt, 2017; Squires, 2023).

Braun and Clarke (2006) proposed a six-step process of carrying out thematic analysis. This process was adopted in this research while analysing the qualitative data that was collected during focus group discussions. The steps that were followed are as follows: 1) Getting familiar with the data; 2) codes from the data are generated; 3) Themes across the spectrum of the data are searched for; 4) The Themes are then reviewed; 5) At this point the themes are defined; 6) The Themes are named. This is the last step. A report on all the six steps above was produced.

In keeping with these six steps, qualitative data were collected using interview guides and audio recorders. The interviews were transcribed and captured into NVivo software for qualitative data analysis. Transcripts were coded and analyzed. Tables with codes were extracted to show how respondents presented the issues when asked about the digital transformation projects implemented in their respective colleges/VTIs.

The main themes for analysis were the variables of the study which included Goal conflict, communication, Shirking, Task programmability, Process quality, Contract type and Digital transformation. The themes were reviewed and defined. The interview findings were reported based on the generated themes as discussed in section 4.2.

3.9.2 Structured Equation Modelling

Structured Equation Modelling (SEM) is a Statistical Analysis tool commonly used to investigate various types of hypotheses (Jobst et al., 2021). The primary goal of SEM is to model a relationship between latent constructs and manifest indicator variables. This is achieved by merging factor analytic techniques and path analytic techniques. SEM therefore was adopted in this study to investigate and test hypotheses formulated from the conceptual framework.

Confirmatory factor analysis (CFA) is the method used to model multiple indicator measurement data. CFA is reported to have many statistical advantages over traditional exploratory factor analysis (Steenkamp & Maydeu-Olivares, 2023). This is so because growing evidence in various studies indicates that the recommended cutoff values for common

model fit indices are poor for traditional factor analysis which is not suitable for use in an exploratory factor analysis (Montoya & Edwards, 2020).

As such, Steenkamp and Maydeu-Olivares, (2023) have introduced a third approach which has emerged as the “unrestricted” factor analysis (UFA) which borrows strengths from both Confirmatory Factor Analysis and Exploratory Factor Analysis. The duo in their article argue that ignoring cross loadings as low as 0.2 could substantially bias factor correlations when Confirmatory factor analysis is used.

Steenkamp and Maydeu-Olivares also demonstrated that a root mean square error of approximation RMSEA of less than or equal to 0.05 may be too lenient to guard against bias in factor correlations that are non-negligible (Steenkamp & Maydeu-Olivares, 2023). In spite of this “new” realization, the results in this study were analyzed using Exploratory factor analysis early in the analysis process since this is a widely used and broadly applied statistical approach in information systems research (Balicki et al., 2020).

EFA was used to reduce a large number of variables (factors) into a smaller number of factors by establishing underlying dimensions between measured variables and latent constructs thereby allowing refinement of theory (Balicki et al., 2020).

Confirmatory Factory analysis follows Exploratory Factor Analysis which provides a framework or model that realizes the anticipated level of explanation or prediction because the number of factors is always less than the factors that were measured during the analysis (Moore, 2012).

3.9.2.1 Partial Least Squares (PLS-SEM) vs Co-variance Based (CB- SEM)

Structured equation modelling (SEM), may be approached using the partial least square (PLS-SEM) approach and co-variance-based approach (CB-SEM). The co-variance-based approach would be the selection of choice if the aim of this study was to confirm a theory. Moreover, the co-variance-based approach to structured equation modelling is only applied to normally distributed data. On the other hand, partial least squares (PLS-SEM) iss used by researchers mainly for theory development and prediction (Hair et al., 2011; Hair et al., 2021).

3.9.2.2 Adoption of the Structured Equation Modelling

In this survey, the researcher adopted PLS-SEM because of the rules of thumb for selecting PLS-SEM over CB-SEM which are; (i) This study was an extension of a structural theory that already exists; (ii) The sample size is moderate and not greater than 200; (iii) this study used latent variable scores in subsequent analyses; (iv) the structural conceptual model had many constructs and many indicators and yet the aim of this study was to predict key target constructs and to identify the “driver” constructs following the analysis; (v) the small data sets had skewed data and yet this study aim was to produce accurate results (Hair et al., 2011). It is clear from the above criteria that PLS-SEM was a more suitable approach to structured equation modelling since the main objective was to ultimately design and evaluate the framework for improved success of digital transformation projects in TVETs in Uganda.

3.10 Framework Development

According to Hevner et al, (2004), a framework can be developed using a case study, a field experiment, a lab experiments, action research or design science research methods. In this study, the design science research method was adopted to develop SDTP. Design science was selected because it provides a conceptual framework for conducting research. Design science also allows for flexibility in data collection and framework evaluation (Hevner et al., 2004).

Design science was therefore adopted as the research method in this study by extending the Agency theory framework (Mahaney & Lederer, 2003a), by merging aspects of the DeLone and McLean framework (DeLone & McLean, 1992), and the dynamic capabilities theory (Teece et al., 1997). The conceptual framework for improved success of digital transformation projects (SDTP) was tested during the field survey in order to derive the current structure of the SDTP framework presented in chapter 5.

3.11 Methods for Framework Validation

In this study, a framework was developed using both derived and adopted variables. A vivid description of the framework and its application was presented. The researcher validated the framework against two parameters. These are: 1) applicability in information systems projects practice and 2) conformity to Information Systems design and principles and Information

Systems reliability, compatibility, re-usability, sustainability and simplicity as posited by March and Smith (1995). The findings during the framework validation helped to achieve the third objective of this study which is addressed by the third research question; *RQ3: To what extent does the framework for improved success of digital transformation projects address increasing failure of digital transformation projects?* A quantitative research approach was adopted and was used to validate this framework. This involved collection of quantitative data that was subjected to rigorous quantitative analysis (Kramer & Yeh, 2023). It is argued that quantitative research enables researchers to answer scholarly and pragmatic questions about digital transformation in firms and the application of artifacts in Information Systems studies (Bansal et al., 2023; Di Vaio et al., 2023). Validity tests were done on the validation questionnaire to ensure that it measured IS design parameters (Barclay & Osei-Bryson, 2010) and that the questionnaire was consistent and reliable. The findings of the validation of this study are explained in the chapters ahead.

CHAPTER FOUR: FOCUS GROUP DISCUSSIONS

4.1 Introduction

In this chapter, we engage in a rigorous analysis of the qualitative data collected through interviews, illuminating the deep dynamics of ICT projects implemented in various colleges and TVETs. The data were acquired using structured interview guides and audio recording devices, subsequently transcribed for thorough scrutiny. This invaluable dataset underwent systematic processing within NVivo software, facilitating a comprehensive qualitative data analysis.

Throughout this analysis, we will navigate the diverse insights gleaned from respondents, addressing the pertinent issues surrounding ICT project implementation within their respective institutions. These insights have been meticulously categorized, with a particular focus on the study's core variables: Goal conflict, communication, shirking, task programmability, process quality, contract type, and digital transformation.

This chapter aims to provide a thorough understanding of the qualitative complexities underpinning the domain of ICT project implementation. It sheds light on the factors that influence project success, employing a rigorous approach, and furnishing valuable insights into the study's variables.

4.2 Goal Conflict

Table 4.1: Goal conflict

REF NO.	COVERAGE	CONTENT
1	0.54%	When we wrote our proposal, I remember we were rubbished, that we are meant to be in Agriculture. Whenever we asked for something, we were reminded that we are meant to be in Agriculture. That's why we concentrated much on Agriculture
2	0.88%	We were not actually clearly informed about what we were entitled to. For example, the building was told that it was going to be put up, and whatever is needed is going to be put there. We were only surprised at the end when we were told that the laptops you requested for the six are here. Yet at first, we were told that Bukalasa you're going to get 200 computers, they are coming
3	0.58%	They promised cameras but only very few were installed. For example, there is no CCTV camera facing the server room. They also promised us a server but we didn't get it. They had also promised us screens, white boards which can work with the projector.
H 4	0.58%	How can you really put up such a structure and you bring six (6) laptops? These people didn't ask us, for us we were here and these people brought them. We received some machines. It's true but for us we never submitted our request. We saw them coming

5	0.30%	Some of the machines are still in the box and not yet installed. So, they are not in use for now. The processes were not so clear
6	0.48%	When you talk of the initial stages which we were not involved in, I cannot say that it was successful. In fact, from planning, we were supposed to receive a computer lab which was scrapped off the plan after
7	0.91%	Some of the equipment, such as computers, were still in store and had never been used since they were not installed. Therefore, it is not possible to determine the effectiveness of the implementation. However, some instructors indicated some level of success due to the use of laptops by almost all instructors, and access to the internet, as well as the ICT training they got from the project
8	0.41%	The ICT infrastructure for digital transformation was not successful at UTC Rwentanga since there was no connectivity given. Without connectivity, the project was not functional.
9	0.53%	The institution was promised a well-equipped computer lab with screens, smart boards, and computers, but only six computers were delivered. Therefore, the project was not successful since the promised equipment was not delivered.

10	1.21%	In the first proposal we had put a number of computers, but then we were told there is no money to buy all these computers. I don't even know how these six computers were decided. I don't think it was us. Only at a later stage to hear, this is the number of equipment you're going to get. They gave us a printer which I thought was a photocopier. I tried to configure it but I have still failed to configure it. It is asking for some app". "The only time I saw the people from the implementation team was during inspection
11	0.69%	At the beginning the monitoring was done well. The specifications were written down by the twinning partner with ICT background. But now even some computers have not been installed so we cannot know whether the real specifications were brought. So, we can't know whether computers can run programs
12	0.38%	We were not actually involved in the process. We just got to know when NITA was here with the machines. We were not involved in the requirements specification process
13	0.21%	We had contractors come onboard and teams from the ministry could come and verify the work
14	0.28%	However, from the principal, the ICT expert/instructor in the institution has a background in Agriculture but not in ICT

15	0.33%	However, some of the machines which were given to us were not installed. It was the institution to put in money to install them, like the server
16	1.76%	To me, the politicians also did their part. They actually played their role. They mobilized the community but also supported us. Because there was a time the community was becoming un-supportive. They were accusing us of chasing them out of their land. If the political wing was also weak, they were going to come back to fight, but they had to inform them of the purpose of development in Bukalasa Agricultural Institute. During COVID time, there were lots of restrictions. If the political leaders were not part of us, maybe some of the workers here would have faced a lot of challenges. The workers felt safe and also the politicians would be able to communicate to the rest of the world. Otherwise, it would have been different if they were not part of us”
17	0.43%	I may not comment too much on politics, as I said we could come once, sometimes voluntarily you come to see what is going on. So, we didn't get to know too much about what was going on.
18	0.70%	It was our lack to be chosen among the beneficiaries. There was no politics. If politicians were there, they would have rectified that error of giving us a library without equipment because when politicians make noise, people respect them. When there is power obviously, the degree of success has to rise

19	-	0.49%	I will agree that of course there is some power dynamics and politics which influenced the success of the project to like 70%. So, to some extent that hierarchy of power played a role in the success of this project
20			
21		1.76%	The challenge we have is that our ration of computers to students is still low. We have more students than computers. So, what we have received is like breakfast to us, we need the lunch itself. We need more computers. Besides that, we expected infrastructure to house the computers but due to COVID the computer house found itself out of scope on the structures we expected. We identified where we could put these computers and that's why we succeeded and we also had to find a way of re-wiring that house to fit the presence of computers. Another challenge is the network, we need a big improvement in the network. NITA came here promising us that they would extend an optical fiber but it's now many years down the road. Since 2019, they have never come back

The results in table 4.1 show that respondents raised 21 issues concerning Goal conflict on ICT projects implemented in TVET institutions. Out of the 21, 4 were leaning towards politics where by ICT project implementation was affected by political issues. For example, a respondent from Bukalasa Technical College indicated thus

“To me, the politicians also did their part. They actually played their role. They mobilized the community but also supported us. Because there was a time the community was becoming unsupportive. They were accusing us of chasing them out of their land. If the political wing was also weak, they were going to come back to fight, but they had to inform them of the purpose of development in Bukalasa Agricultural Institute. During COVID

time, there were lots of restrictions. If the political leaders were not part of us, maybe some of the workers here would have faced a lot of challenges. The workers felt safe and also the politicians would be able to communicate to the rest of the world. Otherwise, it would have been different if they were not part of us”

The respondents also raised four issues to do with power and influence in the implementation of ICT projects in TVETs. For example,

“I will agree that of course there is some power dynamics and politics which influenced the success of the project to like 70%. So, to some extent that hierarchy of power played a role in the success of this project”

And respondent indicated thus;

“We were not actually clearly informed about what we were entitled to. For example, the building was told that it was going to be put up, and whatever is needed is going to be put there. We were only surprised at the end when we were told that the laptops you requested for the six are here. Yet at first, we were told that Bukalasa you’re going to get 200 computers, they are coming”

Perhaps the most issues raised under goal conflict concerned policy. The respondents indicated that policy mismatches created challenges in the implementation process. This is probably because most policies made at the Ministry may not be well articulated to the TVET institutions and the Project Coordination Team. For example, a respondent at the Bukalasa Agricultural college, a beneficiary of this digital transformation undertaking, indicated thus;

“When we wrote our proposal, I remember we were rubbished, that we are meant to be in Agriculture. Whenever we asked for something, we were reminded that we are meant to be in Agriculture. That’s why we concentrated much on Agriculture”

Another respondent was not happy with the manner in which infrastructure projects were implemented. There were cases where very few computers were delivered compared to what was needed. For example,

“How can you really put up such a structure and you bring six (6) laptops? These people didn’t ask us, for us we were here and these people brought them. We received some machines. It’s true but for us we never submitted our request. We saw them coming”

And

“When you talk of the initial stages which we were not involved in, I cannot say that it was successful. In Fact, from planning, we were supposed to receive a computer lab which was scrapped off the plan after”

Further, it appeared as though there was no planning and policy guiding project implementation in TVETs as seen years later here;

“Some of the machines are still in the box and not yet installed. So, they are not in use for now. The processes were not so clear”

4.3 Shirking

Table 4.2: Shirking

REF NO.	COVERAGE	CONTENT
1	0.54%	When we wrote our proposal, I remember we were rubbished, that we are meant to be in Agriculture. Whenever we asked for something, we were reminded that we are meant to be in Agriculture. That's why we concentrated much on Agriculture
2	0.91%	Some of the equipment, such as computers, were still in store and had never been used since they were not installed. Therefore, it is not possible to determine the effectiveness of the implementation. However, some instructors indicated some level of success due to the use of laptops by almost all instructors, and access to the internet, as well as the ICT training they got from the project

Shirking had only two references in the data and both were leaning towards the construct Counterproductive multitasking whereby respondents indicated that;

“When we wrote our proposal, I remember we were rubbished, that we are meant to be in Agriculture. Whenever we asked for something, we were reminded that we are meant to be in Agriculture. That's why we concentrated much on Agriculture”

And also, that

“Some of the equipment, such as computers, were still in store and had never been used since they were not installed. Therefore, it is not possible to determine the effectiveness of the implementation. However, some instructors indicated some level

of success due to the use of laptops by almost all instructors, and access to the internet, as well as the ICT training they got from the project”

4.4 Communication

Table 4.3: Communication

REF NO.	COVERAGE	CONTENT
1	0.30%	Some of the machines are still in the box and not yet installed. So, they are not in use for now. The processes were not so clear
2	0.48%	When you talk of the initial stages which we were not involved in, I cannot say that it was successful. In Fact, from planning, we were supposed to receive a computer lab which was scrapped off the plan after
3	1.25%	We had a committee which wrote the specifications but the ICT sector was not fully involved, I think that is the source as to why the equipment is not well received in the process. But at first, we expected to have improved classroom environments. It was in fact to transform Bukalasa from having classrooms to theatre rooms where we are having digitized tools. The library was to be transformed from textbooks only to textbooks and E-Resource center and also lectures were to have equipment to use. The Internet was also promised but 0%.”

4	0.33%	However, some of the machines which were given to us were not installed. It was the institution to put in money to install them, like the server
5	0.05%	I didn't get any report
6	0.05%	There were no reports
7	0.75%	In terms of challenges, In ICT we never had a lot of challenges. Most of the things were brought in time. Even the computers were brought at the time when the construction was ongoing. It's the internet connection that took long and we had to write to the ministry, to write to NITA. So, we would report through the principal
8	0.63%	What we always did is that whenever challenges were reported during the implementation, first of all during site meetings, we shared those issues out, then on top of that, we made written communications to the project coordination unit. So, communication wasn't a challenge
9	0.45%	Just like in any organization, if there is no proper communication, no good interaction, the project cannot move on. I think the relationship has been good, that's why we have been able to succeed.

10	0.64%	What we always do, they always bring to the attention of the principal the gaps which are there. Not only the person in charge of ICT but also the deputy principal in charge of academics. The instructors report to us the challenges faced in using ICT, the ICT person has an input.
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In terms of communication, the responses were split equally between the constructs of Under reporting and Information Asymmetry. For under reporting it was established that most college principals never received any reports on project implementation. For example, a Principal for one of the colleges indicated thus; “I didn’t get any report”. This was the same across the other TVETs as another respondent indicated that “There were no reports”.

In terms of Information Asymmetry, five responses were registered indicating that;

“We had a committee which wrote the specifications but the ICT sector was not fully involved, I think that is the source as to why the equipment is not well received in the process. But at first, we expected to have improved classroom environments. It was in fact to transform Bukalasa from having classrooms to theatre rooms where we are having digitized tools. The library was to be transformed from textbooks only to textbooks and E-Resource center and also lectures were to have equipment to use. The Internet was also promised but 0%.”

Another respondent said thus;

“What we always did is that whenever challenges were reported during the implementation, first of all during site meetings, we shared those issues out, then on top of that, we made written communications to the project coordination unit. So, communication wasn’t a challenge”

And also, that;

“Just like in any organization, if there is no proper communication, no good interaction, the project cannot move on. I think the relationship has been good, that’s why we have been able to succeed”

And

“What we always do, they always bring to the attention of the principal the gaps which are there. Not only the person in charge of ICT but also the deputy principal in charge of academics. The instructors report to us the challenges faced in using ICT, the ICT person has an input”

4.5 Task Programmability

Table 4.4: Task programmability

REF NO.	COVERAGE	CONTENT
1	0.88%	We were not actually clearly informed about what we were entitled to. For example, the building was told that it was going to be put up, and whatever is needed is going to be put there. We were only surprised at the end when we were told that the laptops you requested for the six are here. Yet at first, we were told that Bukalasa you're going to get 200 computers, they are coming
2	0.58%	They promised cameras but only very few were installed. For example, there is no CCTV camera facing the server room. They also promised us a server but we didn't get it. They had also promised us screens, white boards which can work with the projector.
3	0.57%	We cannot count the full success of the project not until other components are also done. For example, the infrastructure which we were supposed to have some of these facilities, are they really completed? Infrastructures like networking, cabling.
4	0.57%	It's very difficult for us to assess the success or failure of a Digital transformation project. Even at the moment as I talk, there are some computers which are still in store, and not installed. And the project has closed, so it's not successful

5	0.30%	Some of the machines are still in the box and not yet installed. So, they are not in use for now. The processes were not so clear
6	0.48%	When you talk of the initial stages which we were not involved in, I cannot say that it was successful. In Fact, from planning, we were supposed to receive a computer lab which was scrapped off the plan after
7	0.91%	Some of the equipment, such as computers, were still in store and had never been used since they were not installed. Therefore, it is not possible to determine the effectiveness of the implementation. However, some instructors indicated some level of success due to the use of laptops by almost all instructors, and access to the internet, as well as the ICT training they got from the project
8	0.53%	The institution was promised a well-equipped computer lab with screens, smart boards, and computers, but only six computers were delivered. Therefore, the project was not successful since the promised equipment was not delivered.
9	0.67%	In addition to that he had servers kept under his table and not installed yet during the interview with him he didn't mention about that. He reported that everything was fully installed with processes well monitored. This brought some doubt whether the success being reported is indeed there.

10	1.21%	In the first proposal we had put a number of computers, but then we were told there is no money to buy all these computers. I don't even know how these six computers were decided. I don't think it was us. Only at a later stage to hear, this is the number of equipment you're going to get. They gave us a printer which I thought was a photocopier. I tried to configure it but I have still failed to configure it. It is asking for some app". "The only time I saw the people from the implementation team was during inspection
11	0.33%	However, some of the machines which were given to us were not installed. It was the institution to put in money to install them, like the server
12	0.25%	Yeah, the implementation team were dedicated, because they were always doing what was required and on time

Task Programmability had two constructs, however, the construct of Defined processes registered only one response in which it was indicated that

"Yeah, the implementation team were dedicated, because they were always doing what was required and on time"

On the other hand, 11 responses were registered for Execution Methodology. The respondents indicated that the methods of project implementation were not clear. For example;

"We were not actually clearly informed about what we were entitled to. For example, the building was told that it was going to be put up, and whatever is needed is going to be put there. We were only surprised at the end when we were told that the laptops you requested for the six are here. Yet at first, we were told that Bukalasa you're going to get 200 computers, they are coming"

4.6 Contract type

Table 4.5: Contract type

REF NO.	COVERAGE	CONTENT
1	0.54%	When we wrote our proposal, I remember we were rubbish, that we are meant to be in Agriculture. Whenever we asked for something, we were reminded that we are meant to be in Agriculture. That's why we concentrated much on Agriculture
2	0.88%	We were not actually clearly informed about what we were entitled to. For example, the building was told that it was going to be put up, and whatever is needed is going to be put there. We were only surprised at the end when we were told that the laptops you requested for the six are here. Yet at first, we were told that Bukalasa you're going to get 200 computers, they are coming
3	0.58%	They promised cameras but only very few were installed. For example, there is no CCTV camera facing the server room. They also promised us a server but we didn't get it. They had also promised us screens, white boards which can work with the projector.
4	0.58%	How can you really put up such a structure and you bring six (6) laptops? These people didn't ask us, for us we were here and these people brought them. We received some machines. It's true but for us we never submitted our request. We saw them coming

5	0.91%	Some of the equipment, such as computers, were still in store and had never been used since they were not installed. Therefore, it is not possible to determine the effectiveness of the implementation. However, some instructors indicated some level of success due to the use of laptops by almost all instructors, and access to the internet, as well as the ICT training they got from the project
6	0.53%	The institution was promised a well-equipped computer lab with screens, smart boards, and computers, but only six computers were delivered. Therefore, the project was not successful since the promised equipment was not delivered.
7	0.67%	In addition to that he had servers kept under his table and not installed yet during the interview with him he didn't mention about that. He reported that everything was fully installed with processes well monitored. This brought some doubt whether the success being reported is indeed there.
8	1.21%	In the first proposal we had put a number of computers, but then we were told there is no money to buy all these computers. I don't even know how these six computers were decided. I don't think it was us. Only at a later stage to hear, this is the number of equipment you're going to get. They gave us a printer which I thought was a photocopier. I tried to configure it but I have still failed to configure it. It is asking for some app". "The only time I saw the people from the implementation team was during inspection

All the eight responses on Contract type indicated that contracts were Behavior Oriented contracts. No contract was found to be Outcome oriented. Contracts were behavior oriented in the sense that little documentation of the targets, and expected outcomes of the contract. There were no terms of reference during project implementation. For example, a respondent said thus;

“When we wrote our proposal, I remember we were rubbished, that we are meant to be in Agriculture. Whenever we asked for something, we were reminded that we are meant to be in Agriculture. That’s why we concentrated much on Agriculture”

Another respondent reported as follows;

“We were not actually clearly informed about what we were entitled to. For example, the building was told that it was going to be put up, and whatever is needed is going to be put there. We were only surprised at the end when we were told that the laptops you requested for the six are here. Yet at first, we were told that Bukalasa you’re going to get 200 computers, they are coming”

So many commitments and promises seemed to have been made by word of mouth and these were not fulfilled. For example, a respondent reported thus;

“They promised cameras but only very few were installed. For example, there is no CCTV camera facing the server room. They also promised us a server but we didn’t get it. They had also promised us screens, white boards which can work with the projector.”

And

“The institution was promised a well-equipped computer lab with screens, smart boards, and computers, but only six computers were delivered. Therefore, the project was not successful since the promised equipment was not delivered.”

This helps to explain why most equipment had not been delivered as expected by the institutions. In some cases, the equipment was delivered but had never been installed even after project closure! To this effect, a respondent reported thus;

“Some of the equipment, such as computers, were still in store and had never been used since they were not installed. Therefore, it is not possible to determine the effectiveness of the implementation. However, some instructors indicated some level of success due to the use of laptops by almost all instructors, and access to the internet, as well as the ICT training they got from the project”

4.7 Process Quality

Table 4.6: Process quality

REF NO.	COVERAGE	CONTENT
1	0.67%	<p>In addition to that he had servers kept under his table and not installed yet during the interview with him he didn't mention about that. He reported that everything was fully installed with processes well monitored. This brought some doubt whether the success being reported is indeed there.</p>
2	1.25%	<p>We had a committee which wrote the specifications but the ICT sector was not fully involved, I think that is the source as to why the equipment is not well received in the process. But at first, we expected to have improved classroom environments. It was in fact to transform Bukalasa from having classrooms to theatre rooms where we are having digitized tools. The library was to be transformed from textbooks only to textbooks and E-Resource center and also lectures were to have equipment to use. The Internet was also promised but 0%."</p>
3	0.52%	<p>We had a supervisor that is Estate officer of the college, who was the one supervising the processes. But could not fully look down on the processes. The estate officer was the one managing the processes on all the projects</p>

4	1.21%	In the first proposal we had put a number of computers, but then we were told there is no money to buy all these computers. I don't even know how these six computers were decided. I don't think it was us. Only at a later stage to hear, this is the number of equipment you're going to get. They gave us a printer which I thought was a photocopier. I tried to configure it but I have still failed to configure it. It is asking for some app". "The only time I saw the people from the implementation team was during inspection
5	0.69%	At the beginning the monitoring was done well. The specifications were written down by the twinning partner with ICT background. But now even some computers have not been installed so we cannot know whether the real specifications were brought. So, we can't know whether computers can run programs
6 - 8	0.17%	There was no serious monitoring and supervision by the implementation team
9 - 11	0.75%	There was no serious monitoring of the project, and the machines were left in boxes. We had to make a follow up for the machines to be installed. The training which was given to us on how to use the equipment was insufficient. Our principal was the overall supervisor of the equipment, yet decision-making was done from above

12 - 13	0.38%	We were not actually involved in the process. We just got to know when NITA was here with the machines. We were not involved in the requirements specification process
14	0.98%	there was always a monitoring team which did the inspection to see that everything was okay. Even when the items have been delivered, the team inspected to check and see whether what has been brought is exactly what was in the specification. So, the monitoring was done to ensure that what was delivered was actually what was planned. And also, there was always a team from the ministry which would come and do the monitoring
15 - 16	0.21%	We had contractors come onboard and teams from the ministry could come and verify the work
17	1.18%	We had our interest, but there was also technical input of the people from the ministry. Of Course, they knew it better than us. We told them what we wanted. The monitoring was okay because almost every week or after fortnight, different people would come to see the equipment that had been delivered, the installation. Not only from the ministry of education, also from other government agencies. So, in terms of monitoring, it was excellent. From our institution, the person who gave input was an ICT instructor
18	0.28%	However, from the principal, the ICT expert/instructor in the institution has a background in Agriculture but not in ICT

19	0.54%	There was limited monitoring. The monitoring was done at the end of the process during commissioning of the machines. The one who received the machines was the store manager. He is the one who had received a schedule for receiving them
20 - 21	0.45%	We had people from the institute side, then from the board we had the vice chairperson who were checking the processes. For our case all what was indicated were brought. There was nothing left out
22 - 23	0.17%	The project implementation team was dedicated at the beginning and the end
24	0.25%	Yeah, the implementation team were dedicated, because they were always doing what was required and on time
25	0.96%	The relationship is good. The only challenge I always see is filling appraisals where we have an area of weakness that we have to build on, but we never see any chances of filling the weaknesses. For example, I can say that I am lacking experience in website maintenance. Next year I will write the same thing, nothing is done. But at an internal level, there is no challenge. There is a professional relationship.
26	0.42%	Yes, the two are in a good relationship. Obviously if the relationship between them is bad, it's very hard to register success. The two must closely work together to achieve success

27	1.51%	The relationship should be a healthy one. But sometimes issues we could have with the CEO are when it comes to finances, especially if the college is supposed to do procurement internally. Sometimes you can quote something which is of high quality but the principal could know that quality matters a lot. They could be thinking of having let's say 60 computers but not minding about the quality. Because when the specifications are high, computers will become expensive. So, it should be a healthy relationship in a way that we should be able to listen to one another and they should also accept that we being technical in this our advice matters a lot”
28	0.40%	The ICT acts as a technical advisor to the principal. To achieve success, the two must be working together. Otherwise if they are, the CEO might not fully fund the department
29	0.45%	Just like in any organization, if there is no proper communication, no good interaction, the project cannot move on. I think the relationship has been good, that's why we have been able to succeed
30 - 31	0.64%	What we always do, they always bring to the attention of the principal the gaps which are there. Not only the person in charge of ICT but also the deputy principal in charge of academics. The instructors report to us the challenges faced in using ICT, the ICT person has an input

32	0.36%	It is necessary. Because in case something goes wrong in the lab and you don't communicate with your boss., if you're not close then it will become a problem
33	0.78%	When the relationship is bad, it has to affect the success. But the good thing, the relationship is a formal relationship. So what matters is building a system, when you build a system that works, whoever comes fits into the system, so that you don't look at an individual. So that somebody knows what to do and what he is supposed to do

Process quality had been conceptualized with three constructs namely; Monitoring, CIO-CEO relationships and Top Management Participation. Most of the responses (12 each) were recorded on Monitoring and CIO-CEO relationships constructs. Top management participation recorded 9 responses. Clearly, the monitoring of the process was happening. What appears as suspect in this all is the quality of the process for the monitoring exercises.

A few respondents indicated that monitoring was done well, for example,

“There was always a monitoring team which did the inspection to see that everything was okay. Even when the items have been delivered, the team inspected to check and see whether what has been brought is exactly what was in the specification. So, the monitoring was done to ensure that what was delivered was actually what was planned. And also, there was always a team from the ministry which would come and do the monitoring”

And also, that;

“We had our interest, but there was also technical input of the people from the ministry. Of Course, they knew it better than us. We told them what we wanted. The monitoring was okay because

almost every week or after fortnight, different people would come to see the equipment that had been delivered, the installation. Not only from the ministry of education, also from other government agencies. So, in terms of monitoring, it was excellent. From our institution, the person who gave input was an ICT instructor.”

However, most respondents indicated limited monitoring of items delivered compared to what was planned. For example;

“At the beginning the monitoring was done well. The specifications were written down by the twinning partner with ICT background. But now even some computers have not been installed so we cannot know whether the real specifications were brought. So, we can’t know whether computers can run programs”

There were also issues with having junior staff take charge of the projects monitoring activity. The lead to improper implementation. A respondent gave the following concerning monitoring:

“We had a supervisor that is Estate officer of the college, who was the one supervising the processes. But could not fully look down on the processes. The estate officer was the one managing the processes on all the projects”

In some cases, there was no serious monitoring and supervision by the implementation team as indicated below:

“There was no serious monitoring of the project, and the machines were left in boxes. We had to make a follow up for the machines to be installed. The training which was given to us on how to use the equipment was insufficient.”

In some cases, monitoring only came in towards the end of project implementation. For example, a respondent indicated thus;

“There was limited monitoring. The monitoring was done at the end of the process during commissioning of the machines. The one who received the machines was the store manager. He is the one who had received a schedule for receiving them”

In terms of Top Management Participation, most college Principals were involved in the project, though not at policy level. They came in during implementation. A respondent indicates thus;

“Our principal was the overall supervisor of the equipment, yet decision-making was done from above”

In some cases, management of colleges didn't know about the project as seen below;

“We were not actually involved in the process. We just got to know when NITA was here with the machines. We were not involved in the requirements specification process”

In terms of CIO/CEO relationship, it was found that the project teams had a good a relationship as seen below;

“The relationship is good. The only challenge I always see is filling appraisals where we have an area of weakness that we have to build on, but we never see any chances of filling the weaknesses. For example, I can say that I am lacking experience in website maintenance. Next year I will write the same thing, nothing is done. But at an internal level, there is no challenge. There is a professional relationship.”

They further, underlined the importance of maintaining a good relationship between CIO and CEO for project success as seen below;

“Yes, the two are in a good relationship. Obviously if the relationship between them is bad, it's very hard to register success. The two must closely work together to achieve success”

And

“The relationship should be a healthy one. But sometimes issues we could have with the CEO are when it comes to finances, especially if the college is supposed to do procurement internally. Sometimes you can quote something which is of high quality but the principal could know that quality matters a lot. They could be thinking of having let’s say 60 computers but not minding about the quality. Because when the specifications are high, computers will become expensive. So, it should be a healthy relationship in a way that we should be able to listen to one another and they should also accept that we being technical in this our advice matters a lot”

And also, that;

“The ICT acts as a technical advisor to the principal. To achieve success, the two must be working together. Otherwise, if they are not, the CEO might not fully fund the department”

4.8 Digital Transformation

Table 4.7: Digital transformation

REF NO.	COVERAGE	CONTENT
1	0.15%	There was some training which was conducted. People were trained
2	0.43%	The implementation of the ICT infrastructure for digital transformation at UTC Ssese was a success. Students have gained more skills, and their computer skills have improved significantly
3 - 4	0.53%	We can now use computing in agriculture. We can use computers to keep records, write reports, and make presentations. We can keep data about the animals, including their number and species and we are now able to carry out research
5 - 6	1.08%	In terms of ICT, we have been successful in that we received at least 51 computers, some photocopiers, and switches which have been installed. This has gone ahead to help us especially in reducing our cost during examinations. We even used to go outside to hire facilities, I believe this is a positive look on the college where we no longer go outside to hire machines. So, I believe the equipment is installed, is in good conditions so that is successful enough to us

7 - 8	0.76%	<p>Somehow, I can say it has done us good. Because we are now able to give instructions using these computers. We used to get challenges during examinations. Now a student just goes and sits on a computer and registers him/herself for the UBTEB with the help of the instructor. The institution has really benefited from the project</p>
9 - 10	1.10%	<p>Before we received this equipment, we really used to struggle so much with ICT. When it comes to examinations, sometimes it goes up to 1pm or even past. We had a limited number of computers which kept breaking every time. It had made life really hard. But after receiving the equipment, at least we can work up to 2 or 3 shifts. And the type of teaching now changed with the projector making things easy, so the teachers were also able to teach better using these equipment</p>
11	0.41%	<p>the ICT infrastructure for digital transformation was not successful at UTC Rwentanga since there was no connectivity given. Without connectivity, the project was not functional.</p>
12	0.85%	<p>The institution did not specify the number of equipment required, and the implementation team dictated the numbers. However, the project had a positive impact on the institution. The registration process is now faster, and students can register themselves on the computers. Additionally, the students can access notes using the internet, which was not possible before.</p>

13	0.21%	The project was well implemented, and the institution now has better facilities and internet
14 - 15	0.88%	exams now take less time, and instructors can use computers during lectures instead of using chalkboards. However, from what we observed, instructors were still using the old-fashioned book reading to dictate notes, Machines were in store and not in use, and 98% of the students didn't even know whether they had an email or not with some not even knowing the meaning of an email.
16	0.15%	The project has had a positive impact on both staff and students.
17	0.75%	In terms of challenges, In ICT we never had a lot of challenges. Most of the things were brought in time. Even the computers were brought at the time when the construction was ongoing. It's the internet connection that took long and we had to write to the ministry, to write to NITA. So, we would report through the principal
18	0.47%	Staff members use computers, projectors, and interactive whiteboards to deliver lectures and presentations in classrooms. They also use online tools to share course materials and communicate with students

19	0.51%	Students use computers, laptops, to access digital learning materials such as e-books, videos, and online courses. They also use online tools to collaborate with peers, submit assignments, and communicate with instructors
20	0.48%	Both staff and students use ICT equipment to search for and access academic resources such as online journals, databases, and repositories. They also use software tools for data analysis, and report writing
21	0.42%	Staff members use ICT equipment for various administrative tasks such as maintaining student records, managing finances, and communicating with other staff members and stakeholders.

Digital transformation was conceptualized with two constructs namely IT asset use and User satisfaction. IT asset use received 10 responses while User satisfaction received 11. In terms of assets use, respondents were able to use the equipment in various ways. For example, in an agriculture college, the assets were used for agricultural purposes as seen below;

“We can now use computing in agriculture. We can use computers to keep records, write reports, and make presentations. We can keep data about the animals, including their number and species and we are now able to carry out research”

In other colleges ICT assets were reported as used for teaching, conducting exams and doing office work as seen below;

”In terms of ICT, we have been successful in that we received at least 51 computers, some photocopiers, and switches which have

been installed. This has gone ahead to help us especially in reducing our cost during examinations. We even used to go outside to hire facilities, I believe this is a positive look on the college where we no longer go outside to hire machines.”

”Now a student just goes and sits on a computer and registers him/herself for the UBTEB with the help of the instructor. The institution has really benefited from the project”

”Staff members use computers, projectors, and interactive whiteboards to deliver lectures and presentations in classrooms. They also use online tools to share course materials and communicate with students”

”Students use computers, laptops, to access digital learning materials such as e-books, videos, and online courses. They also use online tools to collaborate with peers, submit assignments, and communicate with instructors”

”Both staff and students use ICT equipment to search for and access academic resources such as online journals, databases, and repositories. They also use software tools for data analysis, and report writing”

”Staff members use ICT equipment for various administrative tasks such as maintaining student records, managing finances, and communicating with other staff members and stakeholders.

”

In terms of user satisfaction, it was very evident that users were satisfied by the projects, even when some assets of the project not been fully implemented. This could be explained by the fact that the institutions hardly had any ICT equipment. As the saying goes, “A drowning man will clutch a straw”, meaning that when you have no digital equipment to improve work, anything that comes

to you shall be greatly welcome and received well. For example, the following statements were collected;

"Before we received this equipment, we really used to struggle so much with ICT. When it comes to examinations, sometimes it goes up to 1pm or even past. We had a limited number of computers which kept breaking every time. It had made life really hard. But after receiving the equipment, at least we can work up to 2 or 3 shifts. And the type of teaching now changed with the projector making things easy, so the teachers were also able to teach better using these equipment"

"exams now take less time, and instructors can use computers during lectures instead of using chalkboards. However, from what we observed, instructors were still using the old-fashioned book reading to dictate notes, Machines were in store and not in use, and 98% of the students didn't even know whether they had an email or not with some not even knowing the meaning of an email. "

"Somehow I can say it has done us good. Because we are now able to give instructions using these computers. We used to get challenges during examinations. Now a student just goes and sits on a computer and registers him/herself for the UBTEB with the help of the instructor. The institution has really benefited from the project"

There is absolutely no doubt that the digital transformation effort has yielded significant gains. What remains to be seen is the impact of the enforcement of process quality, task programmability, better communication and ensuring the same goal for both the principal and the agent during the implementation of digital transformation undertakings.

4.9 Challenges

Table 4.8: Challenges

REF NO.	COVERAGE	CONTENT
1	0.70%	<p>Our biggest challenge and one of the reasons I think as to why we have been moving forward and backward on this ICT, one even the capacity to design the infrastructure is lacking. Because we've tried with our ICT expert here but he was also showing that he is lacking something, so you can't rely on him</p>
2	1.76%	<p>The challenge we have is that our ration of computers to students is still low. We have more students than computers. So, what we have received is like breakfast to us, we need the lunch itself. We need more computers. Besides that, we expected infrastructure to house the computers but due to COVID the computer house found itself out of scope on the structures we expected. We identified where we could put these computers and that's why we succeeded and we also had to find a way of re-wiring that house to fit the presence of computers. Another challenge is the network, we need a big improvement in the network. NITA came here promising us that they would extend an optical fiber but it's now many years down the road. Since 2019, they have never come back</p>
3	0.73%	<p>Majority of the teachers find it hard to come up with what is needed in ICT, especially with the older teachers but for the young ones it is easier. Also, we don't have technicians to maintain our ICT, and the people who are teaching our students are ordinarily instructors. They can do so much, but they are limited</p>

The respondents reported some challenges during project implementation as presented below.

"Our biggest challenge and one of the reasons I think as to why we have been moving backward and forward on this ICT, one even the capacity to design the infrastructure is lacking. Because we've tried with our ICT expert here but he was also showing that he is lacking something, so you can't rely on him"

"The challenge we have is that our ration of computers to students is still low. We have more students than computers. So, what we have received is like breakfast to us, we need the lunch itself. We need more computers. Besides that, we expected infrastructure to house the computers but due to COVID the computer house found itself out of scope on the structures we expected. We identified where we could put these computers and that's why we succeeded and we also had to find a way of re-wiring that house to fit the presence of computers. Another challenge is the network, we need a big improvement in the network. NITA came here promising us that they would extend an optical fiber but it's now many years down the road. Since 2019, they have never come back"

"Majority of the teachers find it hard to come up with what is needed in ICT, especially with the older teachers but for the young ones it is easier. Also, we don't have technicians to maintain our ICT, and the people who are teaching our students are ordinally instructors. They can do so much, but they are limited"

4.10 Proposals for improved digital transformation

Table 4.9: Proposals for improved digital transformation

REF NO.	COVERAGE	CONTENT
1	1.02%	<p>I would propose that when the project is coming, they should involve the stakeholders, not only the administration stakeholders, for example at the college they should come one day and meet the students, staff members, so that they can first tell their expectations from the project. Secondly, they need to do serious monitoring at every stage and try to involve technical officers both at the ministry and at the site for example ICT officer</p>
2	1.12%	<p>There is need to improve training and strengthen monitoring. The implementation process had an issue where we were not even supposed to question the supplier because the supplier said who are we to question the supplier yet I am the user who must know what I should get. There is a need for involvement of all the stakeholders. The ministry's participation should be at an advisory level. There is not serious supervision at every level. Full involvement of the ICT staff all through</p>
3	0.70%	<p>There is need for improvement in a number of things. One, there is a need for a full-time lab technician. So even at the college level we need full time system administrators. There is also a need for continuous training, because technology keeps changing so that people can fully utilize the equipment</p>

4	0.68%	There is need to involve users even at the planning stage such that by the time this equipment are supposed to be supplied, they already have a projection of how many are expected to be supplied. There is also a need for a monitoring plan to see that these computers are still working very well
5	0.28%	They need to move on with the same infrastructure but to provide a better network. Having an independent component of ICT
6	0.66%	The advice I can give is in terms of numbers because we were very happy we received the ICT equipment but the number is not enough. The number of students keeps increasing. My advice to the government is to increase the number of ICT equipment, but also to improve on other facilities
7	0.28%	There should be serious involvement of end users in everything. There should be technical people to monitor the processes

The respondents when asked for areas for improvement for improved success of digital transformation in future projects, provided the following proposals;

"I would propose that when the project is coming, they should involve the stakeholders, not only the administration stakeholders, for example at the college they should come one day and meet the students, staff members, so that they can first tell their expectations from the project. Secondly, they need to do serious monitoring at every stage and try to involve technical

officers both at the ministry and at the site for example ICT officer”

“There is need to improve training and strengthen monitoring. The implementation process had an issue where we were not even supposed to question the supplier because the supplier said who are we to question the supplier yet I am the user who must know what I should get. There is a need for involvement of all the stakeholders. The ministry’s participation should be at an advisory level. There is not serious supervision at every level. Full involvement of the ICT staff all through”

“There is need for improvement in a number of things. One, there is a need for a full-time lab technician. So even at the college level we need full time system administrators. There is also a need for continuous training, because technology keeps changing so that people can fully utilize the equipment”

“There is need to involve users even at the planning stage such that by the time this equipment are supposed to be supplied, they already have a projection of how many are expected to be supplied. There is also a need for a monitoring plan to see that these computers are still working very well”

“They need to move on with the same infrastructure but to provide a better network. Having an independent component of ICT”

“The advice I can give is in terms of numbers because we were very happy we received the ICT equipment but the number is not enough. The number of students keeps increasing. My advice to the government is to increase the number of ICT equipment, but also to improve on other facilities”

“There should be serious involvement of end users in everything. There should be technical people to monitor the processes”

CHAPTER FIVE: SURVEY FINDINGS

5.1 Introduction

The main study objective of this study was to investigate the influence of Goal conflict, shirking, Communication, Task Programmability, Process Quality and Contract Type on Digital Transformation in Ugandan TVET Institutions.

This chapter presents the findings from the field study to answer the first six specific objectives. These are, to examine the extent to which Goal Conflict and Process Quality influence Digital Transformation in Ugandan TVET Institutions; to study the effect of Shirking and Process Quality on Digital Transformation in Ugandan TVET Institutions; to explore the relationship between Communication, Process Quality and Digital Transformation in Ugandan TVET Institutions; to study the relationship between task programmability, Process Quality and digital transformation in Ugandan TVET Institutions; to investigate the mediation effect of Process Quality in the relationship between goal conflict, shirking, communication, Task Programmability and Digital Transformation in Ugandan TVET Institutions; and to study the moderation effect of Contract Type in the relationship between Process Quality and Digital Transformation in Ugandan TVET Institutions.

The methodology to achieve these specific objectives was outlined in chapter three. This chapter presents the results for this under the following sub sections.

Section 5.1.1 presents an analysis of the management of missing data within the dataset, Section 5.2 presents the Participant Demographic Characteristics of this study, Section 5.3 presents the Model Assessment and Exploratory Factor Analysis for each variable using PLS-SEM, Section 5.4 presents the results of both Exploratory and Confirmatory Factor Analysis to cater for validity and reliability of the measures of the variables of this study. Section 5.5 presents the Qualitative Analysis of the data collected in this study. Section 5.6 present a summary of this chapter. This chapter presents the answer to specific objectives one to six of this study.

In chapter 2, a conceptual framework for success of Digital Transformation projects (SDTP) was developed. Chapter three explained the methodology for developing this framework. Chapter four presented the findings collected from participants in the various focus group discussions to test each variable in the conceptual framework. This was done to establish the

extent of success from the projects that had been done in each of these Centres of Excellence as described earlier. This Chapter presents the findings of the field study research that was carried out to test the conceptual framework for success of digital transformation projects.

In this chapter, qualitative data was captured and analysed using partial least squares (PLS) regression as a method specifically to reduce variables in this research that were used to predict success for digital transformation projects. Further, PLS was used to a smaller set of predictors. The overall objective of this field study was to validate the variables of the conceptual framework for SDTP.

5.1.1 Missing Value Analysis

This section focuses on the management of missing data within the dataset analysed in this study. This analysis took into account both quantitative and qualitative perspectives. It provides an overview of the extent of missing data, outlines the methods employed for handling these gaps, and discusses the insights gained from qualitative analysis regarding the missing data. This report provides a comprehensive overview of the absence of data within our dataset, focusing on both quantitative and qualitative aspects. It outlines the extent of absent data, the methods employed for managing and imputing these gaps, the results of Little's MCAR test, and the impact of absent data on our analysis. Additionally, it addressed the qualitative insights related to absent data and the decision to exclude the "Shirking" construct from the framework supporting digital transformation.

5.1.1.1 Extent of Absent Data

Within our dataset, varying degrees of absent data were encountered across different constructs and variables. It's important to note that the qualitative survey was not designed to investigate the causes of absent data but rather to support and validate our quantitative findings. Despite the rigorous data entry procedures, instances of absent data occasionally occurred when respondents skipped or omitted certain items for various reasons.

A summary of key statistics before imputation related to absent data is as shown in Table 5.1.

Table 5.1: Little's MCAR Test results before imputation

Variable	Chi-Square	DF	Sig.	Assessment
Goal Conflict	452.916	394,	0.210	Likely MCAR, no systematic pattern
Shirking	146.281	107	0.074	Possible MCAR, warrants further investigation
Communication	149.427	174	0.911	Likely MCAR, no systematic pattern
Task Programming	16.257	12	0.180	Likely MCAR, no systematic pattern
Contract Type	107.067	95	0.187	Likely MCAR, no systematic pattern
Process Quality	59.9	66	0.668	Likely MCAR, no systematic pattern
Digital Transformation	41.882	35	0.197	Likely MCAR, no systematic pattern

Based on the results and assessment, the missing values for constructs in Table 5.1 are likely Missing Completely at Random (MCAR). However, for the "Shirking" construct, while the p-value (sig) of 0.074 is not highly significant, it is still below the common significance level of 0.05. This suggests that there may be some evidence to indicate that the missing values for "Shirking" are not entirely at random and could potentially be related to observed variables or data patterns.

5.1.1.2 Treatment of "Shirking"

The MCAR analysis of the "Shirking" construct in this research, as indicated in Table 5.1, yielded a significance level of 0.074, implying the potential existence of systematic patterns in the missing data. Surprisingly, despite having returned a negative beta value, the "Shirking" construct emerged as a significant element within the digital transformation framework. Its statistical significance in the Confirmatory Factor Analysis suggested that it contributed significantly to our understanding of digital transformation, even though it was associated with a negative beta value. Given the intricate nature of the "Shirking" construct, further research is needed to further explain its complex role within digital transformation frameworks.

5.1.1.3 Imputation Strategy

To address the issue of absent data effectively, imputation methods were implemented. The choice of imputation strategy was influenced by various factors, including the MCAR (Missing Completely at Random) assumption (Hair et al., 2010).

The MCAR assumption suggested that the missing values were observed more likely as a result of factors unrelated to the variables or data patterns. In other words, absent data were considered MCAR when their occurrence was not systematically linked to any data patterns. This assumption was pivotal as it enabled the imputation of absent data without introducing bias into this analysis.

5.1.1.4 Qualitative Insights

While the qualitative survey was not primarily conducted to investigate absent data, it provided valuable contextual insights. Some instances of absent data may be attributed to a lack of clarity or understanding about certain variables especially by the students since one questionnaire was used to collect data from administrators and students alike.

5.1.1.5 Overview of handling missing data

In summary, this report has addressed the management of absent data within our dataset, taking into account quantitative and qualitative perspectives. The results of Little's MCAR (Missing Completely at Random) test and our assessment indicated that most constructs' missing values were likely MCAR, signifying no systematic relationship with observed variables or data patterns.

The "Shirking" construct, while not highly significant, warranted consideration due to its slightly lower p-value ($p=0.074$). However, "Shirking" was subsequently excluded from our analysis framework based on the Confirmatory Factor Analysis test, rendering further reporting on missing value analysis for "Shirking" unnecessary.

Our approach to managing absent data, assessing MCAR assumptions, and making informed decisions has upheld the integrity and validity of our research, allowing us to proceed confidently with our analysis of digital transformation and related constructs.

5.2 Participant Demographic Characteristics

Through the field exercise, data was collected on social demographics of each participant such as Gender, Age, Level of Education and years of work experience in the TVET institution. The participants were also interviewed during focus group discussions on their view and opinions of the role of politics and power in the prioritization of digital transformation reforms in Six Technical Colleges and Three Vocational Education and Training Institutions. The characteristics of the participants in this study are discussed below.

Firstly, it was important to understand the demographics of the study respondent because the adoption and use of this framework in the context of Uganda and Africa as a whole is influenced by Gender and Age (Zerai, 2018).

Secondly, the overall objective of selecting the sample for this study was to ensure that the study population is generalizable and representative to the population in a Technical College.

Thirdly, evidence submits that the demographic and social characteristics of this study do contribute to the use of ICTs and their adoption in TVETs and the curbing of the digital divide. The gender, geography, income, education and occupation are the six socio-demographic determinants of the digital divide (Ernest III et al., 2004).

Data for this study was consequently obtained on Gender, Age Group and Highest Level of Education Role and Job position of working participants.

5.2.1 Level of Formal Education

The data used in this study was collected using a survey instrument and interviews in focus group discussions. This exercise took a fortnight, having tested the research instruments and made the requisite adjustments.

The first week involved the administration of the survey questionnaires to the Technical Colleges (TCs) and the Vocational Technical Institutions (VTIs). The focus group discussions were conducted after the participants had gathered and quorum was achieved with the right respondents. All this was done without any major setbacks.

Accordingly, out of the 178 questionnaires administered, 177 returned. 100 were valid. This represented 56.5% of the questionnaires used in the study, which is a valid response rate (Roscoe, 1975). There were 77 survey results that were discarded due to some missing values

by the students in the colleges and the technical institutions. Most of the newer students did not have answers to some questions because they were not privy to the details of the digital transformation projects in their institutions that had been implemented before they were enrolled by the institution to study. This response rate is acceptable.

Moreover, according to Roscoe (1975), Roscoe theorizes the ‘rule of thumb’ for determining sample size. It states that any sample size larger than 30 and smaller than 500 is appropriate and sufficient for most studies. The sample size for this study is 100. This sample size therefore is satisfactory and considered sufficient for this study given that the response rate, in addition, is greater than 55%.

5.2.2 Gender Distribution

Table 5.2: Respondents Gender

Gender	Frequency	Percent%
Female	31	31
Male	69	69
Total	100	100

5.2.3 Respondents Gender

Table 5.2 shows the distribution by gender indicating that 60% of the respondents are male and only 31% are female despite the provision of equal opportunities (Tabassum & Nayak, 2021) in technical skills acquisition. The results further show that the majority of the respondents were male (69%). This implies that the TVET subsector is dominated by the male gender as opposed to the female. In Uganda, more women are coming on board in the TVET subsector although more men are still actively involved in technical training.

According to the results, data was collected e.g., about the age of the respondents, indicate that the respondents are in age groups ranging from 18 to 65. In the table 5.3 we present the results according to age bracket. The majority of the participants in this study had an age range of 18 to 45 years of age.

5.2.4 Age Bracket of the Respondents

Table 5.3: A Table showing the frequency distribution of the age of respondents in this survey

Age	Frequency	Percent
18-25	34	34
26-35	23	23
36-45	21	21
46-55	18	18
56-65	4	4
Total	100	100

In table 5.3, the age of 34% of the respondents is between 18 - 25 years, 23% are aged between 26 - 35 years, 21% are aged between 36-45 years 18% are aged between 46-55 years and only 4% were respondents in the age range of 56 - 65 years of age. These respondents were therefore mature enough to provide valid responses concerning digital transformation in the various TVET institutions. This implies that the information collected was reliable.

The older participants of 56 and above years of age were the smallest in number. This could be explained by the fact that TVET has only begun taking center stage in the last 8 years or so in the Education Sector.

5.2.5 Education Background

Table 5.4: Showing the Education Background of the respondents

Highest Education level	Frequency	Percent%
Bachelor's Degree	30	30
Certificate	31	31
Diploma	15	15
Master's Degree	16	16
Post Graduate Diploma	7	7

The majority of the respondents were students. The statistical analysis of the respondents submits that 30% have a bachelor's degree; 31%, a certificate; 15% are diploma holders; 16%

hold a Master's Degree while 7% are qualified with a post graduate diploma as their highest qualification. The results in table 5.3 show that the majority of the respondents were well educated and therefore did not find any difficulty reading and understanding the questionnaire so as to respond accurately. The respondents therefore were able to provide reliable data that was based on the make credible conclusions in this survey.

5.2.6 Employment Category

The study showed that each respondent played a specific role in the technical colleges or Vocation Training Institutions. The results in Table 5.5 show the distribution of respondents by employment category.

The table below shows all the respondents who took part in this survey and are categorized by their employment in the various TVET institutions.

Table 5.5: Participants by Employment Category

Role	Frequency	Percent%
A User/Student/Administrative Staff/Beneficiary of the Digital Transformation Project	76	76
Administrator	14	14
Contract Manager	1	1
Implementer. Member of Project Implementation Team	3	3
Member of Top Management at the Ministry	2	2
Quality Assurance	4	4
Total	100	100

The study found that 2% of the survey respondents are members of Top Management; 76% of the respondents were either a user, student, administrative staff or beneficiary of the digital transformation; 14% were administrators in these institutions; 3% were members of the project implementation team; 4% represented members of the quality assurance staff; and 1% representing the contract management team. Therefore, there was a representative number of respondents in each category to provide the responses required to provide reliable data for this survey.

5.2.7 Titles of Respondents and their responsibilities

Table 5.6 showing the titles and responsibilities of the respondents in this survey.

Job description	Frequency	Percent%
Academic Registrar	7	7
Commissioner TVET	1	1
Head of Division or Department	19	19
Head of ICT	4	4
ICT Officer Institution	7	7
Institution Principal	7	7
Instructor at TVET institution	8	8
Principal Officer TVET	2	2
Project Implementer	1	1
Project Supervisor	2	2
Student	42	42
Total	100	100

At the onset, it was necessary to establish the specific job titles of each of the respondents in order to appreciate and explain their appreciation of digital transformation for this study. The distribution of respondents by title is; Academic Registrar 7%; Commissioner TVET 1%; Head of Division or Department 19%; ICT Officer at the Institution 7%; Institution Principal 7%; Instructor at TVET institution 8%; Principal Officer TVET 2%; Head of ICT 4%; Project Implementer 1%; Project Supervisor 2%; and Students represented 42% of the respondents which constitutes the largest number of respondents.

The results in the table 5.7 show that the participants in this study (with the exception of the students) are at least more than 75% that have served the TVET subsector in their capacities for at least 11 years. The result is an indicator that they have all been involved in making decisions using ICT by virtue of their senior management positions. This adds credibility to the findings of this field study research.

Table 5.7: Highest Level of Education Role, Job and Work Experience (N=100)

Variable	Category	Frequency	Percent%
Highest Education level	Bachelor's Degree	30	30
	Certificate	31	31
	Diploma	15	15
	Master's Degree	16	16
	Post Graduate Diploma	7	7
Total		100	100
Job	Academic Registrar	7	7
	Commissioner TVET	1	1
	Head of Division or Department	19	19
	Head of ICT	4	4
	ICT Officer Institution	7	7
	Institution Principal	7	7
	Instructor at TVET institution	8	8
	Principal Officer TVET	2	2
	Project Implementer	1	1
	Project Supervisor	2	2
Total		100	100
Work Experience		6	6
	1-5 Years	50	50
	11-15 Years	15	15
	16-20 Years	13	13
	6-10 Years	9	9
	Over 20 Years	13	13
Total		100	100

Results in table 5.7 show that most respondents (50%) had a work experience of 1-5 years. In general, all the participants had more than 5 years' experience and could therefore appreciate digital transformation at the work place to provide reliable responses in this survey.

5.3 Model Assessment: Exploratory and Confirmatory Factor Analysis

The analysis of the data collected for this study involved evaluating multiple variables (more than two) to identify any possible association among them. Smart PLS software was used to analyze this data to verify the conceptual framework and to test the hypothesis. The partial least squares (Smart PLS) software was used to analyze the measurement and structure of the research framework. PLS has become popular in entrepreneurship and management research. Since this survey research was predictive, PLS was well suited for analyzing this framework (Park et al., 2017).

5.3.1 Internal Consistency Reliability

Table 5.7 shows Composite Reliability (CR) values of hidden variables used. It also indicates Cronbach Alpha (CA) values. These values were higher than 0.70, which is an indicator of fulfilling the requirements for internal consistency (Hair et al., 2021). The CA and CR values are all above 0.7. This indicates that ideas in the framework were adequately stated. As a result, the measurements of the various variables in the framework are very reliable. The results of this framework therefore are sufficient evidence in terms of reliability.

Table 5.8: Internal Consistency Reliability

Constructs	Composite Reliability (CR rho-A)	Composite Reliability (CR rho-C)	Cronbach's Alpha (CA)
Criteria	0.818	0.818	0.724
Politics	0.886	0.904	0.872
Power	0.889	0.886	0.831
Counterproductive multitasking	0.93	0.936	0.92
Self-deployment	0.886	0.917	0.855
CEO-CIO Relationship type	0.938	0.940	0.916
Information Asymmetry	0.855	0.871	0.783
Outcome Oriented contract	0.734	0.882	0.732
Behaviour Oriented contract	0.92	0.917	0.879
Monitoring & Evaluation	0.963	0.908	0.878
Top Management Participation	0.991	0.929	0.893
IT Resources Usage	0.868	0.909	0.867
User Satisfaction	0.845	0.904	0.839

5.3.2 Indicator Reliability

Indicator reliability represents how much of the variation in an item is explained by a given construct in the framework and is referred to as the variance extracted from the item. The indicator reliability loadings are shown in table 5.8. For an indicator to be reliable, the unit-dimensionality of the model must have a factor loading of above 0.7.

Hair et al., 2021 postulates that constructs that load with a factor loading above 0.7 are accepted while constructs that have a factor loading of less than 0.5 are altogether dropped and omitted. When such constructs with very low factor loadings are omitted and eliminated, both the CR

and AVE values are increased in the accepted construct loadings above the suggested thresholds of 0.7 (Hair et al., 2021; Memon et al., 2021). The outcome of this action of eliminating constructs with very low factor loadings adds to the strength of the links among the loadings and constructs in the framework.

5.4 Exploratory (EFA) and Confirmatory factor Analysis (CFA)

Factor analysis is a technique used to reduce on the number of variables in a given framework from a large number to a smaller number of factors. This is done with a view to summarize and ensure data reduction so that data may be described using fewer dimensions than were indicator in the conceptual framework.

Exploratory Factor Analysis (EFA) was achieved by extracting common variance from all the variables and scoring each variable with a given score. The Varimax method (Kaiser, 1958) was used to form the factor structure with the Varimax factor rotation and Kaiser Normalization (Hair et al 2006) in order to transform the original conceptual framework factor loadings to a pattern that was easier to inspect and interpret. The extracted factors, which were considered significant are those that had an eigen value of at least one unit, and considering indicators whose factor loading is at least equal to 0.5.

Comrey & Lee, (2013) categorize factor loadings in the ranges; 0.32 and lower as poor, between 0.32 and 0.45 as fair; 0.45 and 0.55 as good; 0.56 and 0.63 as good; 0.64 and 0.70 as very good and over 0.70 as excellent. Using this procedure, the indicators with sufficient information about each study variable were retained. This involved complete removal of indicators that had factor loadings lower than 0.5 (a range value considered as poor for factor convergent validity).

Further, factors with cross loadings that correlated highly with two or more constructs (a violation of discriminant validity) and loadings that indicated that a construct of interest was not similar to other constructs (in violation of convergent validity) were dropped.

After Exploratory Factor Analysis (EFA) was complete, Confirmatory Factor Analysis (CFA) was conducted with a view to further establish the validity and reliability of the indicators and also confirm the factor structure of each variable as was determined in the exploratory factor analysis. In performing CFA, factor loadings or regression weights were further examined more carefully.

In the case of this survey, an average of 0.708 for the indicators per construct were considered as acceptable for both indicator validity and convergent validity. Moreover, during the CFA, the heterotrait-monotrait ratio for correlations (HTMT) for discriminant validity with a threshold value of greater than or equal to 0.85 were accepted. HTMT values above or equal to 0.85 confirm discriminant validity between the constructs (Henseler et al., 2015).

The Model Fit for the measurement model or CFA was eventually assessed using the Standardized Root Mean Square Residual (SRMR) index with an acceptable range of 0 to 0.08 as the threshold according to Lohmöller (1989). The SRMR allowed the assessment of the average magnitude of discrepancies between the observed and expected correlation as an absolute measure of the Model Fit criterion in this survey research.

5.4.1 EFA and CFA results for Goal Conflict

Data Analysis was carried out using structured equation modelling. Exploratory Factor Analysis was carried out and results were obtained as shown in table 5.8 below. These results were further tested using Confirmatory Factor Analysis method in order to refine and confirm the factors to be used in the structural model. The Confirmatory Factor analysis results for the variable “Goal Conflict” are presented in sub section 4.4.1.1 together with the KMO results for the CFA model for Goal Conflict. This model is comprised of three constructs namely Politics, Power and Criteria. The Politics construct was coded as PT in SPSS, and was measured by ‘Politics playing a role in the acceptance of this project’ (PT1), ‘Politics playing a role in the prioritization of Digital transformation (DT) reforms’ (PT2), ‘Politics playing a role in the allocation of resources towards DT’(PT3), ‘Political influence in favour of a Digital Transformation Project being necessary for success of the project for Digital Transformation’ (PT4), ‘Being aware of the local politics for success of Digital projects’ (PT5), ‘Impact of political influence of institution vs influence of politician on the extent of project success’ (PT6), ‘Impact of political influence of an individual on DT’ (PT7). The Power construct was coded at PO in SPSS, and was measured by ‘The role power dynamics plays in digital transformation’ PO1, ‘The impact on leadership in their ability to influence the adoption of DT’ PO2, ‘The influence of power of the institution to influence DT’ PO3, ‘The performance of the implementation team depending on the power given by Top Management’ PO4, ‘DT success influenced by position of power in policy implementation of the DT project PO5. The Policy construct was coded as PY in SPSS, and was measured by ‘Policy in place to guide DT

projects' PY1, 'Success of DT depends on the backing of a powerful political actor' PY2, 'Ability to control resources in a TVET institution leads to policy implementation success' PY3, 'Leaders of DT must be an individual(s) holding a position of influence' (PY4), 'A DT policy being vital for the success of a DT project' (PY5).

The table 5.9 shows the results for the Exploratory Factor Analysis for Goal conflict in form of a rotated component matrix in the order of how each factor was accordingly loaded after analysis.

Table 5.9: Rotated Component Matrix for Goal Conflict

Code	Label	Politics	Power	Criteria	Policy
PT2	Politics played a role in the prioritization of Digital Transformation reforms	.828			
PT1	Politics played a role in the acceptance of this project in this institution	.825			
PT3	Politics played a role in the allocation of resources towards DT	.824			
PT7	The Political influence of an individual politician has greater impact towards the success of digital transformation for TVET projects over that of a TVET institution	.727			
PT4	Political influence in favour of a Digital Transformation Project is necessary for success of the project for Digital Transformation	.725			
PT5	To get things moving for success of Digital projects, it is necessary to be aware of the local politics in the process	.586			
PO1	Power dynamics in the institution plays an important role in persuading institutions to comply with digital transformation	.851			
PO2	The degree of authority of the project leadership impacts their ability to persuade institutions to adopt new reforms from digital transformation	.794			

PO5	Success in Digital Transformation will be achieved when the project leadership holds a position of power in policy implementation	.792		
PO3	The performance of the project implementation team depends on the power of the institution (TVET institution) for acceptable outcomes	.629		
PO4	The performance of the Project Implementation Team depends on the power given by Top Management	.598		
CR4	The transformation project is error-free	.780		
CR6	The institution has a high-quality digital infrastructure following this project	.754		
CR1	Project was completed within budget	.687		
CR3	There is favourable impact on how the institute conducts core business at the institution	.644		
CR5	The contract requirements are fully met	.642		
CR2	There is favourable financial impact of project	.523		
PY5	A Digital transformation policy is essential for the success of a (DT) Project	.714		
PY3	The TVET Institutions ability to control its resources leads to policy implementation success	.700		
Eigen values	3.786	3.17	2.863	1.771
Variance (%)	19.925	16.69	15.067	9.320
Cumulative Variance (%)	19.925	36.61	51.678	61

The EFA for Goal conflict results in Table 5.10 reveal that four constructs were retained as significant factors because their Eigen Values were above the threshold of 1 unit. There were 19 out of 23 indicators that were retained in the measurement scale.

The analysis shows that the factors that were extracted for goal conflict, in the order of importance are as follows; Politics (Eigen value = 3.786, Variance = 19.925%), followed by

Power (Eigen value = 3.170, Variance = 16.6900%), Criteria (Eigen value=2.863, Variance =15.067%) and Policy (Eigen Value = 1.771, Variance = 9.320%).

Table 5.10: Significance of EFA for Goal Conflict

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.702
Bartlett's Test of Sphericity	Approx. Chi-Square	732.453
	Df	171
	Sig.	.000

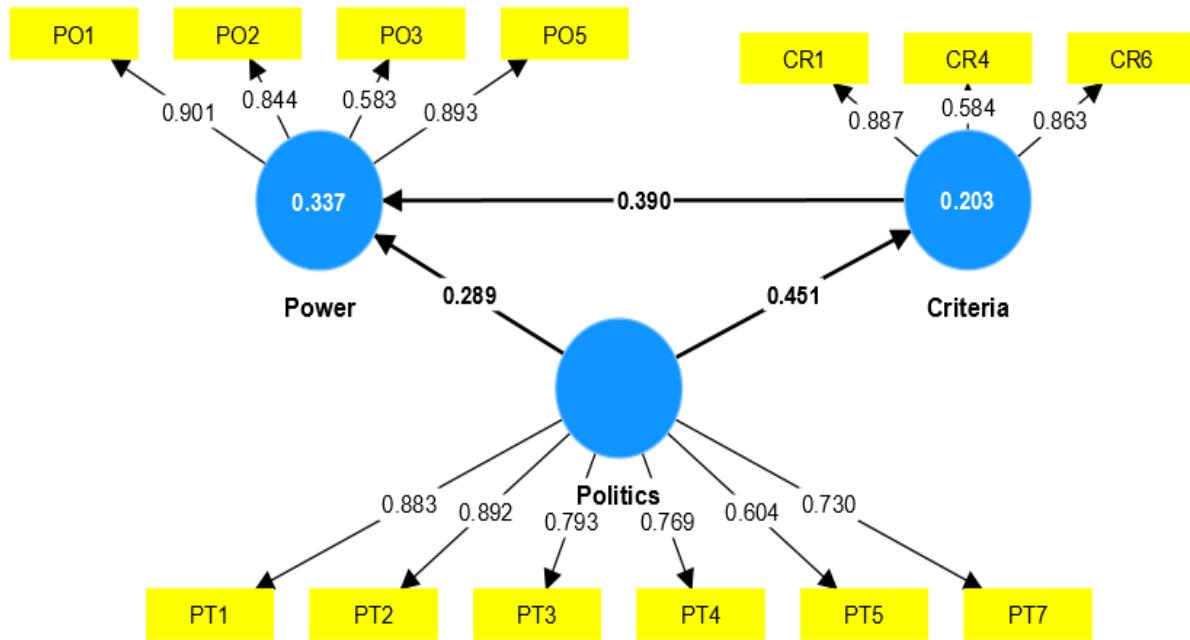
The results in Table 5.10 show that the Kaiser-Meyer-Olkin (KMO) test for sample adequacy returned a value of 0.702, which is above 0.5. This shows that the sample used in this Field Survey Research that was subject to this investigation was suitable for Factor Analysis using Structured Equation Modelling (Williams et al., 2010). The Bartlett s test of Sphericity returned an approximate chi-square value of 732.453. The degrees of freedom, df = 17. This was found to be acceptable and significant result with a P value of 0.000 which is below 0.05, this implies that the factors that make up the factor structure have significant relationships sufficient to measure goal conflict.

5.4.1.1 Confirmatory Factor Analysis results for Goal Conflict

The CFA for Goal conflict is as presented in Figure 5.1 below. The analysis confirmed three of the four factors that were retained after the CFA. The three factors were retained after the construct, ‘Policy’ and all its indicators were deleted. The construct and its indicators were deleted because they were not significant in this survey.

The other important reason for the removal of ‘Policy’ as a construct with all its indicators is the fact that ‘Policy’, if left un removed would affect the reliability and validity statistics like the average variance extracted and the HTMT ratio thereby distorting the outcome of this survey.

Figure 5.1: Measurement model (CFA) for Goal Conflict



The summary of the CFA in the measurement model of Goal conflict in Figure 5.1 show that the following indicators were found to be significant; PO1, PO2, PO3 and PO5 for power; CR1, CR4 and CR6 for criteria; PT1, PT2, PT3, PT4, PT5 and PT7 for politics. These indicators were then used in the computation of the scores for Goal conflict which were used in the estimation of the structural model. These are the only indicators that were retained following Confirmatory Factory analysis (CFA).

5.4.1.2 Reliability and Validity for Goal Conflict

In this study, reliability and validity of the data collection instruments was done using the data set with 100 valid responses. Before starting data collection of data to be used in developing and testing theoretical frameworks, one of the first steps in analysis of data was to test and establish the reliability and validity of the measurement instruments (Hilkenmeier et al., 2020). This was done to estimate the distinctiveness between dimensions. SPSS was used to test the data collection instrument for internal consistency.

Specifically, Cronbach's alpha test in structural equation modelling (PLS-SEM) was used to measure reliability of the tool for data collection. All scores for each item that scored above 0.7 were considered as satisfactory although measures above 0.9 are likely to show that items

may be measuring the same phenomenon. This means that the item is probably not a valid measure of a given construct (Hair et al., 2021).

To mitigate the possible failure to ascertain the reliability of items in a construct whose items score above 0.9, it is important to apply the composite reliability alongside Cronbach's alpha to test the internal consistency of the data collection instrument effectively (Hair et al., 2021).

The results in table 5.11 below show that the indicators retained in the summary of the measurement model of Goal conflict guarantee both reliability and validity. The test scores for the composite reliability for Criteria, Politics and Power are greater than 0.60. This implies that there is Internal Consistency. Furthermore, both convergent validity and discriminant validity were assured since the AVE for all factors is over 0.5 and the HTMT for each pair of constructs is below 0.85 as suggest by (Henseler et al., 2015).

Table 5.11 showing the test results for Reliability and Validity for Goal Conflict

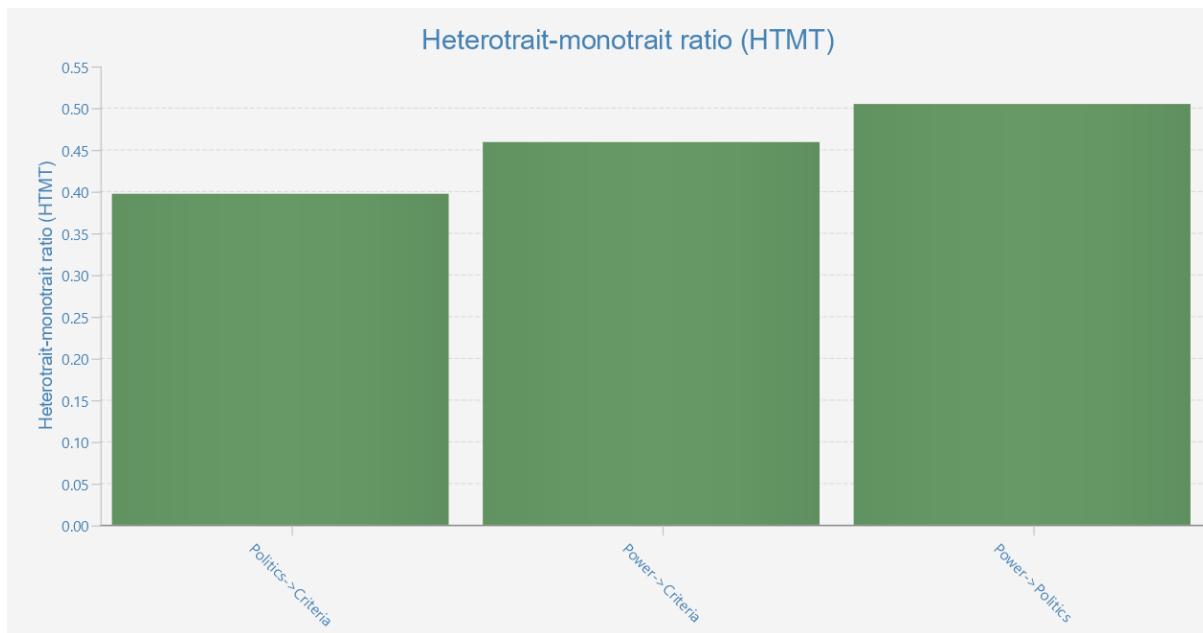
	Cronbach Alpha	CR		AVE	HTMT	
		rho-A	rho-C		Criteria	Politics
Criteria	0.724	0.818	0.818	0.624		
Politics	0.872	0.886	0.904	0.616	0.494	
Power	0.831	0.889	0.886	0.666	0.562	0.52

Model Fit Indices: SRMR=.0091, d_ULS=.756, d_G=.313, Chi-square=178.257, NFI=.756

As may be observed in the table 5.11 above, the values are all higher than 0.7, which is an indicator of compliance with internal consistency (Hair et al., 2021). This implies that the ideas in the conceptual framework were adequately stated thereby rendering measurement outcomes of the framework very reliable. Consequently, the measurement outcome of this framework in this study has provided sufficient evidence in terms of reliability.

Confirmation of discriminant validity is further shown by the bar chart for the HTMT ratio for Goal Conflict is presented in figure 5.2 below. Additionally, the SRMR of 0.0091 in table 4.5 also indicates good model fit for the measurement model.

Figure 5.2: HTMT Ratio for Goal Conflict



It can be seen that all the values, are greater than 0.2 which is the lower threshold for the HTMT while testing for discriminant validity and yet less than 0.85 which is the upper threshold for the HTMT test for discriminant validity.

5.4.2 EFA and CFA for Shirking

Exploratory Factor Analysis for Shirking as a construct was carried out. The results were obtained as shown in table 5.11 below. These results were further tested using Confirmatory Factor Analysis method in order to refine and confirm the factors to be used in the structural model. The Confirmatory Factor analysis results for the variable “Shirking” are presented in sub section 5.1.3 together with the KMO results for the CFA model for Shirking. This model is comprised of two constructs namely Counterproductive Multi-tasking and Self deployment.

The Shirking construct was coded as SH in SPSS, and was measured by ‘Taking excessive breaks’ SH1, ‘Taking long lunches’ SH2, ‘Talking on phone’ SH3, ‘Surfing the internet’, SH4, ‘Excessive time on social media’, SH5, ‘Working on enjoyable, less important tasks’, SH6, ‘Socializing’, SH7, ‘Calling in when sick when healthy’, SH8, ‘Working on wrong tasks’ SH9, ‘Working on other tasks other than DT tasks’ SH10, ‘Poor organization’, SH11. Each of these measurements fall under “Counter Productive Multitasking” or “Self-Deployment”.

The table 5.12 below shows the results for the Exploratory Factor Analysis for Shirking as a variable in form of a rotated component matrix in the order of how each factor was accordingly loaded after analysis.

Table 5.12: Factor Structure for Shirking (Rotated Component Matrix)

Code	Label	Counter Productive multi-tasking	Self deployment
SH3	Talking on phone	0.883	
SH4	Surfing the Internet	0.877	
SH5	Excessive time on Social media	0.872	
SH7	Socializing	0.807	
SH6	Working on enjoyable, less important tasks	0.762	
SH1	Taking excessive breaks	0.66	
SH10	Working on other tasks other than the digital transformation tasks		0.873
SH11	Poor organization	0.844	
SH9	Working on wrong tasks	0.836	
SH8	Calling in Sick when healthy	0.781	
Eigenvalues		4.407	3.463
Variance (%)		44.075	34.631
Cumulative Variance (%)		44.075	78.706

The results following the exploratory Factor Analysis for Shirking in Table 5.12 show that two constructs were retained as significant factors because their Eigen Values that were above the threshold of 1.00 that is considered worth analyzing. There were 10 out of 11 indicators that were retained in the measurement scale. The analysis shows that the factors that were extracted for Shirking, in the order of factor loading are as follows; Counter Productive Multi-tasking (Eigen value = 4.407, Variance = 44.075%), followed by Self Deployment (Eigen value = 3.463, Variance = 34.631%).

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy test and the Bartlett's Test of Sphericity were also carried out. Table 5.13 presents the significance and results of these tests.

Table 5.13: Significance of EA for Shirking

KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.885
Bartlett's Test of Sphericity	Approx. Square	Chi-Square	820.048
	df		45
	Sig.		.000

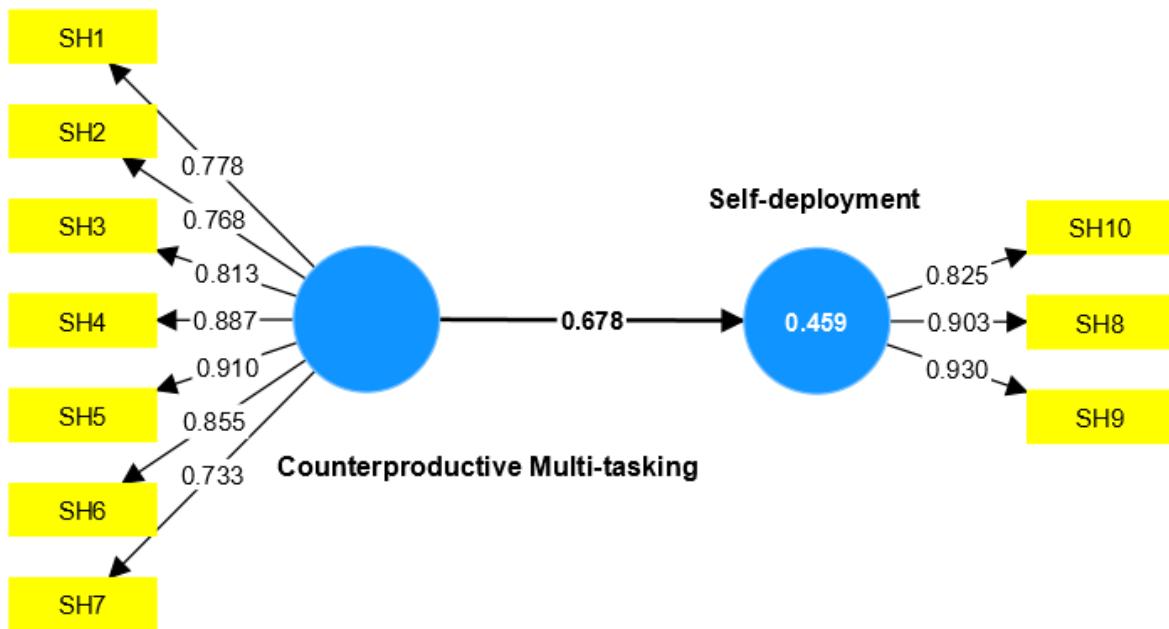
The results in Table 5.13 show that the Kaiser-Meyer-Olkin (KMO) test for sample adequacy returned a value of 0.885, which is above 0.5. This shows that the sample used to test the variable "Shirking" in this Field Survey Research was suitable for Factor Analysis using Structured Equation Modelling (Williams et al., 2010).

The Bartlett s test of Sphericity returned an approximate chi-square value of 820.048. The degrees of freedom, df = 45. This was found to be acceptable and significant result with a P value of 0.000 which is below 0.05, this implies that the factors that make up the factor structure have significant relationships sufficient to measure Shirking as a variable in this survey.

5.4.2.1 Confirmatory Factor Analysis (CFA) results for Shirking

The CFA for Shirking is as presented in Figure 5.3 below. The analysis confirmed two factors that were retained after the CFA. The two retained factors are; Counterproductive Multi-tasking and Self deployment. The summary of the CFA in the measurement model of Shirking in Figure 4.2 shows that the following indicators were found to be significant; SH1, SH2, SH3, SH4, SH5, SH6 and SH7 for Counterproductive Multi-tasking; SH10, SH8 and SH9 for Self-deployment. These are the only indicators that were retained following Confirmatory Factory analysis (CFA).

Figure 5.3: Showing CFA for Shirking



The Confirmatory Factor Analysis in the measurement model of Shirking in Figure 5.3 shows the indicators which were retained since they had indicator validity by virtue of having an average factor loading above 0.708. For Counterproductive Multi-tasking the indicators that were found to be significant include; SH1, SH2, SH3, SH4, SH5, SH6 and SH7 and for Self-deployment, they were SH10, SH8 and SH9.

These indicators were then used in the computation of the scores for Shirking which were used in the estimation of the structural model. These are the only indicators that were retained following Confirmatory Factor Analysis (CFA).

5.4.2.2 Reliability and Validity for Shirking

The results in table 5.14 below show that the indicators retained in the summary of the measurement model of Shirking guarantee both reliability and validity. The Composite Reliability values for Counterproductive multitasking and Self-deployment are higher than 0.70. This implies that there is Internal Consistency. Furthermore, convergent validity was assured since the AVE for both factors is over 0.5 and likewise discriminant validity was guaranteed since the HTMT for each pair of constructs is was below 0.85 as suggested by Henseler et al., (2015).

Table 5.14 showing the test results for Reliability and Validity for Shirking

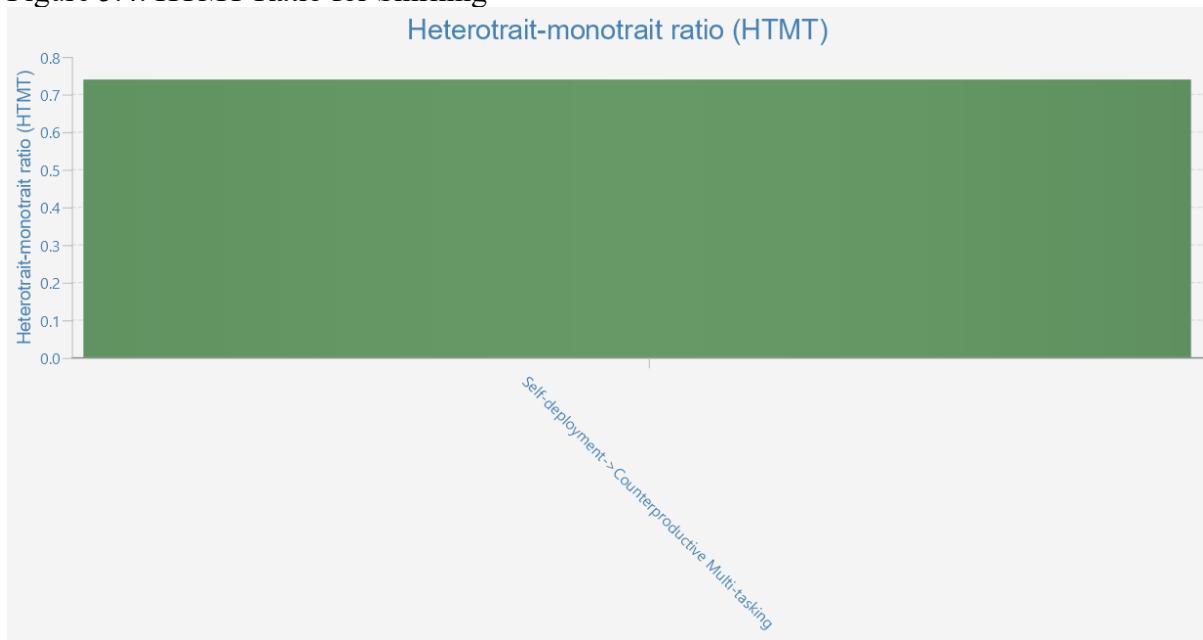
	Cronbach's Alpha	CR		AVE	HTMT Self- Deployment
		rho-A	rho-C		
Counterproductive multitasking	0.92	0.93	0.936	0.677	
Self-Deployment	0.855	0.886	0.917	0.788	0.738
Model Fit Indices: SRMR=.077, d_ULS=.327, d_G=.250, Chi-square=131.324, NFI=.833					

The Table 5.14 above shows that the Cronbach's Alpha value after testing for reliability is higher than 0.7, which is an indicator of compliance with internal consistency (Hair et al., 2021).

This implies that the ideas (indicators and the dimensions formed out of the indicators) in the conceptual framework were adequately stated thereby rendering measurement outcomes of the framework very reliable. Consequently, the measurement outcome of this framework in this study has provided sufficient evidence in terms of reliability.

Confirmation of discriminant validity is further shown by the bar chart for the HTMT ratio for Shirking as presented in figure 5.4 below. Additionally, the SRMR of 0.077 in table 4.8 falls between the acceptable range for the SRMR index between 0 and 0.08 (Hu & Bentler, 1999). This indicates a good model fit for the measurement model for shirking

Figure 5.4: HTMT Ratio for Shirking



The figure 5.4 above shows that the HTMT ratio for Self-deployment to Counterproductive Multitasking is 0.77. This value is greater than 0.2 which is the lower threshold for the HTMT ratio while testing for discriminant validity. Also noteworthy is the fact that the HTMT ratio is less than 0.85 which is the upper threshold for discriminant validity.

5.4.3 EFA and CFA for Communication

This subsection presents the results from the Exploratory Factor Analysis and later the Confirmatory Factor Analysis for further refinement of the indicators for the variable, “Communication” in the Conceptual Framework. The CFA results are presented in sub section 5.4.3.1 with the KMO results for the CFA model for Communication.

The CEO-CIO relationship type construct was coded as RT in SPSS, and was measured by ‘the CIO being open about problems’ RT1, ‘The CIO discusses how the project will achieve requirements for DT in simple terms’ RT2, ‘The communication channel between the CIO and CEO is always to a satisfactory extent’ RT3, ‘The CEO relies on the CIOs technical expertise for successful DT of TVETs’ RT4, ‘The CIO innovatively finds ways around obstacles between himself and the CEO’ RT5, ‘The CEO and the CIO have a healthy professional relationship’ RT6. The Reporting construct was coded as RE in SPSS, and was measured by ‘The project implementation team overstating their progress’, RE1, ‘Project team understating

actual time they spend on tasks each day', RE2, 'The project hides problems they know in the project' RE3, 'Some tasks are skipped yet not reported as skipped' RE4, 'Reports are carefully worded every time' RE5. The Information Asymmetry construct was coded as IA in SPSS, and was measured by 'Task team members openly discussing project problems in status reporting' IA1, 'Task team members readily sharing critical project status information' IA2, 'Task team members openly describing issues to auditors when called upon' IA3, 'Task team members only openly discussed problems they believed could be corrected quickly' IA4.

The table 5.15 shows the results for the Exploratory Factor Analysis for Communication as a variable in form of a rotated component matrix in the order of how each factor was accordingly loaded after analysis.

Table 5.15: Factor Structure for Communication (Rotated Matrix)

Code	Label	CEO-CIO Relationship	Information Asymmetry	Reporting
RT3	The Communication Channel between the CIO and CEO is always open to a satisfactory extent	.910		
RT2	The CIO discusses how the project will achieve what is needed in simple English and not technical jargon	.904		
RT1	Management does not worry about looming IT catastrophes because CIO is open about problems	.890		
RT4	The CEO relies on the CIOs technical expertise for success of digital transformation of the TVET institution	.806		
IA3	Task team members openly described issues to auditors when called upon		.849	
IA2	Task team members readily share critical project status information		.698	
IA4	Task team members only openly discuss problems they believed they could correct quickly		.652	
RE2	Project team understate the actual time they spend on task each day			.862
RE1	The project implementation team was over stating their progress			.823
RE3	The project hides problems they know in the project			.636
Eigen values		3.423	2.144	1.859

Variance (%)	34.23	21.44	18.592
Cumulative Variance (%)	34.23	55.67	74.26

Table 5.15 shows the results for the exploratory factor analysis for Communication. 10 out of 15 indicators were retained in the measurement scale as significant factors whose Eigen values were above the threshold of 1.00 that were considered for analysis.

The analysis showed that the factors that were extracted for Communication are; CIO-CEO Relationship (Eigen Value = 3.423, Variance = 34.23%), followed by Information Asymmetry (Eigen Value = 2.144, Variance = 21.44%) and Reporting (Eigen Value = 1.89, Variance = 18.592%). The Bartlett's test of Sphericity and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy test were both carried out. Table 5.15 presents the results and significance of this analysis.

Table 5.16: results and significance of EFA and CFA analysis.

KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.796
Bartlett's Test of Sphericity	Approx. Square	Chi- Square	438.216
	df		45
	Sig.		.000

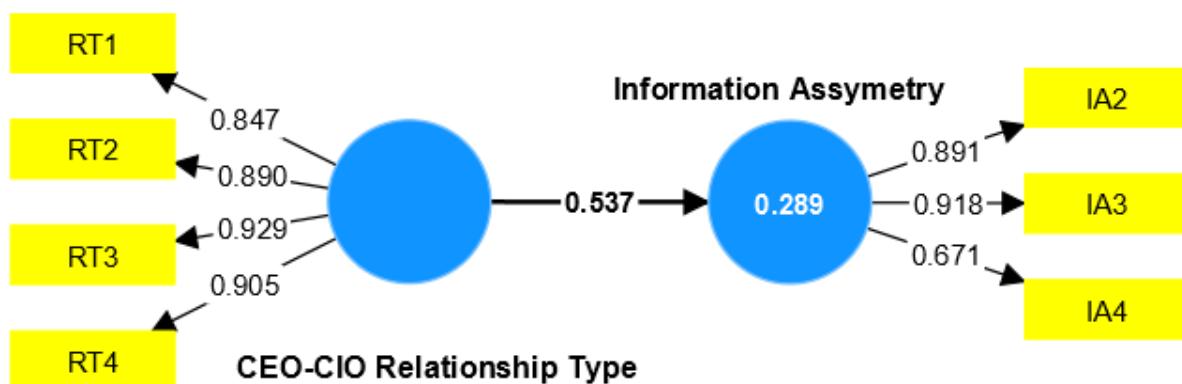
The Bartlett s test of Sphericity returned an approximate chi-square value of 438.216. The degrees of freedom, df = 45. This was found to be acceptable and significant since the p value of 0.000 was below 0.05. This implies that the factors that make up the factor structure have significant relationships that were sufficient to measure Communication as a variable in this survey.

The results in table 5.16 also show that the Kaiser-Meyer-Olkin (KMO) test for sample adequacy returned a value of 0.796, which is a value greater than 0.5 which is the lower threshold for sample adequacy. The sample used to test the variable “Communication” in this survey was suitable for analysis using structured equation modelling (Williams et al, 2010).

5.4.3.1 Confirmatory Factor Analysis results for Communication

The Confirmatory Factor Analysis for Communication is presented in Figure 5.5. The analysis confirmed two factors that were retained. These two factors are “Information Asymmetry” and “CEO-CIO Relationship Type”. The summary of the CFA in the measurement model of Communication in Figure 5.5 shows that the following indicators were found to be significant; RT1, RT2, RT3, RT4 and RT5 for CEO-CIO Relationship-Type; IA2, IA3 and IA4 for information Asymmetry.

Figure 5.5; Showing CFA for Communication



The indicators shown in Fig. 5.5 were used in the computation of the scores for Communication which were used in the estimation of the structural model. These are the only indicators that were retained following Confirmatory Factor Analysis.

5.4.3.2 Reliability and Validity for Communication

The results in table 5.16 show the retained indicators in the summary which guarantee both reliability and validity. The results further show that the test scores for the composite reliability for both factors (CEO-CIO relationship type and Information Asymmetry) are higher than 0.70 which means that internal consistency is confirmed.

The results further show that both discriminant and convergent validity were established since the AVE for all the factors is greater than 0.5 and the HTMT ratio is greater than 0.2 but below 0.85 as was postulated by Henseler et al, (2015).

Table 5.17 showing the test results for Reliability and Validity for Communication

	Cronbach Alpha	CR		AVE	HTMT Information Asymmetry
		rho-A	rho-C		
CEO-CIO Relationship Type	0.916	0.938	0.940	0.798	
Information Asymmetry	0.783	0.855	0.871	0.695	0.594
Model Fit Indices: SRMR=.079, d_ULS=.173, d_G=.091, Chi-square=57.669, NFI=.870					

Table 5.17 shows that the Cronbach's Alpha reliability test result was higher than 0.7, which indicates compliance with internal consistency (Hair et al., 2021). Overall, the ideas in the conceptual framework were adequately stated in so doing rendering measurement outcomes of the framework very reliable. As such, the outcome of these measurements for this framework in this survey provide sufficient evidence in terms of reliability.

The next graph (figure 5.6) presents the HTMT ratio of 0.594 for Communication. This confirms the discriminant validity of the two factors. This HTMT ration result lies within the upper and lower threshold range of 0.2 – 0.85 when testing for discriminant validity. Graph 4.3 therefore confirms discriminant validity for Communication.

Figure 5.6: A graph showing the HTMT ratio of Information Asymmetry to CEO-CIO relationship type



Furthermore, the SRMR of 0.079 in table 5.16 falls within the acceptable range for the SRMR index which is between 0 and 0.08 (Hu and Bentler, 1999). As such, this shows a good model fit for the measurement model for Communication.

5.4.4 EFA and CFA for Task Programmability

As has been the practice for all the other variables, Exploratory Factor Analysis for Task Programmability was done. The results from this analysis were obtained as shown in table 4.6 below. These results were further tested using Confirmatory Factor Analysis method in order to refine and confirm the factors to be used in the structural framework. The Confirmatory Factor analysis results for the variable “Task Programmability” are presented in sub section 4.4.4.1 together with the Kaiser-Meyer-Olkin (KMO) results for sampling adequacy.

The KMO is for the CFA model for Task Programmability. This model is comprised of one construct namely Task Programmability. The Task Programmability construct was coded as TP in SPSS, and was measured by ‘Having a clear, written methodology for executing the DT project’ TP1, ‘clear procurement guidelines were followed from start to finish of the DT project’ TP2, ‘Reliance on clear specifications from IT professionals for DT procurements’ TP3.

The results for the Exploratory Factor Analysis for Task Programmability are shown in Table 5.17. The results show that four constructs were retained as significant factors because their Eigen Values were above the threshold of 1 unit. There were 4 out of 4 indicators that were retained in the measurement scale. The analysis shows that the factor that was extracted for Task Programmability Politics has an Eigen value = 2.917 and a Variance = 72.923%.

Table 5.18: Showing the factor structure for task programmability

Code	Label	Factor loading
TP3	Clear specifications were relied upon from IT professionals for Digital Transformation IT procurements	.904
TP2	Clear procurement guidelines were followed from start to finish of the project	.894
TP4	Each Implementation team members clearly knows what task they are required to do all the time through the project	.874
TP1	I have a clear, written methodology for executing this project	.733
Eigen values		2.917
Variance (%)		72.923

Table 5.18 presents the results of the Kaiser-Meyer-Olkin Measure of Sampling Adequacy test which returned a value of 0.820, a value above the threshold of 0.5. This value indicates that the sample used to test the variable, “Task Programmability” in this study was suitable for Factor Analysis using Structured Equation Modelling.

Furthermore, the Bartlett’s test of Sphericity returned an approximate chi-square value of 193.165, the degrees of freedom, df = 6 and the significance p value = 0.000 which is below 0.05, which implies that the factors that make up the factor structure have significant relationships sufficient to measure Task Programmability as a variable in this study.

Table 5.19: Significance of Exploratory Factor Analysis for Task Programmability

KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.820
Bartlett's Test of Sphericity	Approx.	Chi-Square	193.165
	df		6
	Sig.		.000

The results presented above in Table 5.19 show that the Kaiser-Meyer-Olkin (KMO) test for sample adequacy returned a value of 0.820, which is above 0.5. This shows that the sample used to test the variable “Task Programmability” in this Field Study was suitable for Factor Analysis using Structured Equation Modelling. The Bartlett’s test of Sphericity returned an approximate chi-square value of 193.165. The degrees of freedom, df = 6. This was found to be acceptable and significant result with a P value of 0.000 which is below 0.05, this implies that the factors that make up the factor structure have significant relationships sufficient to measure Task Programmability as a variable in this survey.

5.4.4.1 Confirmatory Factor Analysis results for Task Programmability

The CFA for Task Programmability confirmed one factor that was retained after the CFA. The retained factor is: “Task Programmability.” The summary of the CFA in the measurement model of Task Programmability in the table 4.13 shows that the following indicators were found to be significant; TP1, TP2, TP3, and TP4. These indicators were then used in the computation of the scores for Task Programmability later used in the estimation of the overall structural model.

5.4.5 EFA and CFA for Contract Type

Exploratory Factor Analysis for the variable Contract Type was done. The results of this analysis were obtained as shown in table 5.20. These results were further tested using Confirmatory Factor Analysis to refine and confirm the factors to be used in the structural framework. The Confirmatory Factor analysis results for the variable “Contract Type” are presented in sub section 5.4.5.1 together with the KMO results for the CFA model for Contract Type. This model is comprised of two constructs for Contract Type namely “Outcome Oriented” and “Behaviour Oriented”.

The Contract Type construct is categorized as Output Oriented Outcome contracts and Behaviour Oriented Contracts. These sub groups were coded as OOC and BOC respectively in SPSS. The two indicators were measured by ‘Contract for team members provided with a flexible work schedule’ OOC1, ‘Contract for team members provides for public praise’ OOC2, ‘Contract for team members provides for Technical training’ OOC3, ‘Contract for team members provides for sense of contribution to organization’ OOC4, ‘Contract for team members provides for favorable annual performance appraisals’ OOC5, ‘Contract for team members provides for choice of future assignment’ OOC6, ‘Contract for team members provides for Job promotion’ OOC7. These are the measurement parameters for Output Oriented Contracts.

Behaviour Oriented Contracts as the contract of choice for improved success of DT projects, were also measured and coded as BOC in SPSS. BOC were measured checking to see whether the ‘Contract for team members provides for a guaranteed salary irrespective of outcome’ BOC1, ‘Contract for team members provides for entitlement to newer technology (i.e., laptop, tablet)’ BOC2, ‘Contract for team members provides for opportunity to work from home’ BOC3, ‘Contract for team members provides for private office space’ BOC4.

The table 5.20 below shows the results for the Exploratory Factor Analysis for Contract Type as a variable in form of a rotated component matrix in the order of how each factor was accordingly loaded following this analysis.

Table 5.20: Exploratory Factor Structure and results for Contract Type

Code	Label	Outcome Oriented	Behaviour Oriented
OOC3	Contract for team members provides for technical training	.906	
OOC2	Contract for team members provides for public praise	.863	
OOC4	Contract for team members provides for sense of contribution to organization	.861	
OOC1	Contract for team members provides for flexible work schedule	.740	
BOC3	Contract for team members provides for opportunity to work from home		.871

BOC2	Contract for team members provides for entitlement to newer technology (i.e. laptop, tablet)	.853
BOC1	Contract for team members provides for a guaranteed salary irrespective of outcome	.815
BOC4	Contract for team members provides for private office space	.702
Eigen values	3.107	2.76
Variance (%)	38.833	34.497
Cumulative Variance (%)	38.833	73.33

The Exploratory Factor Analysis for Contract Type that are presented in Table 5.18 above show that two constructs were retained as significant factors because their Eigen Values that were above the threshold of 1.00 that is considered worth analyzing. There were 8 out of 10 indicators that were retained in the measurement scale as shown in table 5.20.

The analysis shows that the factors that were extracted for Contract type, in the order of factor loading are as follows; Output Oriented (Eigen value = 3.107, Variance = 38.833%), followed by Behaviour Oriented (Eigen value = 2.76, Variance = 34.497%).

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy test and the Bartlett's Test of Sphericity were also carried out. Table 5.21 presents the significance and results of these tests.

Table 5.21: Significance of Exploratory Factor Analysis for Contract Type

KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.779
Bartlett's Test of Sphericity	Approx. Square	Chi- square	462.941
	df		28
	Sig.		.000

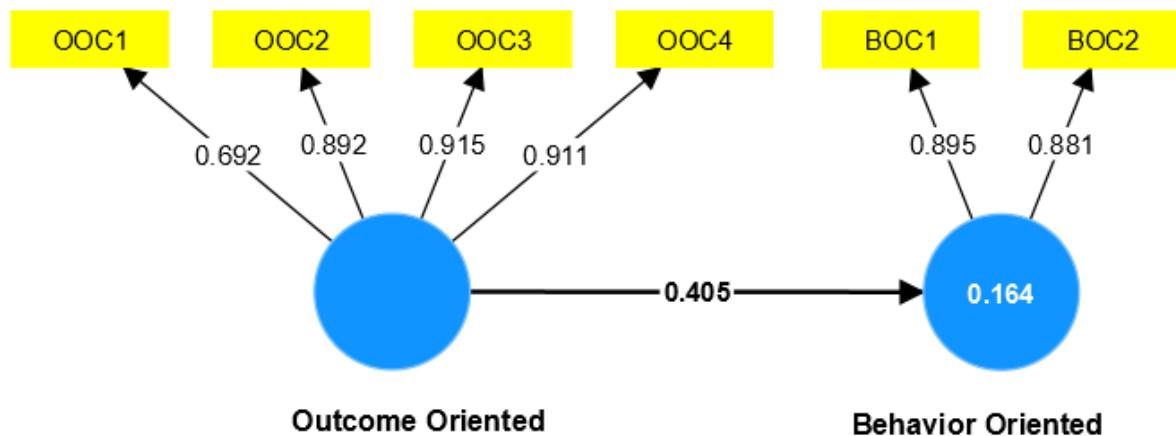
The results in Table 5.21 show that the Kaiser-Meyer-Olkin (KMO) test for sample adequacy returned a value of 0.779, which is above 0.5. This shows that the sample used to test the

variable “Contract Type” in this Field Study was suitable for Factor Analysis using Structured Equation Modelling. The Bartlett s test of Sphericity returned an approximate chi-square value of 462.941. The degrees of freedom, $df = 28$. This was found to be acceptable and significant result with a P value of 0.000 which is below 0.05, this implies that the factors that make up the factor structure have significant relationships sufficient to measure Contract Type as a variable in this study.

5.4.5.1 Confirmatory Factor Analysis (CFA) results for Contract Type

The CFA for Contract Type is as presented in Figure 5.7 below. The analysis confirmed two factors that were retained after the CFA.

Figure 5.7: Confirmatory Factor Analysis for Contract Type



The two retained factors are: “Outcome Oriented” and “Behaviour Oriented”. The summary of the CFA in the measurement model of Contract type in Figure 5.7 shows that the following indicators were found to be significant; OOC1, OOC2, OOC3 and OOC4 for Outcome Oriented Contracts; BOC1 and BOC2 for Behaviour Oriented Contracts.

These indicators were then used in the computation of the scores for Contract Type which were used in the estimation of the structural model. These are the only indicators that were retained following Confirmatory Factory analysis (CFA).

5.4.5.2 Reliability and Validity for Contract Type

The results in table 5.21 below show that the indicators retained in the summary of the measurement model of Contract Type guarantee both reliability and validity.

Table 5.22: Reliability and Validity Measures for Contract Type

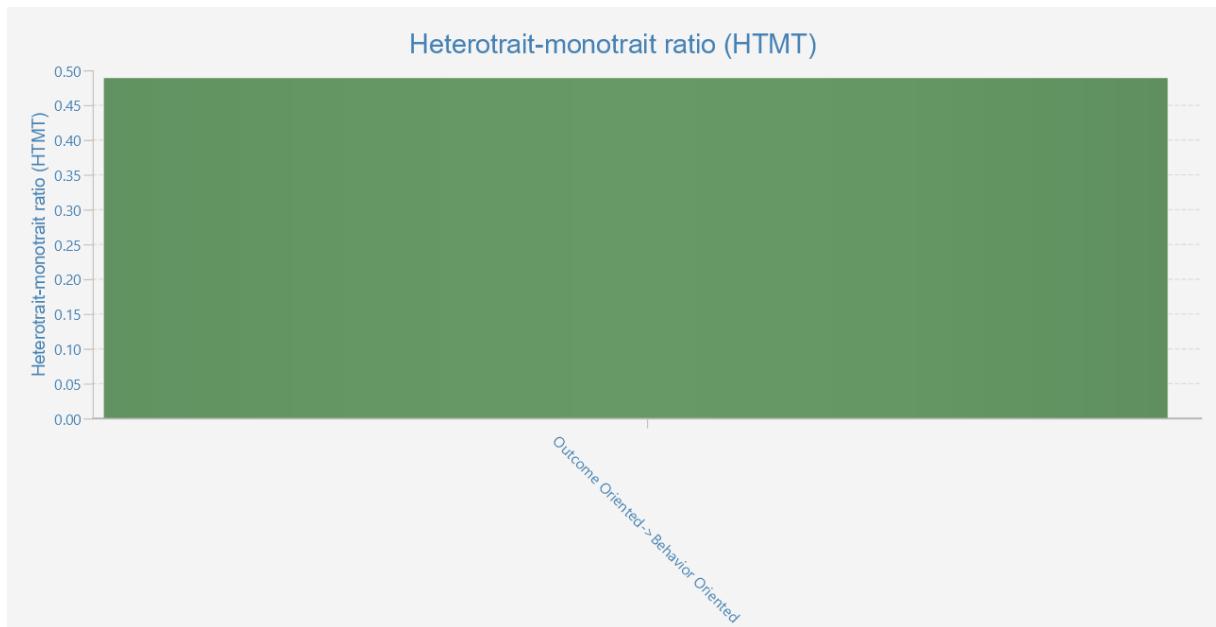
	Cronbach Alpha	CR	CR	AVE	HTMT
		rho-A	rho-C		Behavior Oriented
Outcome Oriented	0.732	0.734	0.882	0.789	
Behavior Oriented	0.879	0.92	0.917	0.735	0.488

Model Fit Indices: SRMR=.072, d_ULS=.108, d_G=.085, Chi-square=54.420, NFI=.820

The Table 5.22 above shows that the Cronbach's Alpha value after testing for reliability is higher than 0.7 for both Outcome and Behaviour Oriented contract indicators. This indicates compliance with internal consistency. This implies that the concepts in the proposed framework were adequately stated thereby rendering measurement outcomes of the framework very reliable. Consequently, the measurement outcome of this framework in this study has provided sufficient evidence in terms of reliability.

Confirmation of discriminant validity is further shown by the bar chart for the HTMT ratio for Contract type is presented in the graph shown in figure 5.8 below. Additionally, the SRMR of 0.077 in table 5.8 falls between the acceptable range for the SRMR index between 0 and 0.08 (Hu & Bentler, 1999). This indicates a good model fit for the measurement model.

Figure 5.8: A graph showing the HTMT ratio of Outcome Oriented to Behaviour Oriented factor loadings



The HTMT ratio for Outcome Oriented to Behaviour Oriented outcomes is 0.488. This value is greater than 0.2 which is the lower threshold for the HTMT ratio while testing for discriminant validity. Also noteworthy is the fact that the HTMT ratio is less than 0.85 which is the upper threshold for discriminant validity.

5.4.6 EFA and CFA for Process Quality

Exploratory Factor Analysis for Process Quality was done. The results for this analysis were obtained in table 5.22 as shown. These results were further tested using Confirmatory Factor Analysis method in order to refine and confirm the factors to be used in the structural framework. The Confirmatory Factor analysis results for the variable “Process Quality” are presented in sub section 5.4.6.1 together with the KMO results for the CFA model for Process Quality. This model is comprised of two constructs namely Monitoring and Evaluation and Top Management Participation.

The Monitoring and Evaluation construct was coded as ML in SPSS, and was measured by ‘presence of a project plan for monitoring DT projects’ ML1, ‘Periodic comparison of project progress to schedule’ ML2, ‘Use of project management software for DT projects’ ML3,

‘Submission of progress reports for effective monitoring’ ML4, ‘Periodic team meetings to review each process’ ML5, ‘Periodic review sessions’ ML6.

The Top Management Participation construct was coded as TMP in SPSS, and was measured by ‘Top Management followed the implementation of digital transformation as an item on its agenda’ TMP1, ‘Top managements insistence on periodic quality assurance reports for each digital transformation process’ TMP2, ‘Top management insisting that only qualified experts are assigned the role to monitor each DT process’ TMP3, ‘Process quality is top on our Agenda for Top Management to achieve DT’ TMP4.

Table 5.23: A table showing the Factor Structure for Process Quality

Code	Label	Top Management Participation	Monitoring & Evaluation
TMP3	Top Management Guided that only qualified experts are assigned the role to monitor quality of each DT process	.922	
TMP2	Top Management insists on periodic quality assurance reports for each digital transformation process	.921	
TMP1	Top Management on its agenda followed the implementation of digital transformation	.872	
ML1	There is a project plan for this project used for Monitoring of this project	.939	
ML3	Project Management Software was used in this project for successful digital transformation	.919	
ML2	There was periodic comparison of project progress to schedule	.866	
Eigen values		2.497	2.494
Variance (%)		41.623	41.57
Cumulative Variance (%)		41.623	83.193

The results following the exploratory Factor Analysis for Process Quality in Table 5.23 show that two factors were retained as significant primarily because their Eigen Values were above the threshold of 1.00. This means that both factors were considered as worth analyzing. There

were 6 out of 10 indicators that were retained in the measurement scale after exploratory factor analysis.

The analysis shows that the factors that were extracted for Process Quality, in the order of factor loading are as follows; Top Management Participation (Eigen value = 4.407, Variance = 44.075%), followed by Self Deployment (Eigen value = 2.497, Variance = 41.623%) and Monitoring and Evaluation (Eigen value = 2.494, Variance = 41.57%). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy test and the Bartlett's Test of Sphericity were also carried out. Table 5.18 presents the significance and results of these tests.

Table 5.24: Significance of Exploratory Factor Analysis for Process Quality

KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.693
Bartlett's Test of Sphericity	Approx. Square	Chi-Square	359.047
	df		15
	Sig.		.000

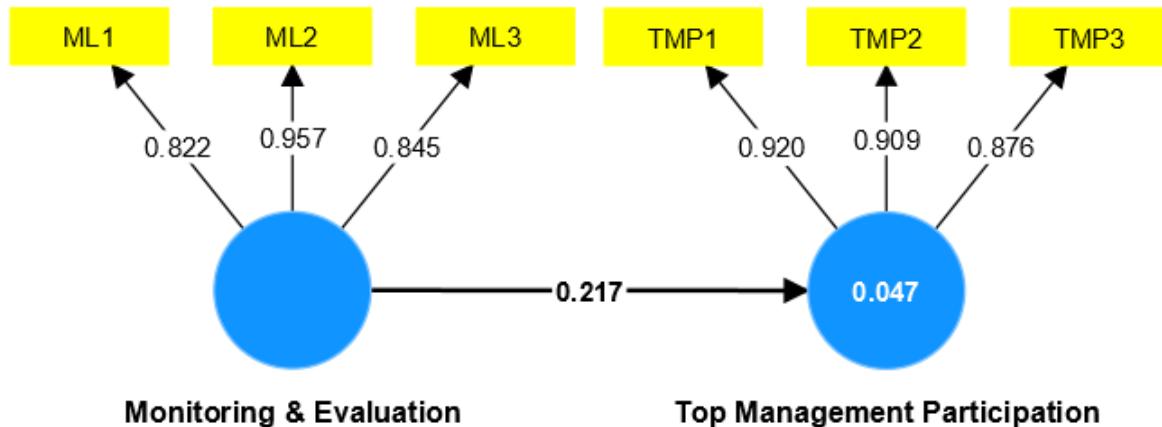
The results in Table 5.24 show that the Kaiser-Meyer-Olkin (KMO) test for sample adequacy returned a value of 0.693, which is above 0.5. This shows that the sample used to test the variable “Process Quality” in this Study was suitable for Factor Analysis using Structured Equation Modelling. The Bartlett's test of Sphericity returned an approximate chi-square value of 359.047. The degrees of freedom, df = 15. This was found to be an acceptable and significant result with a P value of 0.000 which is below 0.05, this implies that the factors that make up the factor structure have significant relationships sufficient to measure Process Quality as a variable in this survey.

5.4.6.1 Confirmatory Factor Analysis (CFA) results for Process Quality

The CFA for Process Quality is as presented in Figure 5.9 below. The analysis confirmed two factors that were retained after the CFA. The two retained factors are: “Monitoring and Evaluation” and “Top Management Participation.” The summary of the CFA in the measurement model of Process Quality in Figure 5.9 shows that the following indicators were

found to be significant; ML1, ML2 and ML3 for Monitoring and Evaluation; TMP1, TMP2 and TMP3 for Top Management Participation.

Figure 5.9 Showing CFA for Process Quality



These are the six indicators that were retained following Confirmatory Factory analysis (CFA). These indicators were later used in the computation of scores for Process Quality with a view to obtain the estimation of the structural model.

5.4.6.2 Reliability and Validity for Process Quality

The results in table 5.25 below show that the indicators retained in the summary of the measurement model of Process Quality guarantee both reliability and validity.

Table 5.25: A table showing Reliability and Validity of Measures for Process Quality

	Cronbach Apha	CR	CR	AVE	HTMT
		rho-A	rho-C		Top Management Participation
Monitoring & Evaluation	0.878	0.963	0.908	0.769	
Top Management Participation	0.893	0.991	0.929	0.813	0.167

Model Fit Indices: SRMR=.079, d_ULS=.152, d_G=.141, Chi-square=92.099, NFI=.746

The test scores for the composite reliability for Monitoring & Evaluation and Top Management Participation are greater than 0.70. This implies that there is Internal Consistency.

Furthermore, both convergent validity and discriminant validity were assured since the AVE for both factors are over 0.5 and the HTMT for the pair of constructs above is below 0.85 as suggested by Henseler et al., (2015) as the thresholds for the HTMT ratio.

Additionally, the SRMR of 0.077 in table 5.22 falls between the acceptable range for the SRMR index between 0 and 0.08 (Hu & Bentler, 1999). This indicates a good model fit for the measurement model.

5.4.7 EFA and CFA for Digital Transformation

Exploratory Factor Analysis for the dependent variable, “Digital Transformation” as a construct was carried out. The results were obtained as shown in table 5.26 below. These results were further tested using Confirmatory Factor Analysis so as to refine and confirm the factors to be used in the structural framework. The Confirmatory Factor analysis results for the variable “Digital Transformation” are presented in sub section 5.4.7.1 together with the sampling adequacy test (KMO) results for the CFA model for Digital Transformation. This model is comprised of two constructs namely IT Resource Usage and User Satisfaction.

Under the Digital Transformation construct, both IT Resource Usage coded as IRU in SPSS and User Satisfaction coded as US were investigated as factors for improved success of digital transformation projects. Both IRU and US were measured by confirming that ‘All ICT equipment from the USDP/ARSDP project is being used for teaching’ IRU1, ‘All ICT equipment from the USDP/ARSDP project is being used for students to learn independently’ IRU2, ‘All ICT equipment from the USDP/ARSDP project is being used for Institution administration’ IRU3, ‘All ICT equipment from the USDP/ARSDP project is being used for digital transformation for Analytics’ IRU4, Users in the TVET institutions are satisfied with the new digital products’ US1, ‘Students are satisfied with the Digital Technology at the Institutions for improved learning’ US2, ‘Administrators are satisfied with the digital equipment used to improve on how they work (e.g. better decision making)’ US3, ‘The institution is now more responsive to the needs of its customers’ US4.

Table 5.26: A table showing the Factor Structure for Digital Transformation

Code	Label	IT Resources	User Usage	User Satisfaction
IRU4	All ICT equipment from the USDP/ARSDP project is being used for digital transformation for Analytics	.859		
IRU1	All ICT equipment from the USDP/ARSDP project is being used for teaching	.822		
IRU3	All ICT equipment from the USDP/ARSDP project is being used for Institution administration	.728		
IRU2	All ICT equipment from the USDP/ARSDP project is being used for students to learn independently	.714		
US4	The institution is now more responsive to the needs of its customers	.859		
US2	Students are satisfied with the Digital Technology at the Institutions for improved learning	.834		
US1	Users in the TVET institutions are satisfied with the new digital products	.804		
US3	Administrators are satisfied with the digital equipment used to improve on how they work (e.g. better decision making)	.609		
Eigen values		2.953	2.889	
Variance (%)		36.917	36.119	
Cumulative Variance (%)		36.917	73.036	

The results following the exploratory Factor Analysis for Digital Transformation in Table 5.23 show that two constructs were retained as significant factors because their Eigen Values that were above the threshold of 1.00. Both factors were considered as worth analyzing as a result. There were 7 out of 8 indicators that were retained in the measurement scale. The analysis shows that the factors that were extracted for Digital Transformation after EFA, in the order of factor loading are as follows; IT Resource Usage (Eigen value = 2.953, Variance = 36.917%), and User Satisfaction (Eigen value = 2.889, Variance = 36.119%). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy test and the Bartlett's Test of Sphericity were also carried out.

Table 5.27: Significance of Exploratory Factor Analysis for Digital Transformation

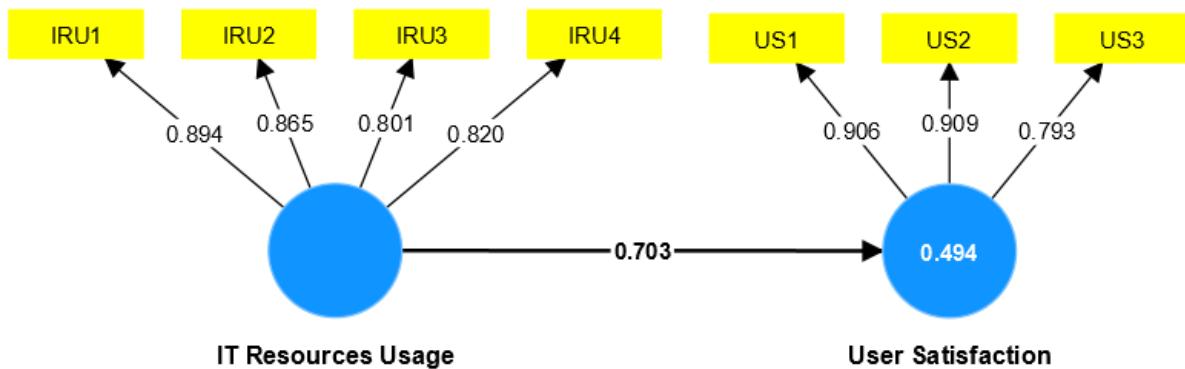
KMO and Bartlett's Test			
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.814
Bartlett's Test of Sphericity	Approx. Square	Chi-Square	538.677
	df		28
	Sig.		.000

The results in Table 5.27 show that the Kaiser-Meyer-Olkin (KMO) test for sample adequacy returned a value of 0.814, which is above 0.5. This shows that the sample used to test the variable “Digital Transformation” in this Field Study was suitable for Factor Analysis using Structured Equation Modelling. Bartlett's test of Sphericity returned an approximate chi-square value of 538.677. The degrees of freedom, df = 28. This was found to be acceptable and significant result with a P value of 0.000 which is below 0.05, this implies that the factors that make up the factor structure have significant relationships sufficient to measure Digital Transformation as a variable in this research study.

5.4.7.1 Confirmatory Factor Analysis (CFA) results for Digital Transformation

The CFA for Digital Transformation is as presented in Figure 5.10 below. The analysis confirmed two factors that were retained after the CFA. The two retained factors are: “IT Resource Usage” and “User Satisfaction.” The summary of the CFA in the measurement model of Digital Transformation in Figure 4.6 shows that the following indicators were found to be significant; IRU1, IRU 2, IRU 3 and IRU 4, for IT Resource Usage; US1, US2, US3 and US4 for User Satisfaction. Under the Digital Transformation construct, both IT Resource Usage coded as IRU in SPSS and User Satisfaction coded as US were investigated as factors for improved success of digital transformation projects.

Figure 5.10: Confirmatory Factor Analysis results for Digital Transformation



Both IRU and US were measured by confirming that ‘All ICT equipment from the USD/P/ARSDP project is being used for teaching’ IRU1, ‘All ICT equipment from the USD/P/ARSDP project is being used for students to learn independently’ IRU2, ‘All ICT equipment from the USD/P/ARSDP project is being used for Institution administration’ IRU3, ‘All ICT equipment from the USD/P/ARSDP project is being used for digital transformation for Analytics’ IRU4, Users in the TVET institutions are satisfied with the new digital products’ US1, ‘Students are satisfied with the Digital Technology at the Institutions for improved learning’ US2, ‘Administrators are satisfied with the digital equipment used to improve on how they work (e.g. better decision making)’ US3, ‘The institution is now more responsive to the needs of its customers’ US4. These indicators were then used in the computation of the scores for Digital Transformation which were used in the estimation of the structural model. These are the indicators that were retained following Confirmatory Factory analysis (CFA).

5.4.7.2 Reliability and Validity for Digital Transformation

The results in table 5.28 below show that the indicators retained in the summary of the measurement model of Digital Transformation guarantee both reliability and validity. The test scores for the composite reliability for Counterproductive multitasking and Self-deployment are greater than 0.85. This implies that there is Internal Consistency.

Furthermore, both convergent validity and discriminant validity were assured since the AVE for all factors is over 0.5 and the HTMT for the construct pair in table 4.22 is below 0.85 as suggested by Henseler et al., (2015).

Table 5.28: A table showing the Reliability and Validity of 'Digital Transformation'

		Cronbach Alpha	CR rho-A	CR rho-C	AVE	HTMT IT Resources Usage
IT Resources	Usage	0.867	0.868	0.909	0.715	
User Satisfaction		0.839	0.845	0.904	0.759	0.824

Model Fit Indices: SRMR=.069, d_ULS=.261, d_G=.192, Chi-square=123.372, NFI=.749

5.6 Chapter Summary

In this section we present a summary of the findings of the field study. The general objective of this field study was to identify the variables (latent) or factors that contribute to the improved success of digital transformation projects in Technical, Vocational Education and Training Institutions in Ugandan.

Following this field study and the descriptive statistics reported in this chapter, the responses to the indicators on all the seven latent variables were positive. The mean scores across all indicators ranged from 2.0 to 4.2 (Lowest to highest) on a 5-point Likert scale. In this study, the variables analyzed were Goal conflict, Shirk, Communication, Task Programmability, Contract Type, Process Quality and Digital Transformation.

Following the reliability test on each variable, using Cronbach's alpha, the results showed that all the latent variables are positive. The lowest recorded value following the Cronbach's alpha assessment was a minimum score of 0.732 which is above the threshold of 0.7.

Further, the convergent validity results showed that all of seven latent variables had a convergent score of over 0.5 based on the AVE technique for this specific assessment. Globally, the discriminant validity scores grounded on the HTMT technique was adequate although the latent variable "Top Management Participation" scored an HTMT value of 0.167 which is approximately 0.2 for assessment of discriminant validity.

The results of this study in this chapter therefore show that the study tools applied in this research have a high overall validity and reliability. The results therefore also suggest that this

framework for digital transformation success is robust, true and accurate. Further, the constructs and aspects in this framework for improved success of digital transformation projects as well as their relationships were precise and appropriate for this study.

The framework after the confirmatory factor analysis was complete since only valid constructs and aspects were retained and the others dropped. Chapter 4 also presented the results of the qualitative data analysis. These qualitative analysis results support the overall findings of the results from the quantitative analysis using PLS-SEM. The next chapter will discuss the proposed framework that may be relied upon to improve digital transformation projects in Ugandan TVETs.

CHAPTER SIX: DESIGN OF SDTP

6.1 Introduction

Chapter two of this study introduced a conceptual framework for improved Success of Digital Transformation Project (SDTP) and how this framework was derived. Following the principles of the design science methodology detailed in chapter three, a descriptive field study to test the SDTP conceptual framework was employed. This involved validating crucial variables and factors essential for analyzing the constructs that formed the conceptual framework using structured equation modelling. Thus, the current chapter delves into the design of SDTP. The following sections elucidate the process of deriving SDTP. This chapter will also present the hypotheses pertaining to the relationships among constructs explained in chapter two.

6.2 Development of the proposed model

In the development of SDTP, the design cycle from the design science methodology was utilized. This design cycle facilitates the development and refinement of the actual artifact, along with successive evaluations of the artifact's effectiveness (Drechsler & Hevner, 2016). As outlined by Vaishnavi et al. (2004), design is not a novel concept; it involves the process of constructing an artefact with a specific purpose in mind (Brady et al., 2013). Within the framework of design science, the central outcome of the design phase is an artifact that can manifest as models, constructs, methods, or instantiations (Vaishnavi et al., 2004).

In the context of this study, the artifact SDTP – an encompassing framework designed to facilitate improved success of digital transformation projects. A framework constitutes a system of interconnected components supporting a designated approach to a particular goal (Business Directory, 2010). It serves as a flexible guide, agreeable to modification by addition or removal of elements as necessary (Business Dictionary, 2010).

In the realm of design science inquiries, the development of a framework is rooted in both theoretical and practical insights (Hevner et al., 2004; Peffers & Tuunanen, 2005). This alignment arises from the design science's emphasis on the creation of artifacts through the skillful application of theories, methods and approaches found within the existing knowledge base (Peffers & Tuunanen, 2005; Drechsler & Hevner, 2016). In developing SDTP, the researcher conducted an exhaustive examination of literature concerning theories like Agency theory, DeLone and McLean theory as well as the dynamic capabilities theory.

Furthermore, an assessment of literature on factors enabling and hindering successful digital transformation projects was exhaustively done. Insights gathered from the literature survey in chapter two steered the development of the conceptual framework for SDTP (depicted in figure 2.17). To complement this literature exploration, a detailed descriptive field study was executed to validate the variables and their relationships incorporated within the SDTP conceptual framework. Figure 6.1 offers a visual representation of the components involved in designing the conceptual framework for SDTP.

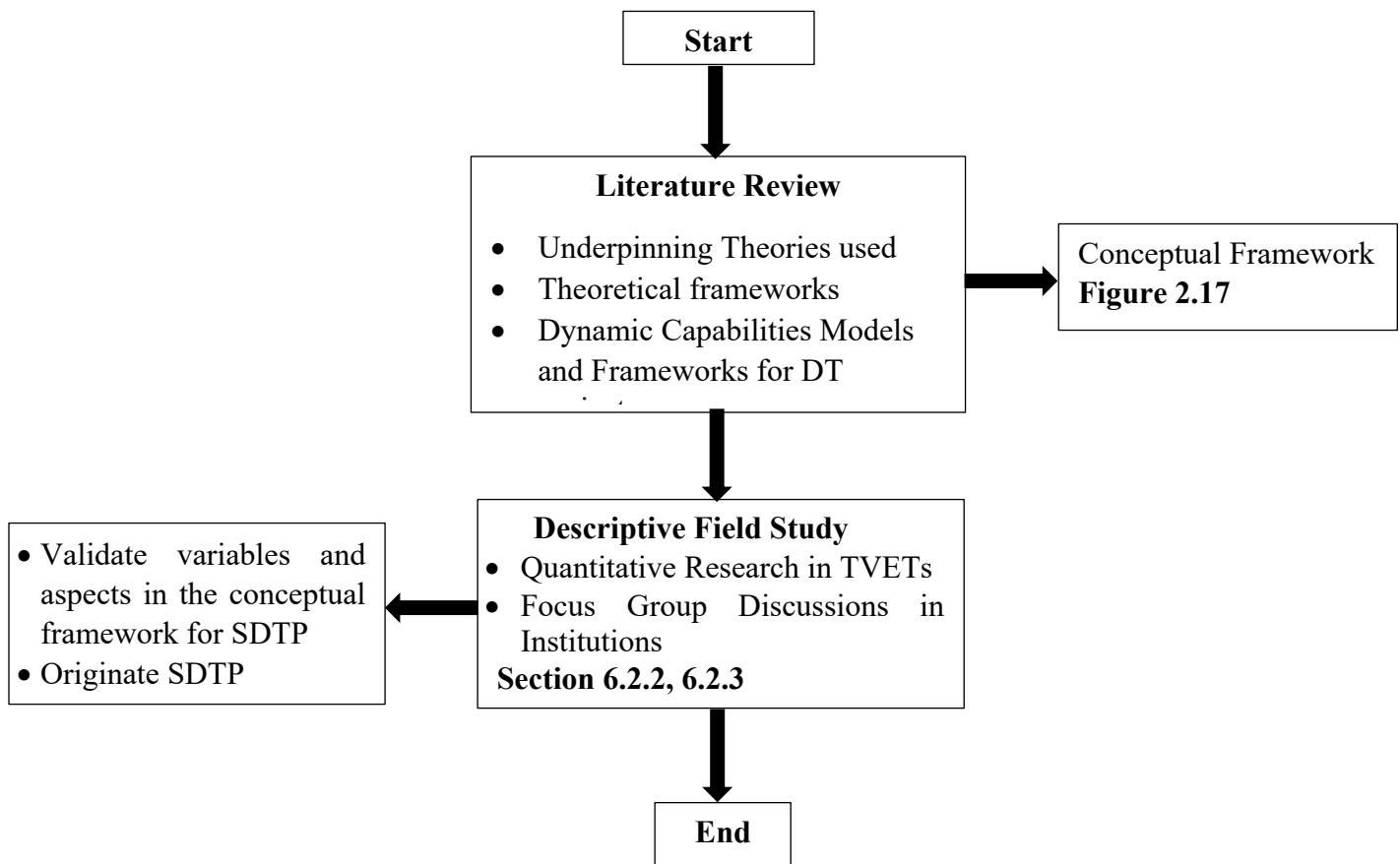


Figure 6.1: An illustration showing the design of the conceptual framework for SDTP

6.2.1 Implementation of Theories of Project Success

Theoretical frameworks about digital transformation project success hold important relevance in the execution of processes leading to successful digital transformation projects. These structural theories simplify the separation of digital transformation processes into distinct components, allowing for the contextual application of techniques and tools (Metla, 2008).

An arrangement of project success theories and frameworks, such as the organizational capabilities theory (Joshi et al., 2022); knowledge-based theory of the firm (Grant, 1996); DeLone and McLean Theory (DeLone & McLean, 1992), Agency Theory (Mahaney and Lederer, 2003) has emerged and been employed to analyze digital transformation project processes. The insights collected from these project success theories are created as follows: 1) SDTP adheres to most of the structures of the Agency Theory Framework by Mahaney and Lederer for the Project Success framework, that seek to analyze and address the inherent conflicts of interest that arise between principals and agents. These conflicts arise due to differing goals and information asymmetry between the two parties. The principal desires the agent's actions to align with their own interests and yet the agent may be motivated with incentives that diverge from the interests of the principal. SDTP builds upon the input, process and outcome arrangement utilized within Agency theory framework; 2) Most of the variables initially established in the Agency Theory Framework (Mahaney & Lederer, 2003) have been retained within SDTP although with modifications. The retained constructs include factors like Goal Conflict, Shirking, Task Programmability, Project Success (now call digital transformation project success) and information asymmetry (now called Communication); 3) Aspects denoted in black font within the framework for SDTP have been retained from the foundational Agency theory framework, forming its core. Conversely, aspects highlighted in italics have been introduced into the SDTP framework that were adapted from other structural theories; 4) The selection of the Agency Theory Framework as the foundational theory is rooted in its specific focus on the principal's goal's versus the agents goals, process quality of the monitoring and control mechanisms, communication to curtail information asymmetry and the relationship between the principal and the agent who carries out the delegated tasks given by the principal to achieve project success. Contract design was another area of focus. The results of this study showed that Contract Type is insignificant in the context of Ugandan TVETs; 5) As such, the interrelationships among variables suggested within the Agency theory framework

have been modified in the framework for SDTP in the subsequent form: a) The influence of Goal Conflict on Process Quality impacts digital transformation project success negatively; b) Effective communication limits the tendency by agents to withhold information from the principal leading to improved process quality which significantly leads to improved digital transformation project success; c) Shirk significantly, negatively influences process quality which in turn negatively influences the overall outcomes for digital transformation project success; d) Task Programmability shapes the appropriation of roles and responsibilities within the project implementation team which positively influences Process Quality which in turn has a direct positive and significant impact on digital transformation project success.

6.2.2 Design Implications of Findings from the Descriptive Field Study

During the SDTP design process, its conceptual framework underwent testing through a descriptive field study. The data obtained from this study was subjected to Exploratory Factor Analysis (EFA) and then Confirmatory Factor Analysis (CFA) techniques using the Partial Least Square method by applying Structural Equation Modelling (SEM).

The primary objective of this approach was to examine the causal relationships among the variables, while accounting for measurement of statistical error. This is done with a view to explain the patterns of correlations among the variables and to also explain the variance within the variables with the derived framework to the greatest extent possible. When this was done then, then ultimately the primary objective of establishing factors that improve the success of digital transformation projects was achieved.

Following the assessment of reliability and validity scores, a selection was made to extract several variables for the subsequent examination of the refined SDTP conceptual framework (version 2). This is the first iteration of this design. The variables that demonstrated a robust loading of at least 0.7 onto their respective factors were deemed suitable for the continued evaluation of the SDTP conceptual framework.

These constructs along with their corresponding measurement items are revisited and outlined as follows: 1) The Politics construct was coded as PT in SPSS, and was measured by ‘Politics playing a role in the acceptance of this project’ (PT1), ‘Politics playing a role in the prioritization of Digital transformation (DT) reforms’ (PT2), ‘Politics playing a role in the

allocation of resources towards DT’(PT3), ‘Political influence in favour of a Digital Transformation Project being necessary for success of the project for Digital Transformation’ (PT4), ‘Being aware of the local politics for success of Digital projects’ (PT5), ‘Impact of political influence of institution vs influence of politician on the extent of project success’ (PT6), ‘Impact of political influence of an individual on DT’ (PT7); 2) The Power construct was coded at PO in SPSS, and was measured by ‘The role power dynamics plays in digital transformation’ PO1, ‘The impact on leadership in their ability to influence the adoption of DT’ PO2, ‘The influence of power of the institution to influence DT’ PO3, ‘The performance of the implementation team depending on the power given by Top Management’ PO4, ‘DT success influenced by position of power in policy implementation of the DT project PO5; 2) The Policy construct was coded as PY in SPSS, and was measured by ‘Policy in place to guide DT projects’ PY1, ‘Success of DT depends on the backing of a powerful political actor’ PY2, ‘Ability to control resources in a TVET institution leads to policy implementation success’ PY3, ‘Leaders of DT must be an individual(s) holding a position of influence’ (PY4), ‘A DT policy being vital for the success of a DT project’ (PY5); 3) The Shirking construct was coded as SH in SPSS, and was measured by ‘Taking excessive breaks’ SH1, ‘Taking long lunches’ SH2, ‘Talking on phone’ SH3, ‘Surfing the internet’, SH4, ‘Excessive time on social media’, SH5, ‘Working on enjoyable, less important tasks’, SH6, ‘Socializing’, SH7, ‘Calling in when sick when healthy’, SH8, ‘Working on wrong tasks’ SH9, ‘Working on other tasks other than DT tasks’ SH10, ‘Poor organization’, SH11. Each of these measurements fall under “Counter Productive Multitasking” or “Self-Deployment”; 4) The CEO-CIO relationship type construct was coded as RT in SPSS, and was measured by ‘the CIO being open about problems’ RT1, ‘The CIO discusses how the project will achieve requirements for DT in simple terms’ RT2, ‘The communication channel between the CIO and CEO is always to a satisfactory extent’ RT3, ‘The CEO relies on the CIOs technical expertise for successful DT of TVETs’ RT4, ‘The CIO innovatively finds ways around obstacles between himself and the CEO’ RT5, ‘The CEO and the CIO have a healthy professional relationship’ RT6. The Reporting construct was coded as RE in SPSS, and was measured by ‘The project implementation team overstating their progress’, RE1, ‘Project team understating actual time they spend on tasks each day’, RE2, ‘The project hides problems they know in the project’ RE3, ‘Some tasks are skipped yet not reported as skipped’ RE4, ‘Reports are carefully worded every time’ RE5. The Information Asymmetry construct was coded as IA in SPSS, and was measured by ‘Task team members openly discussing project problems in status reporting’ IA1, ‘Task team members readily

sharing critical project status information' IA2, 'Task team members openly describing issues to auditors when called upon' IA3, 'Task team members only openly discussed problems they believed could be corrected quickly' IA4; 5) The Task Programmability construct was coded as TP in SPSS, and was measured by 'Having a clear, written methodology for executing the DT project' TP1, 'clear procurement guidelines were followed from start to finish of the DT project' TP2, 'Reliance on clear specifications from IT professionals for DT procurements' TP3; 6) The Contract Type construct is categorized as Output Oriented Outcome contracts and Behaviour Oriented Contracts. These sub groups were coded as OOC and BOC respectively in SPSS. The two indicators were measured by 'Contract for team members provided with a flexible work schedule' OOC1, 'Contract for team members provides for public praise' OOC2, 'Contract for team members provides for Technical training' OOC3, 'Contract for team members provides for sense of contribution to organization' OOC4, 'Contract for team members provides for favorable annual performance appraisals' OOC5, 'Contract for team members provides for choice of future assignment' OOC6, 'Contract for team members provides for Job promotion' OOC7. These are the measurement parameters for Output Oriented Contracts. Behaviour Oriented Contracts as the contract of choice for improved success of DT projects, were also measured and coded as BOC in SPSS. BOC were measured checking to see whether the 'Contract for team members provides for a guaranteed salary irrespective of outcome' BOC1, 'Contract for team members provides for entitlement to newer technology (i.e., laptop, tablet)' BOC2, 'Contract for team members provides for opportunity to work from home' BOC3, 'Contract for team members provides for private office space' BOC4. The table 5.18 below shows the results for the Exploratory Factor Analysis for Contract Type as a variable in form of a rotated component matrix in the order of how each factor was accordingly loaded following this analysis; 7) The Monitoring and Evaluation construct was coded as ML in SPSS, and was measured by 'presence of a project plan for monitoring DT projects' ML1, 'Periodic comparison of project progress to schedule' ML2, 'Use of project management software for DT projects' ML3, 'Submission of progress reports for effective monitoring' ML4, 'Periodic team meetings to review each process' ML5, 'Periodic review sessions' ML6. The Top Management Participation construct was coded as TMP in SPSS, and was measured by 'Top Management followed the implementation of digital transformation as an item on its agenda' TMP1, 'Top managements insistence on periodic quality assurance reports for each digital transformation process' TMP2, 'Top management insisting that only qualified experts are assigned the role to monitor each DT process' TMP3, 'Process quality is top on our Agenda

for Top Management to achieve DT' TMP4; 8) Under the Digital Transformation construct, both IT Resource Usage coded as IRU in SPSS and User Satisfaction coded as US were investigated as factors for improved success of digital transformation projects. Both IRU and US were measured by confirming that 'All ICT equipment from the USDP/ARSDP project is being used for teaching' IRU1, 'All ICT equipment from the USDP/ARSDP project is being used for students to learn independently' IRU2, 'All ICT equipment from the USDP/ARSDP project is being used for Institution administration' IRU3, 'All ICT equipment from the USDP/ARSDP project is being used for digital transformation for Analytics' IRU4, Users in the TVET institutions are satisfied with the new digital products' US1, 'Students are satisfied with the Digital Technology at the Institutions for improved learning' US2, 'Administrators are satisfied with the digital equipment used to improve on how they work (e.g. better decision making)' US3, 'The institution is now more responsive to the needs of its customers' US4.

After identifying the significant factors and their corresponding measures, the initial phase of path modelling was initiated. The purpose of this phase was to examine the links between independent and the dependent variables. Additionally, the process of path modeling produced factor loadings, which are crucial for identifying relevant measurement items. Consequently, incorporating path modelling in both the first and second iterations facilitated the creation of the SDTP, as shown in section 6.2.5.

6.2.3 Path Modelling: 1st Iteration

Path modelling serves as a technique aimed at estimating and comprehending intricate interrelationships among latent variables. These path models include both direct and indirect effects among observable models (Gorai et al., 2015). Path models are rooted in multiple regression equations therefore path models can be seen as logical extensions of regression models (We & Zang, 2009). In view of this, the subsequent subsection explores the assessments utilized to validate the structural model within the scope of this study.

The validation of the structural model was achieved through the application of the coefficient of determination (R^2) and path coefficients. These parameters, facilitating the evaluation of the model's predictive power and relationship strengths, were obtained through two iterations of path modelling and subsequent analysis using Partial Least Squares software (Ringle et al., 2015). Leveraging a series of multilinear regressions, the PLS-SEM software is proficient at

predicting causal effects (Ringle et al., 2014). The outcomes of the Structural Equation Modelling algorithm, explaining factor loading, R² values and the influences variables exert upon one another, are depicted in figure 6.2.

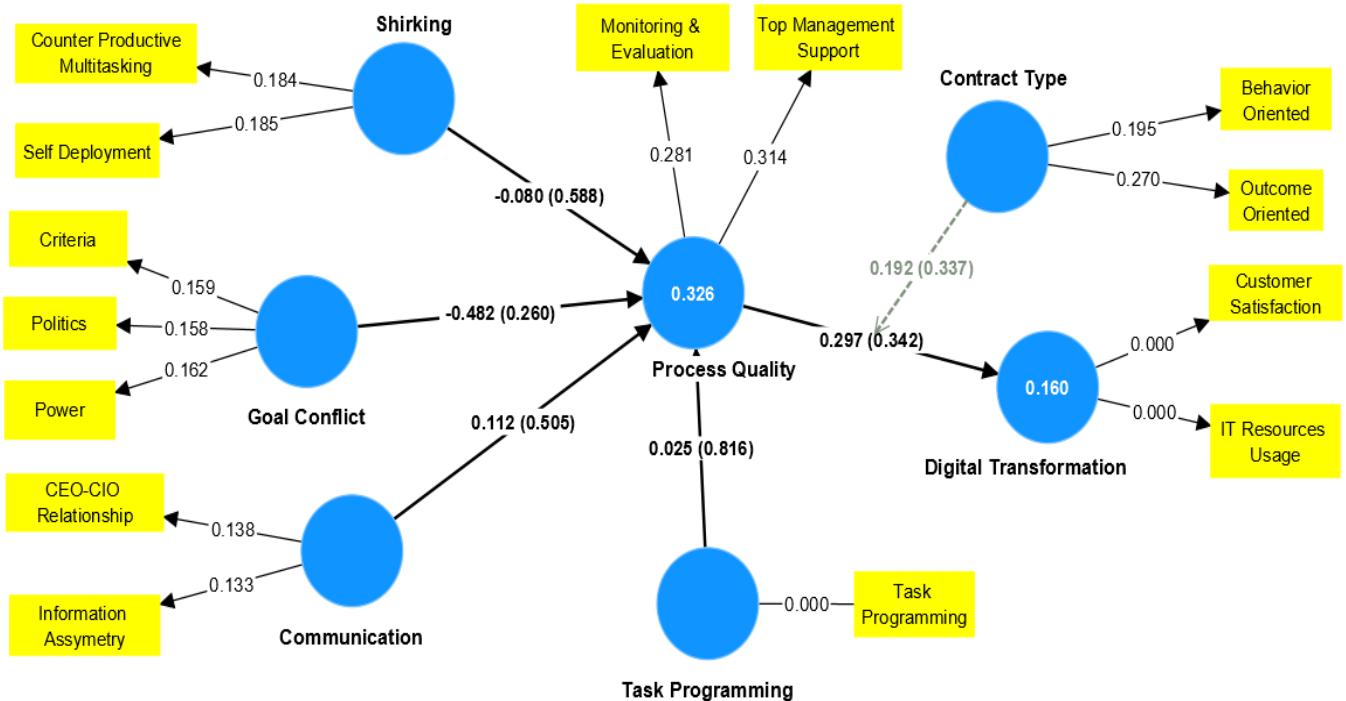


Figure 6.2: First iteration results indicating Factor loadings, R² values and variable effects

The Table 6.1 shows the analysis of path coefficients for the first iteration of the model in Figure 6.2. The examination of path coefficients indicated that most of the scores were not statistically significant. More importantly, Contract Type, the moderating variable has a coefficient ($\beta = 0.192$) which represents the strength of the relationship between contract type and Digital Transformation. As a moderating variable, the coefficient ($\beta = 0.192$) is weak. Further, the p-value associated with the beta value indicates the p-value of 0.337 is greater than the significance threshold of 0.05 which proposes that the observed relationship between Contract Type and Digital Transformation could credibly be due to random chance rather than a meaningful effect. The fact that there is absence of statistical significance in the coefficient of the variable “Contract Type” ($p>0.05$) carries implications for the overall model. This suggests that the moderating variable’s impact on the independent variable lacks a reliable distinction from random chance. Therefore, the interpretation and validity of the entire model

may be influenced, potentially hindering its effectiveness in explaining the inherent relationships within the dataset.

From the results we see from Table 6.1 and Table 6.2, the interaction (Process Quality * Contract Type) creates an interaction term which allowed this study to assess whether the joint impact of both variables together has a unique effect on Digital Transformation beyond the expectation from each variable individually. The result of this analysis in table 6.1 showed that the combined effect of “Process Quality” and “Contract Type” significantly contributes to explaining the variation in “Digital Transformation”. The positive beta = 0.192 shows that when both “Process Quality” and “Contract Types” are favorable, they collectively enhance the likelihood or extent of “Digital transformation” as the analysis result in table 6.1 show.

Table 6.1: Significance of path coefficients from first iteration

	Beta	Mean	SD	T Statistic	Sig	R ²	H ₀
Goal Conflict - ► Process Quality	-.482	-.248	.428	1.126	.260	.326	Not Supported
Communication - ► Process Quality	.112	.053	.167	.666	.505		Not Supported
Task Programmability - ► Process Quality	.025	.014	.106	.232	.816		Supported
Shirking - ► Process Quality	-.080	-.014	.147	.541	.588		Supported
Goal Conflict - ► Digital Transformation	-.143	-.100	.122	1.174	.241	.160	Not Supported
Process Quality - ► Digital Transformation	.297	.057	.313	.950	.342		Not Supported
Task Programmability - ► Digital Transformation	.007	.003	.034	.218	.828		Not Supported
Shirking - ► Digital Transformation	-.024	-.022	.040	.594	.553		Supported
Process Quality*Contract Type - ► Digital Transformation	.192	.033	.200	.961	.000		Supported
Model Fit Indices: SRMR=.103, d_ULS=1.111, d_G=.464, Chi-square=294.660, NFI=.409							

The results in Table 6.1 show that most of the path coefficients were not significant, with p-values above the p-value maximum threshold of 0.05. The insignificant path coefficients were between Goal Conflict and Process Quality with a p-score of 0.260, Communication and Process Quality with a p-score of 0.505, Goal Conflict and Digital Transformation with a p-score of 0.241, Process Quality and Digital Transformation with a p-score of 0.342 and Task Programmability and Digital Transformation with a p-score of 0.828. All the details of the

results in Figure 6.2 are summarized in Table 6.1, showing the t-statistic, beta values and the p-values.

The model fit indices also indicated that the Standardized Root Mean Square Residual (SRMR) = 0.103. An SRMR value below 0.08 is considered a very good fit, and a value of 0.103 is above this threshold. It was necessary to consider the SRMR value in conjunction with other fit indices to make a comprehensive assessment of the model fit.

The Normed Fit Index (NFI) value of 0.409 as shown in Table 6.1 suggest that this model's fit, for the NFI ranges from 0 to 1, is relatively low. Generally, an NFI value above 0.90 is considered a good fit, while values below 0.9 suggest that the model might not be fitting the data well.

Further, in table 6.2, we present the findings of the Moderated Mediation Analysis of this data set. This table shows the Estimation of Indirect Effects of mediation of Process Quality and Digital Transformation by Goal Conflict. All the path coefficients returned p-values that are over and above the p-value for statistical significance. This means that the mediation effect of "Process Quality * Contract Type" does not sufficiently explain the relationship between "Goal Conflict" and "Digital Transformation" within this study as evidenced by the non-significant p-value and the relatively weak beta coefficient.

Table 6.2: Estimation of Indirect Effects and Mediation

	Beta	Mean	SD	T Statistic	P - Value	H ₀
Goal Conflict -► Process Quality -► Digital Transformation	-.143	-.100	.122	1.174	.241	Not Supported
Communication -► Process Quality -► Digital Transformation	.033	.024	.049	.049	.502	Not Supported
Task Programmability -► Process Quality -► Digital Transformation	.007	.003	.034	.218	.828	Not Supported
Shirking -► Process Quality -► Digital Transformation	-.024	-.022	.040	.0594	.594	Not Supported

The analysis of the mediation involving “Goal Conflict” leading to “Process Quality*Contract Type*” and subsequently to “Digital Transformation” in table 6.1 shows no statistical significance since the p-value of 0.241 of these paths. This also means that the observed mediation effect by “Contract Type” could have occurred by mere random chance. Moreover, there isn’t strong evidence to support a meaningful indirect relationship. The analysis therefore suggested that there was need to refine measurements by examining the measurement of the moderating variable (Contract Type) and the dependent variable. All efforts to ensure reliable and valid measures of the constructs under investigation were not successful.

A second iteration was carried out as explained in section 6.2.4. “Contract Type” in the next iteration was not used in the final framework for Digital Transformation. Contract type was dropped from the study because being in the model made the model not to fit and hence it was removed after subjecting all the factors to a Confirmatory Factor Analysis. This may be explained by the fact that throughout this study, there was no agent or project member of the project implementation team who held an outcome-oriented contract. All the contracts for each staff were behavioral contracts.

For the avoidance of doubt, further statistical measures were done to establish the goodness of fit for this model. Collinearity Statistics were recorded after the analysis of the paths shown in table 6.3. These statics are the Variation Inflation Factor and the f-square. The Variation Inflation Factor (VIF) was used to assess the extent to which the predictor variables in a statistical model are highly correlated with each other. This correlation makes it hard to figure out how each predictor affects the outcome by itself.

Table 6.3: Collinearity statistics and f-Square

	Variance Inflation Factor (VIF)	f-Square (f^2)
Goal Conflict - ► Process Quality	1.250	.275
Communication - ► Process Quality	1.414	.013
Task Programmability - ► Process Quality	1.166	.001
Shirking - ► Process Quality	1.095	.009

Process Quality - ► Digital Transformation	1.269	.0083
Contract Type - ► Digital Transformation	1.335	.002
Process Quality* Contract Type - ► Digital Transformation	1.062	.046

VIF values are typically greater than or equal to 1. A VIF above 1.5 may be of concern or might require attention and further investigation for corrective action. In the context of this study, the results in table 6.3 show very low multicollinearity among the independent (predictor) variables used in this study.

The f^2 value however is a measure that shows the degree of the variance in digital transformation that can be explained by each predictor variable on either Process Quality or Digital Transformation. This enabled the researcher to understand the practical significance of a predictor's effect on the outcome, beyond just statistical significance.

The results in Table 6.3 show that the F-Squared value of 0.275 for the Goal Conflict variable on Process Quality has a moderate effect on Digital Transformation when Contract Type moderates Process Quality and Digital Transformation.

Also, Process Quality * Contract Type with an $f^2 = 0.046$ has a moderate effect on Digital Transformation. On the other hand, all the rest of the predictor variables returned f^2 values less than 0.02 which is the threshold for the effect of a predictor variable to have substantial practical significance. As such, the Researcher found it necessary to ensure further refinement of the model based on feedback from fit indices. The outcome of the second iteration is presented in table 6.4.

6.2.4 Path Modelling: 2nd Iteration

Following the initial iteration in Partial Least Squares (PLS) analysis, factors that were determined to be non-significant were excluded from the model. Subsequently, the model was re-fitted. During this process, attention was directed to the factor loadings, and those factors exhibiting loadings below 0.70 on their respective latent variables, were identified and then eliminated. Consequent to this refinement, a second PLS algorithm was executed. There was

an improvement in the new model, its path coefficients, VIF and f^2 values as is discussed in section 6.2.5.

6.2.5 Factor loadings, effects between variables and R^2 values

After excluding factors with loadings below 0.70, the Partial Least Squares algorithm was run again, which is the second iteration. The outcomes of this refined analysis are displayed in Figure 6.3.

Estimation of Total Effects

After using the Partial Least Squares algorithm, the measurement indicators connected well with their latent constructs, with most having coefficients over 0.70 shown if Figure 6.3. The model fit statistics and indices for the final model show that the model fitted the data well. This is so because the findings for the fit indices and fit statistics were within commendable ranges. The SRMR = 0.062 and the NFI = 0.951. Please see the details of the path coefficients and the estimation of Total Effects in Table 6.1. Figure 6.3 displays R^2 values represented as blue circles, path coefficients illustrating relationships between variables, and factor loadings denoted by arrows connecting variables and their measurement items. Further details about these findings are presented in the subsequent subsections.

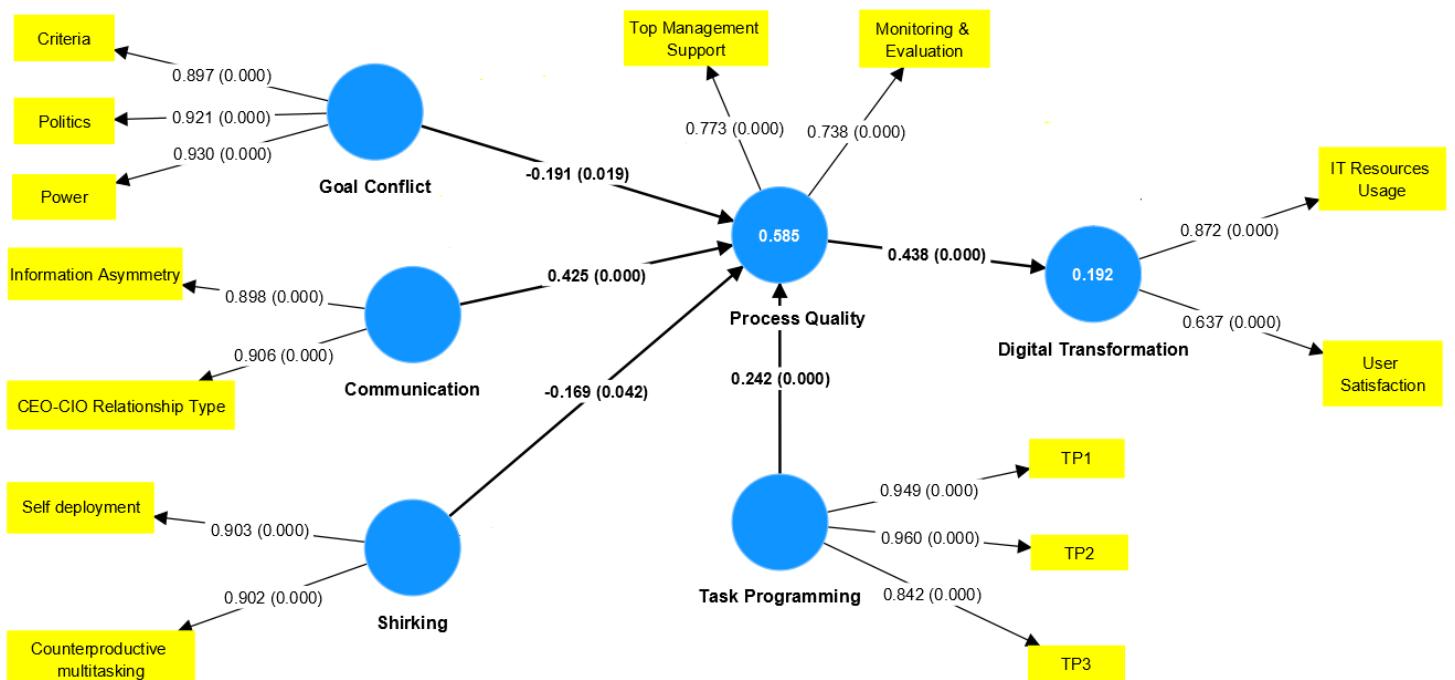


Figure 6.3: Factor loadings, R^2 values and variable effects

Coefficient of Determination (R^2) values

In this study, the R^2 values are explained as follows. The Moderating variable (Process Quality), $R^2=0.585$. This means that 58.5% of changes in Process Quality can be explained by the other factors in this research. This shows a strong connection between process quality and the other variables considered in the analysis of the variables in this study.

For the dependent variable (Digital Transformation), $R^2=0.192$. This means that 19.2% of the changes in digital transformation can be explained by the factors in this study. This is common in complex areas like digital transformation where so many other factors that have not been considered and analyzed in this study also contribute to the success of digital transformation.

Dependent variables in complex phenomena like digital transformation often have lower R^2 values due to unobserved factors (Ozili, 2023). It is important to note that a high R-Square value does not necessarily imply causation or that the model is a good predictor for all situations since other factors, models' assumptions and limitations must be considered when interpreting R^2 values (Grace-Martin, 2013; Ozili, 2023).

Significance of Factors and Path Coefficients

The results in Figure 6.3 show that the path coefficients were significant with scores.

Table 6.4: Path Coefficients and Total Effects

	Beta	Mean	SD	T Statistic	Sig	R^2	H_0
Goal Conflict - ► Process Quality	- .191	-.195	.082	2.340	.019	.585	Supported
Communication - ► Process Quality	.425	.424	.096	4.445	.000		Supported
Task Programmability - ► Process Quality	.242	.246	.063	3.859	.000		Supported
Shirking - ► Process Quality	- .169	-.169	.083	2.035	.042		Supported

Goal Conflict - ► Digital Transformation	- .084	-.090	.039	2.130	.033	.192	Supported
Communication - ► Digital Transformation	.186	.196	.056	3.299	.001		Supported
Process Quality - ► Digital Transformation	.438	.462	.072	6.092	.000		Supported
Task Programmability - ► Digital Transformation	.106	.113	.033	3.226	.001		Supported
Shirking - ► Digital Transformation	- .074	-.079	.043	1.742	.082		Not Supported
Model Fit Indices: SRMR=.062, d_ULS=4.873, d_G=2.155, Chi-square=665.782, NFI=.951							

Variance Inflation Factor and effect size of Path

The variance inflation factor (VIF) and the F-squared statistics are showed in the table 6.2. For Process quality, the results from this research study show that the variance inflation factor (VIF) of 1.207 suggests that there is minimal multicollinearity between the predictor variables in this study model for improved success of digital transformation projects in Ugandan TVETs.

Multicollinearity happens when two or more factors in analysis of study data are very similar, sharing almost the same information. This can make it hard to understand which factor is truly affecting the outcome. It can also make results less reliable and cause confusion about the importance of each factor. It is important to fix multicollinearity to get accurate insights from analysis of data by removing one factor or even combining factors.

VIF values below 5 are generally considered acceptable (cite), and a value of 1.207 for Process Quality falls comfortably within this range. In other words, the predictor variable (Process Quality) does not suffer from excessive correlation with other predictors.

Furthermore, the F-squared (f^2) value of 0.238 represents the effect size for the path from Process Quality to digital transformation. This value indicates a moderate effect, where approximately 23.8% of the variance in the dependent variable (digital transformation) is explained by the predictor variable (Process Quality).

Effect Sizes are typically classified as small, medium, or large, and a value of 0.238 falls in the moderate range, suggesting a meaningful contribution of Process Quality to explaining digital transformation.

Therefore, the low VIF value indicates no serious multicollinearity concerns, and the moderate F-square value suggests that the path from Process Quality to digital transformation has a meaningful impact on explaining the variance in digital transformation outcomes.

Table 6.5: Collinearity statistics and f-Square

	Variance Inflation Factor (VIF)	f-Square (f^2)
Goal Conflict - ► Process Quality	1.302	.068
Communication - ► Process Quality	1.746	.249
Task Programmability - ► Process Quality	1.207	.117
Shirking - ► Process Quality	1.466	.047
Process Quality - ► Digital Transformation	1.207	.238

The F-square value of 0.047 represents the effect size for the relationship between “shirking” and “process quality”. This value indicates a small effect, where only about 4.7% of the variance in “shirking” is explained by “process quality”. This suggests a relatively minor contribution of “process quality” to explain “shirking”. This ties in with the findings in Table 6.1 which shows the p value for this path as 0.042 which indicates weak significance.

The connection between “goal conflict” and “process quality” is not very strong. The influence of “process quality” on explaining changes in “goal conflict” is small. Other factors might have a more significant impact on “goal conflict”.

Also, the same statistics show the VIF of 1.746 suggests that there is minimal multicollinearity between “Communication” and “Process Quality” and that the effect of “Communication” on “Process Quality” is meaningful ($f^2=0.249$), explaining about a quarter (24.9%) of the changes

in “process quality”. This suggests that good communication has a noticeable impact on improving process quality which in turn has a meaningful impact on explaining the variance in digital transformation outcomes.

Finally, the VIF value of 1.207 in the statistics for the relationship between “task programmability” and “process quality” may be explained as follows. There is minimal collinearity between the two variables. The VIF value falls within an acceptable range, suggesting that these variables are not strongly correlated which is good. The F-Squared (f^2) value of 0.117 represents the effect size for this relationship which indicates a moderate effect. This means that approximately 11.7% of the variance in “process quality” can be explained by changes in “task programmability”. This process path has a p-value of 0.001. This suggests that how easily tasks can be programmed affects the quality of processes to a noticeable extent. This in turn has meaningful impact on explaining the variance in digital transformation outcomes.

The Role of Process Quality in this Model

Process quality in this study plays a mediation (middleman) role between Goal Conflict and digital transformation, Shirk and digital transformation, Communication and digital transformation, Task Programmability and digital transformation. Digital transformation is the dependent variable in this study. Process quality helps to explain how the independent variables affect digital transformation.

The R^2 value of 0.585 (58.5%) shows that process quality itself is influenced by other variables in this model. We see in this study that changes in Goal Conflict, Shirk, Communication and Task Programmability impact digital transformation through their impact on process quality. These results of this research study reveal that process quality acts as a bridge or pathway between the factors investigated and the success or outcome of digital transformation.

The role of Process Quality in this study was to show how improvements or changes in Goal Conflict, Shirk, Communication and Task Programmability can positively or negatively influence the quality of processes, which in turn, shapes the Success of Digital Transformation. The variables chosen for study and analysis in this research collectively explain around 19.2% of the changes observed in digital transformation. This percentage clearly indicates how exhaustive the variables chosen in this study account for the variations in digital

transformation. Future research may use this derived model from this study to establish other factors that will cause even more observed changes in digital transformation in addition to those investigated in this research.

Model fitness indices

The model fit for the Final Structural Model for Success of Digital Transformation Projects is presented in Table 6.3.

Table 6.6: Showing the Model Fit Indices of the Final Structural Model.

Model Fit Indices	Estimated Model
SRMR	.062
d_ULS	4.873
Chi-square	665.782
NFI	.951
d_G	2.155

*SRMR = **0.062**

The standardized Root Mean Square Residual (SRMR) values typically range from 0 to 1. A lower SRMR value closer to 0, indicates a better fit between the model and the observed data. An SRMR value of 0 indicates a perfect fit, meaning the model's predictions match the observed data perfectly and that the model's predictions are aligning well with the actual data. A value of 0.062 is considered favorable because the observed data points align well with the model's predictions.

R² for Process Quality Explained

In the context of digital transformation project success, the path coefficient for Process Quality variable (R²) is 0.585 as can be seen in table 6.2. A coefficient (R²) of 0.585 for "Process Quality" indicates a robust and meaningful connection between process quality and the success

of digital transformation projects. Furthermore, a path coefficient of 0.585 for Process Quality as a moderating variable suggests a strong relationship between process quality and project success.

Changes in Process Quality can have a substantial impact on project outcomes. Such a strong coefficient also has direct strategic implications. It suggests that focusing efforts and resources on improving and maintain process quality can be a strategic lever for enhancing the likelihood of successful digital transformation projects in Ugandan TVETs. It is noteworthy to mention that digital transformation often involves significant changes in processes and workflows. Therefore, a coefficient (R^2) of 0.585 indicates that ensuring high processes during these changes is a key factor in driving successful outcomes.

This study contributes valuable insights to the digital transformation literature by highlighting the central role of process quality in achieving successful project outcomes. This is a finding that holds practical implications and can guide decision-making for project managers, organizations, and stakeholders involved in such initiatives.

6.3 Hypothesis Testing

This section presents an exploration of hypothesis testing within the realm of digital transformation outcomes, with a specific focus on the mediating role of Process Quality. Understanding the factors that contribute to digital transformation within Ugandan Technical and Vocational Education and Training (TVET) institutions holds significant importance. Therefore, separating and communicating the factors contributing to successful digital transformation projects is significant to enable decision makers to lay more emphasis on building a digitally skilled workforce for economic growth by fostering innovation, entrepreneurship, and economic development among other reasons.

Based on the seven constructs in the conceptual framework for SDTP in chapter 2, eleven hypotheses were tested in this study. These hypotheses were phrased and tested as alternative hypotheses (as opposed to null hypotheses) to represent the assertion in this study about the effect and relationship the independent, mediating and dependent variable have on each other. Table 6.7 summarizes the path coefficients with specific focus on the Beta values and the p-values for each hypothesis represented by each path and its respective path coefficient.

Table 6.7: Showing the Path coefficients for the representing the Hypotheses.

	Beta	Mean	SD	T Statistic	Sig	R ²	H ₀
Goal Conflict - ► Process Quality	- .191	-.195	.082	2.340	.019	.585	Supported
Communication - ► Process Quality	.425	.424	.096	4.445	.000		Supported
Task Programmability - ► Process Quality	.242	.246	.063	3.859	.000		Supported
Shirking - ► Process Quality	- .169	-.169	.083	2.035	.042		Supported
Goal Conflict - ► Digital Transformation	- .084	-.090	.039	2.130	.033	.192	Supported
Communication - ► Digital Transformation	.186	.196	.056	3.299	.001		Supported
Process Quality - ► Digital Transformation	.438	.462	.072	6.092	.000		Supported
Task Programmability - ► Digital Transformation	.106	.113	.033	3.226	.001		Supported
Shirking - ► Digital Transformation	- .074	-.079	.043	1.742	.082		Not Supported

The proposed hypotheses are revisited below:

H1_a: Goal conflict has a negative significant effect on Digital transformation projects in Ugandan TVET institutions.

The results in table 6.1 show that there is a meaningful negative impact (beta = -0.84, p = 0.03) on the success of digital transformation projects. The negative coefficient -0.84 suggests that for every unit increase in goal conflict, there is an expected decrease of 0.84 units in the success of digital transformation projects. This cannot be ignored.

Managers should therefore ensure that goal conflict is greatly minimized or eradicated altogether where possible.

The p-value on the other hand ($p = 0.03$) indicates that this effect is statistically significant and is within the maximum threshold of 0.05. This serves as statistical evidence that the relationship explained in the hypothesis is unlikely to be due to random chance. This finding is consistent with existing theory and literature. This hypothesis is supported.

H1_b: Goal conflict has a negative significant effect on Process Quality in digital transformation projects in Ugandan TVET institutions.

The results in table 6.1 indicate that there is a significant negative effect of goal conflict on Process Quality. The analysis results ($\beta = 0.191$, $p = 0.019$), revealed the strength and direction of the effect, of Goal Conflict on Process Quality.

The p value of 0.019 underscores the level of significance. In this case 0.019 indicates that this effect is statistically significant implying that the observed relationship is unlikely to be due to random chance. This finding is consistent with literature and with existing theory. This hypothesis is supported.

H₂: Shirk ing has a negative significant effect on Process Quality in digital transformation project in Ugandan TVETs.

The table 6.1 shows results that indicate that there is a noticeable negative impact on the quality of processes when shirking occurs. The results returned $\beta = -0.169$ which revealed that the strength and direction happens in the negative direction to the arrow in the final model. The p value = 0.042 which indicates that this effect is statistically significant.

Therefore, it is implied from these research results that the observed relationship between shirking and process quality is unlikely to be due to random chance. The findings are consistent with both existing literature and supporting theory. This hypothesis is supported.

H₃: Communication has a positive significant effect on Process Quality in digital transformation in Ugandan TVET institutions.

The results in Table 6.1 show a positive beta value of 0.425. This indicates a positive relationship between communication and process quality. This means that as communication improves, the quality of processes in the context of digital transformation within Ugandan TVET institutions tends to improve as well.

The p-value of 0.000 indicates that this effect is statistically significant. This strongly suggests that the observed positive relationship between communication and process quality is unlikely to be due to random chance. This result, as shown in Table 6.1 provides robust evidence to support the hypothesis that improved communication positively influences the quality of processes during digital transformation project implementation in Ugandan TVET institutions. These findings align with both established literature and corroborating theory. This hypothesis is supported.

H₄: Task Programmability has a positive significant effect on Process Quality in digital transformation projects in Ugandan TVET institutions

Task Programmability has a notable and meaningful positive influence on Process Quality within digital transformation projects carried out in Ugandan TVET institutions. The coefficient of beta = 0.242 indicates the strength and direction of this impact, and the p-value of 0.000 underscores its statistical significance. Specifically, for every one unit increase in Task Programmability, there is an expected increase of 0.242 units in Process Quality. This beta coefficient implies that higher levels of Task Programmability are associated with higher levels of Process Quality within the context of this study. These results are consistent with existing research and complementary theories confirming the validity of this hypothesis.

Mediation Analysis

Mediation analysis is a statistical method that was used in this study to uncover the intermediary factor that explained how the independent variables in this study affect the dependent variable by providing insights into the complex pathways between variables, enhancing the researchers understanding of the observed effects. Table 6.8 shows the

estimation of indirect effects of the independent variables and the mediation effect of the mediating variables.

Table 6.8: Estimation of Indirect Effects and Mediation

	Beta	Mean	SD	T Statistic	P - Value	H ₀
Goal Conflict -► Process Quality -► Digital Transformation	-.084	-.090	.039	2.130	.033	Supported
Communication -► Process Quality -► Digital Transformation	.186	.196	.056	3.299	.001	Supported
Task Programmability -► Process Quality -► Digital Transformation	.106	.113	.033	3.226	.001	Supported
Shirking -► Process Quality -► Digital Transformation	-.074	-.079	.043	1.742	.082	Not Supported

The next four proposed hypotheses are revisited below:

H5a: Process Quality mediates the relationship between Goal Conflict and Digital Transformation in Ugandan TVETs

The beta coefficient = -0.084 represents the strength and direction of this mediation. In this study, a negative beta value in the validation of this hypothesis aligns with the expectation that higher levels of Goal Conflict lead to poorer Process Quality. As Goal Conflict increases, Process Quality tends to decrease. This result as shown in Table 6.4 contributes to the understanding of how Goal conflict impacts the intermediary variable, “Process Quality”, which in turn affects digital transformation outcomes in Ugandan TVET institutions. The results of this analysis as shown in Table 6.4 align with established research and supportive theories, affirming the credibility of this hypothesis.

H5b: Process Quality mediates the relationship between Shirking and Digital Transformation in Ugandan TVETs

Table 6.4 shows that in the analysis of data in this research, there is a potential mediation effect of Process Quality between Shirking and Digital Transformation. The p- value =

0.082 however is above the threshold of the typical significance level of 0.05. Therefore, there is no statistical significance of this mediation. This hypothesis therefore is not supported.

H5c: Process Quality mediates the relationship between Communication and Digital Transformation in Ugandan TVETs

The findings as shown in table 6.4 suggest the Process Quality helps to explain how Communication affects Digital Transformation in Ugandan TVETs. As Communication Improves, there is a tendency for Process Quality to also improve ($\beta = 0.186$), thereby positively influencing digital transformation outcomes.

The p-value ($p = 0.001$) emphasizes that this mediated relationship is statistically important. Further, this relationship highlights the role of Process Quality in mediating the impact of Communication on Digital Transformation Projects in Uganda TVETs. The findings presented in Table 6.4 are in harmony with established research and supporting theories, confirming the validity of this hypothesis. This hypothesis is supported.

H5d: Process Quality mediates the relationship between Task Programmability and Digital Transformation in Ugandan TVETs

Table 6.4 shows analysis results of the beta coefficient = 0.106 which indicates a positive, strong mediation effect. The p-value of $p = 0.001$ emphasizes the statistical significance of this mediated relationship. Process Quality plays a role in explaining how Task Programmability impacts Digital Transformation in Ugandan TVETs. As Task Programmability improves, there is a tendency for process quality to also improve, thereby positively influencing Digital Transformation outcomes.

The $p = 0.001$ highlights the statistical importance of this mediated relationship, reinforcing the significance of Process Quality as a mediator in this study. The results showed in Table 6.4 align cohesively with existing research and theories that provide support, thereby affirming the credibility of this hypothesis. These findings substantiate the validity of the hypothesis, confirming its support.

H6: Contract Type moderates the relationship between Process Quality and Digital Transformation in Ugandan TVETs

H7: Process Quality positively affects Digital Transformation projects in Ugandan TVETs

The coefficient (beta = 0.438), and significance ($p = 0.000$) indicate that better Process Quality contributes positively to the effectiveness of digital transformation efforts. The $p =$ value of 0.000 means that this relationship is unlikely due to chance. Therefore, Process Quality has a strong positive impact on the success of Digital Transformation projects in Ugandan TVET institutions.

The results presented in Table 6.4 align consistently with established research and supportive theories, validating the hypothesis's credibility. These findings reinforce the hypothesis's validity and confirm its support.

6.3.1 Development of the framework for digital transformation

In the ever-changing landscape of digital transformation, having a structured approach is paramount for success. This section introduces a comprehensive framework specifically tailored to guide Ugandan TVETs and related organizations through the details of the digital transformation project journey. Alongside this framework, this section will also present qualitative findings that provide deeper insights into the different phases of digital transformation.

This newly created framework incorporates the planning, implementation and transformation phases of digital change. It integrates established practices from the Agency theory, theoretical insights from the DeLone and McLean Theory and practical considerations to offer a visual roadmap that Ugandan TVETs and similar organizations can follow. By outlining key stages and relationships, the framework aids in navigating the complex challenges of digital transformation. This presentation not only underscores the framework's role in fostering clarity and alignment but also incorporates qualitative insights to enrich our understanding of real-world experiences. Through this holistic approach, the findings in this study aim to illuminating the path toward a digitally empowered future.

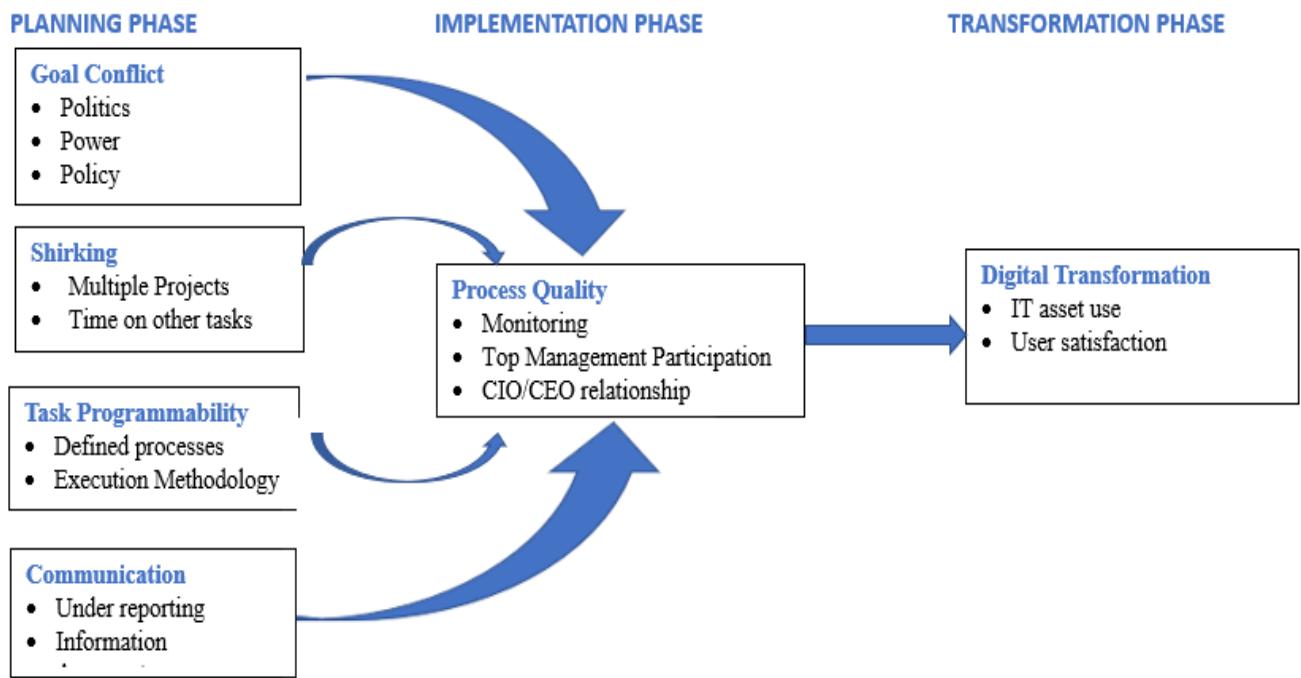


Figure 6.4: Framework for digital transformation

6.4 Application of the SDTP Framework

This framework was developed to establish how improvement to the Success of Digital Transformation Projects can be achieved. The findings of this study show that the variables (Goal Conflict, Shirkung, Task Programmability, Communication and Digital Transformation) have practical implications for Digital Transformation Projects in Ugandan Technical and Vocational Education and Training (TVET) institutions. These include the following: 1) Project Goal Alignment. This framework can be used to ensure that project goals align with the institution's overall objectives and stakeholder's expectations. This will help to minimize the goal conflict between the project implementation team (the agents) and the key stakeholders (the principal) who in this case is Top Management at the Ministry of Education and Sports. This will minimize goal conflict in order to create a clear path for digital transformation in Ugandan TVETs; 2) Effective Communication Strategy Development. Managers may utilize insights from the framework to recognize the role of communication in enhancing process quality. Develop a robust communication plan that keeps stakeholders informed (both the Principal and the Agent), engaged, and aligned throughout the digital transformation project; 3) Task Programmability and Automation. This framework flags the need to address and identify areas where automation can enhance efficiency. Training for both the project

implementation team and Top Management on relevant software and technologies that align with digital transformation project's objectives must be done before embarking on digital transformation projects in TVETs; 4) Stakeholder Engagement. When all players in Digital Transformation are involved (e.g., educators, administrators, students, project implementation team, and industry players) in the project's planning and implementation phases, potential shirking is mitigated and stakeholder commitment is enhanced. This needs to be championed by Top Management. We also see the need for a healthy CIO – CEO relationship where the CIO takes the lead in naturing this relationship and the CEO provides an enabling environment for the same; 5) Progress Monitoring and Adaptation. It is imperative to use the SDTP framework's variables to monitor project progress. Furthermore, it can be seen from this framework that Top Management (the principal) must regularly assess process quality, communication effectiveness, and digital skills acquisition for both the digital transformation project implementation team and the users of the project outcome. The users are the students, the trainers, administrators and the stakeholders of the TVET institutions; 6) Quality Assurance and Continuous Improvement. The SDTP framework can be applied to establish quality assurance mechanisms by encouraging a culture of continuous improvement in Ugandan TVETs. This can be achieved by using data to refine strategies to address any issues that may arise; 7) Capacity Building for Digital Transformation Users. This framework shows that success of digital transformation projects in also determined by use of digital technology in the TVETs. Therefore, Top Management must strategically aim towards equipping both the trainers and the learners with not only technical digitally skills but with skills for critical thinking, problem-solving, and adaptability skills. This will help the students and the trainers to contribute to the digital economy more effectively; 8) Measurement of Digital Project Success. This framework helps to define key performance indicators (KPIs) that align with the independent variables. Success of the digital transformation project can then be measured based on improved process quality, effective communication, and enhanced digital skills.

By applying SDTP in this way, a structured approach that enhances the likelihood of achieving improved success of digital transformation projects in TVETs is created. Clearly, the variables in SDTP guide decision-making, stakeholder engagement, and resource allocation, ultimately contributing to successful implementation and positive outcomes of digital transformation projects.

REFERENCES

- ACT. (2005). *Access to Information Act, 2005.pdf*.
- Afeti, G. (2018). Revitalising technical and vocational education and training in Africa: Issues outstanding. *Journal of Vocational, Adult and Continuing Education and Training*, 1(1), xi. <https://doi.org/10.14426/jovacet.v1i1.9>
- Ahdadou, M., Aajly, A., Tahrouch, M., Ahdadou, M., Aajly, A., Tahrouch, M., Technology, I., & Lessons, G. (2022). *Information Technology Governance : Lessons Learned from The Covid-19 Crisis To cite this version : HAL Id : hal-03599334 Information Technology Governance : Lessons Learned from The Covid-19 Crisis*.
- Ako-Nai, A., & Singh, A. M. (2019). Information technology governance framework for improving organisational performance. *SA Journal of Information Management*, 21(1), 1–11. <https://doi.org/10.4102/sajim.v21i1.1010>
- Al-Ababneh, M. M. (2020). Linking Ontology, Epistemology and Research Methodology. *Science & Philosophy*, 8(1), 75–91. <https://doi.org/10.23756/sp.v8i1.500>
- Aleksejevec, V. (2020). *Determining the Critical Factors of the Project Success*.
- Alharahsheh, H. H., & Pius, A. (2020). A Review of key paradigms: positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, 2(3), 39–43.
- Ali, S., & Green, P. (2005). Determinants of Effective Information Technology Governance : A Study of IT Intensity. *Proceedings of International IT Governance Conference*, 13.
- Aliyu, A. A., Abdu, A. A., Kasim, R., & Martin, D. (2015). Research Framework Development on the Effect of Intangible Location Attributes on the Values of Residential Properties in Jos, Nigeria. *Developing Country Studies*, 5(16), 8–30.
- Amalina, D., & Suryani, E. (2022). Evaluating the Success of E-Invoice Implementation at a State-Owned Enterprise Using DeLone & McLean IS Success Model. *IPTEK Journal of Proceedings Series*, 1, 388–396.
- Angelou, G., & Economides, A. A. (2012). Controlling Risks in ICT Investments with Real Options Thinking. *SSRN Electronic Journal, Pci*. <https://doi.org/10.2139/ssrn.1718415>
- Anjoga, H., & Kituyi, M. (2017). A Framework for Usability of e-Government Services in Developing Countries. *Journal of Accounting and Auditing: Research & Practice*, 2017(September 2016), 1–15. <https://doi.org/10.5171/2017.313796>
- Anunobi, C. V., & Okoye, I. B. (2008). The role of academic libraries in universal access to print and electronic resources in the developing countries. *Library Philosophy and Practice*, 2008(MAY.).
- Arrow, K. (1974). *The limits of organization*. WW Norton & Company.

- Atrash, A. (2022). *How to Improve A Process*.
- Baguma, R., & Lubega, J. (2013). Factors for success and failure of e-government projects: The case of e-government projects in Uganda. *ACM International Conference Proceeding Series, October*, 194–197. <https://doi.org/10.1145/2591888.2591921>
- Bailey, E., & Becker, J. D. (2014). A comparison of IT governance and control frameworks in cloud computing. *20th Americas Conference on Information Systems, AMCIS 2014*, 1–16.
- Baiman, S. (1982). *Agency Research in Management Accounting: A Survey*.. *Journal of Accounting Literature.*, p. 159.
- Baker, G. P., Jensen, M. C., & Murphy, K. J. (1988). Compensation and incentives: Practice vs. theory. *The Journal of Finance*, 43(3), 593–616.
- Balicki, J., WSEAS (Organization), International Conference on Mathematical, C. and S. S. (2nd : 2014 : G., & International Conference on Finite Differences, F. E. (n.d.). *Advances in applied and pure mathematics : Proceedings of the 2nd International Conference on Mathematical, Computational and Statistical Sciences (MCSS '14) ; Proceedings of the 7th International Conference on Finite Differences, Finite Elements, Finite Volumes, Boundary Elements (F-and-B '14) : Gdansk, Poland, May 15-17, 2014*.
- Balnaves, M., & Caputi, P. (2001). *Introduction to quantitative research methods: An investigative approach*. Sage.
- Bans-Akutey, A., & Tiimub, B. M. (2021). Triangulation in Research. *Academia Letters, August*, 1–6. <https://doi.org/10.20935/al3392>
- Bart, C., & Turel, O. (2010). IT and the board of directors: An empirical investigation into the “Governance questions” Canadian board members ask about IT. *Journal of Information Systems*, 24(2), 147–172. <https://doi.org/10.2308/jis.2010.24.2.147>
- Bassellier, G., Reich, B. H., & Benbasat, I. (2001). Information technology competence of business managers: A definition and research model. *Journal of Management Information Systems*, 17(4), 159–182. <https://doi.org/10.1080/07421222.2001.11045660>
- Beachboard, J., Aytes, K., & Probst, J. (2010). IT Governance and IT Management: Is There a Difference That Makes a Difference? *Proceedings of the 2010 InSITE Conference, January*, 077–086. <https://doi.org/10.28945/1234>
- Ben Boubaker, K., Harguem, S., & Nyrhinen, M. (2021). IT Governance Modes Choice: An Institutional Theory Perspective. *International Journal of Management and Data Analytics (IJMADA) Int. J. Management and Data Analytics*, 1(1), 1–10.
- Benbunan-Fich, R. (2000). Internet Business Models and Strategies (Book Review). *Mid-Atlantic Journal of Business*, 36(4), 229.
- Bendig, D., Wagner, R., Jung, C., & Nüesch, S. (2022). When and why technology leadership enters the C-suite: An antecedents perspective on CIO presence. *The Journal of Strategic Information Systems*, 31(1), 101705.

- 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.
- Bergen, M., Dutta, S., & Walker Jr, O. C. (1992). Agency relationships in marketing: A review of the implications and applications of agency and related theories. *Journal of Marketing*, 56(3), 1–24.
- Bhika, B. D. (2017). Challenges facing projects due to a lack of resources Submitted by : Bervesh D Bhika October 2017 Supervisor : Prof . JHC Pretorius. *Dissertation*, 22–30.
- Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A METHOD TO INTEGRATE DESCRIPTIVE AND EXPERIMENTAL FIELD STUDIES AT THE LEVEL OF DATA AND EMPIRICAL CONCEPTS1. In *JOURNAL OF APPLIED BEHAVIOR ANALYSIS*.
- Bitwayiki, C. (2019). *Exploring Information Technology Return on Investment Reports for Planning, Budgeting, and Implementation*. Walden University.
- BMAU. (2019). *BMAU BRIEFING PAPER (7 / 19) May 2019 The National Backbone Infrastructure : Is the country reaping BMAU BRIEFING PAPER (7 / 19) May 2019. May*, 1–4.
- Bohren, O. (1998). The agent ' s ethics in the principle-agent model : JBE JBE. *Journal of Business Ethics*, 17(May), 745–755.
- Boland Jr, R. J., & Hirschheim, R. A. (1987). *Critical issues in information systems research*. John Wiley & Sons, Inc.
- Boyatzis, R. E. (1998). *Transforming qualitative information: Thematic analysis and code development*. sage.
- Braun, V., Clarke, V., & Hayfield, N. (2023). *Thematic analysis: A reflexive approach*. SAGE Publications.
- Caluwe, L., De Haes, S., Wilkin, C., & Huygh, T. (2021). How Boards of Directors Can Contribute to Governing IT. *Proceedings of the 54th Hawaii International Conference on System Sciences*, 0, 6047–6056. <https://doi.org/10.24251/hicss.2021.731>
- Campbell, J., Wilkin, C. L., Moore, S., Campbell, J. ;, Wilkin, C. L. ;, & Stephen, M. (2011). *Association for Information Systems AIS Electronic Library (AISeL) Investigation of the Comprehensiveness of the ISO/IEC 38500:2008 Standard in an Inter-organisational Public/Private-sector Context*. 2011.
- Carvalho, M. M. (2014). An investigation of the role of communication in IT projects. *International Journal of Operations and Production Management*, 34(1), 36–64. <https://doi.org/10.1108/IJOPM-11-2011-0439>
- CHAOS. (2020). *Standish Chaos Report 2020*.
- Chinen, C. (2003). *THE USE OF ICTs IN TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING UNESCO Institute for Information Technologies in Education*. 190.

- Chulkov, D. V., & Desai, M. S. (2005). Information technology project failures. Applying the bandit problem to evaluate managerial decision making. *Information Management and Computer Security*, 13(2), 135–143. <https://doi.org/10.1108/09685220510589316>
- CIPESA. (2015). *Promoting inclusive use of ICT in monitoring service delivery in Uganda*.
- Cocco, A. F. (1995). *Using performance goals to motivate workers: a practical guide for project managers*.
- Cohen, L., Manion, L., Morrison, K., & Publishers, R. (2009). Book Reviews Research Methods in Education (6th ed). *The Australian Educational Researcher*, September.
- Coltman, T., Devinney, T., Latukefu, A., & Midgley, D. (2001). E-Business: Revolution, Evolution, or Hype? *Faculty of Informatics - Papers*, 44. <https://doi.org/10.2307/41166111>
- Comrey, A. L., & Lee, H. B. (2013). *A first course in factor analysis*. Psychology press.
- Cresswell, A. M. (2004). Return on Investment In Information Technology : A Guide for Managers. *Centre for Technology in Government*, August, 1–52.
- Creswell, J. (2012). Second Edition QUALITATIVE INQUIRY& RESEARCH DESIGN Choosing Among Five Approaches. In *Design: Choosing Among Five Approaches* (Vol. 3, Issue June).
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage publications.
- Crotty, M. (2020). *The foundations of social research: Meaning and perspective in the research process*. Routledge.
- Crowston, K., Rubleske, J., & Howison, J. (2006). Human-Computer Interaction in Management Information Systems. *Human-Computer Interaction in Management Information Systems*, 1(November), 120–138.
- Dąbrowska, J., Almpanopoulou, A., Brem, A., Chesbrough, H., Cucino, V., Di Minin, A., Giones, F., Hakala, H., Marullo, C., Mention, A. L., Mortara, L., Nørskov, S., Nylund, P. A., Oddo, C. M., Radziwon, A., & Ritala, P. (2022). Digital transformation, for better or worse: a critical multi-level research agenda. *R and D Management*, 52(5), 930–954. <https://doi.org/10.1111/radm.12531>
- Dalle, J., Siyoto, S., Dwi Astika, N., Jaya Negara, D., Chandra, T., Anam, K., Kalimantan Muhammad Arsyad Al Banjary, I., Adhyaksa, J., & Kalimantan, S. (2020). Moderating Role of IT Adoption and Mechanism of Dynamic Capabilities on Indonesian Pharmaceutical Firms Performance. In *Systematic Reviews in Pharmacy* (Vol. 11, Issue 9).
- Daniel, E. M., & Wilson, H. N. (2003). The role of dynamic capabilities in e-business transformation. *European Journal of Information Systems*, 12(4), 282–296. <https://doi.org/10.1057/palgrave.ejis.3000478>
- Danson, M., Taheri, B., & Richards, J. (2018). Research Philosophy and Research Design. In *Researching Tourism, Leisure and Hospitality for your dissertation* (Issue 2014).

- Daraghmi, E. (2023). The Adoption of Augmented Reality Technology in e-learning: Case of a Mobile Application During Covid-19. *International Conference on Business and Technology*, 915–936.
- Davis, J. M. (2013). Leveraging the IT competence of non-IS workers: social exchange and the good corporate citizen. *European Journal of Information Systems*, 22(4), 403–415.
- De Haes, S., Caluwe, L., Huygh, T., & Joshi, A. (2020). Governing digital transformation. *Management for Professionals*.
- De Haes, S., Huygh, T., Joshi, A., & Van Grembergen, W. (2016). Adoption and Impact of IT Governance and Management Practices. *International Journal of IT/Business Alignment and Governance*, 7(1), 50–72. <https://doi.org/10.4018/ijitbag.2016010104>
- De Haes, S., & Van Grembergen, W. (2008). An Exploratory Study into the Design of an IT Governance Minimum Baseline through Delphi Research. *Communications of the Association for Information Systems*, 22, 1–29. <https://doi.org/10.17705/1cais.02224>
- 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. <https://doi.org/10.1080/10580530902794786>
- De Haes, S., Van Grembergen, W., Joshi, A., & Huygh, T. (2020a). *Enterprise Governance of IT, Alignment, and Value. January*, 1–13. https://doi.org/10.1007/978-3-030-25918-1_1
- De Haes, S., Van Grembergen, W., Joshi, A., & Huygh, T. (2020b). *Enterprise Governance of IT, Alignment, and Value. March 2021*, 1–13. https://doi.org/10.1007/978-3-030-25918-1_1
- De Magalhães, F., Luís, F., Gaspar, M. A., Luciano, E. M., & Napolitano, D. M. R. (2020). Information technology governance: legitimization, theorization and field trends. *Revista de Gestão*, 28(1), 50–65. <https://doi.org/10.1108/rege-01-2020-0001>
- Debreccen, R. S., & Gray, G. L. (2009). IT governance and process maturity: A multinational field study. *Journal of Information Systems*, 27(1), 157–188. <https://doi.org/10.2308/isys-50418>
- DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 60–95.
- DeLone, W., & McLean, R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30. <https://doi.org/10.1080/07421222.2003.11045748>
- DeLone, W., Migliorati, D., & Vaia, G. (2018). Digital IT Governance. In G. Bongiorno, D. Rizzo, & G. Vaia (Eds.), *CIOs and the Digital Transformation: A New Leadership Role* (pp. 205–230). Springer International Publishing. https://doi.org/10.1007/978-3-319-31026-8_11
- DesJardine, M. R., Zhang, M., & Shi, W. (2022). How Shareholders Impact Stakeholder Interests: A Review and Map for Future Research. *Journal of Management*, 49(1), 400–429. <https://doi.org/10.1177/01492063221126707>

- Dirk Steuperert, Steven De Haes, Tim Huygh, G. P. (2021). *Exploring the Dimensions and Attributes of A Maturity Model for IT Governance Organizational Structures.pdf* (pp. 6037–6046). <https://doi.org/10.24251/HICSS.2021.730>
- Djurovic, A. (2020). *IT_project_failure_Sydney_water.*
- Drucker, P. F. (2018). *The effective executive.* Routledge.
- Dudovskiy, J. (2016). Deductive approach (deductive reasoning). *The Ultimate Guide to Writing a Dissertation in Business Studies: A Step by Step Assistance.* Sl: Sn.
- Eason, K., & Harker, S. (1988). The Suppliers Role in the Design of Products for Organisations. *The Computer Journal, 31*(5), 426.
- Eicker, F., Haseloff, G., & Lennartz, B. (2017). Vocational education and training in Sub-Saharan Africa: Current situation and development. In *Volkawagen Stiftung.*
- Eisenhardt, K. M. (1988). Agency-and institutional-theory explanations: The case of retail sales compensation. *Academy of Management Journal, 31*(3), 488–511.
- Eisenhardt, K. M. (1989). Agency theory: An assessment and review. *Academy of Management Review, 14*(1), 57–74.
- Eisenhardt, K. M., & Eisenhardt, K. M. (2018). Linked references are available on JSTOR for this article : Agency Theory : An Assessment and Review. *Academy of Management, 14*(1), 57–74.
- Eisenhardt, K. M., & Martin, J. A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal, 21*(10-11), 1105–1121.
- Eja, K. M., & Ramegowda, M. (2020). Government project failure in developing countries: A review with particular reference to Nigeria. *Global Journal of Social Sciences, 19*(1988), 35–47. <https://doi.org/10.4314/gjss.v19i1.4>
- Ernest III, J., Wilson, E. J., & Wilson III III, E. J. (2004). *The information revolution and developing countries.* MIT press.
- Fadler, M., & Legner, C. (2021). Toward big data and analytics governance: redefining structural governance mechanisms. *Proceedings of the 54th Hawaii International Conference on System Sciences, 5696–5705.* <https://doi.org/10.24251/hicss.2021.691>
- Fattah, A., & Setyadi, R. (2021). Determinants Effectiveness Information Technology Governance in Higher Education Institution (HEI) using partial least squares structural equation modeling approach (PLS-SEM). *Journal of Physics: Conference Series, 1807*(1). <https://doi.org/10.1088/1742-6596/1807/1/012007>
- Feeny, D. F., Edwards, B. R., Simpson, K. M., & Feeny, B. D. F. (1992). CEO / CIO Understanding the Relationship. *MIS Quarterly, 16*(4), 435–448.
- Felin, T., & Powell, T. C. (2016). Designing organizations for dynamic capabilities. *California Management Review, 58*(4), 78–96. <https://doi.org/10.1525/cmrr.2016.58.4.78>
- Feltus, C. (2008). *Introducing ISO / IEC 38500 : Corporate Governance in ICT Christophe Feltus. January 2008.*

- Florentine, S. (2017). IT project success rates finally improving | CIO. In *CIO.com*.
- Freeman, M., & Beale, P. (1992). Measuring Project Success. *Information Systems Project Management, March*. <https://doi.org/10.4135/9781452274966.n13>
- Gavilanes-Molina, A., & Merchán-Rodríguez, V. (2022). Information technology governance: an analysis of the approach in Ecuador. *Bulletin of Electrical Engineering and Informatics*, 11(1), 466–476. <https://doi.org/10.11591/eei.v11i1.3449>
- Gelderman, M. (1998). The relation between user satisfaction, usage of information systems and performance. *Information & Management*, 34(1), 11–18.
- Gomez-Mejia, L. R., & Balkin, D. B. (1992). Determinants of Faculty Pay: an Agency Theory Perspective. *Academy of Management Journal*, 35(5), 921–955. <https://doi.org/10.5465/256535>
- Gordon, F. R. (2012). *Impact of Information Technology Governance Structures on Strategic Alignment*. 66(December), 37–39.
- Grabner, I., & Speckbacher, G. (2010). HOW TO CONTROL CREATIVE WORK: THE ROLE OF INTRINSIC MOTIVATION AND TASK PROGRAMMABILITY IN CONTROL SYSTEM DESIGN. *Academy of Management Proceedings*, 2010(1), 1–6.
- Greenberger, L. S. (2016). Effective Communications for Project Success. *Remediation*, 26(2), 121–128. <https://doi.org/10.1002/rem.21463>
- Greene, J. C., & Caracelli, V. J. (1997). Defining and describing the paradigm issue in mixed-method evaluation. *New Directions for Evaluation*, 74, 5–17.
- Grembergen, W. Van. (2011). Strategies for Information Technology Governance. In *Strategies for Information Technology Governance*. <https://doi.org/10.4018/978-1-59140-140-7>
- Guinan, P. J., Cooprider, J. G., & Faraj, S. (1998). Enabling Software Development Team Performance during Requirements Definition: A Behavioral Versus Technical Approach. *Information Systems Research*, 9(2), 101–125. <https://doi.org/10.1287/isre.9.2.101>
- Guldentops, E., Van Grembergen, W., & De Haes, S. (2002). Control and governance maturity survey: establishing a reference benchmark and a self assessment tool. *Information Systems Control Journal.-Rolling Meadows, Ill.*, 6, 32–35.
- Haffke, I. (2017). Dissertation Ingmar Haffke. *D-Nb.Info*.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage publications.
- Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, 19(2), 139–152. <https://doi.org/10.2753/MTP1069-6679190202>
- Hamann, M., Schiemann, F., Bellora-Bienengräber, L., & Günther, T. W. (2015). *Three Additional Analyses: Exploring the Dimensions of Organizational Performance: A Construct Validity Study Management Accounting Quality and Disclosure Quality View project Management*

Control and Product Development View project.
<https://www.researchgate.net/publication/282611894>

Hamel, G., & Prahalad, C. K. (1990). Strategic intent. *Mckinsey Quarterly*, 1, 36–61.

Harguem, S. (2021). A conceptual framework on IT governance impact on organizational performance: A dynamic capability perspective. In *Academic Journal of Interdisciplinary Studies* (Vol. 10, Issue 1, pp. 136–151). <https://doi.org/10.36941/ajis-2021-0012>

Hartono, H., Aristo, J., Rosadi, P., Darma, W., Ekklesia, R., & Efraison, W. (2020). Evaluating IT Governance at Network Access Provider on COBIT 5 Domain EDM. *Journal of System Integration*, 2, 1–10. <https://doi.org/10.20470/jsi.v11i2.397>

Helberg, C. (1996). Pitfalls of Data Analysis. *Practical Assessment, Research, and Evaluation*, 5. <https://doi.org/10.7275/jdka-5935>

Henderson, J. C., & Venkatraman, H. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, 32(1), 472–484. <https://doi.org/10.1147/sj.382.0472>

Henderson, J., Thomas, J., & Venkatraman, N. (1992). *Making Sense of IT: Strategic Alignment and Organizational Context*.

Hevner, A., & Chatterjee, S. (2021). *Design Research in Information Systems*.

Hevner, A., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Research. *MIS Quarterly*, 28(1), 75–105.

Hilkenmeier, F., Bohndick, C., Bohndick, T., & Hilkenmeier, J. (2020). Assessing Distinctiveness in Multidimensional Instruments Without Access to Raw Data – A Manifest Fornell-Larcker Criterion. *Frontiers in Psychology*, 11. <https://doi.org/10.3389/fpsyg.2020.00223>

Hj. Ebil, S., Salleh, S. M., & Shahrill, M. (2020). The use of E-portfolio for self-reflection to promote learning: A case of TVET students. *Education and Information Technologies*, 25(6), 5797–5814.

Horwath, C., Chan, W., Leung, E., & Pili, H. (2012). Enterprise risk management for cloud computing. *COSO Juni*.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1–55.

Hussy, J., & Hussy, R. (1997). Business research: a practical guide for undergraduate and postgraduate students. *Basingstock: Macmillan Business*.

ISACA. (2019). *Impressions From Delivering COBIT 2019 Foundation Training for Auditors*.

ISO. (2008). *ISO - ISO IEC standard for corporate governance of information technology*.

ITGI. (2008). IT Governance Global Status Report - 2008. In *Control*.

- Jared, D., Orwa, G., & Oloko, M. (2016). Relationship Between Dynamic Capabilities and Competitive Advantage of Technical , Vocational And Entrepreneurship Training Institutions in Kenya. *International Journal of Academic Research in Business and Social Sciences*, 5(8), 222.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Corporate Governance: Values, Ethics and Leadership*, 77–132. <https://doi.org/10.2139/ssrn.94043>
- Jobst, L. J., Bader, M., & Moshagen, M. (2021). A Tutorial on Assessing Statistical Power and Determining Sample Size for Structural Equation Models. *Psychological Methods*. <https://doi.org/10.1037/met0000423>
- Johannesson, P., & Perjons, E. (2014). *An introduction to design science* (Vol. 10). Springer.
- Jokonya, O., & Lubbe, S. (2009). Using information technology governance, risk management and compliance (GRC) as a creator of business values - A case study. *South African Journal of Economic and Management Sciences*, 12(1), 115–125. <https://doi.org/10.4102/sajems.v12i1.264>
- José, J., Peña, S., Vicente, E. F., & Ocaña, A. M. (2013). ITIL, COBIT and EFQM: Can They Work Together? *International Journal of Combinatorial Optimization Problems and Informatics*, 4(1), 54–64.
- Joshi, A., Benitez, J., Huygh, T., Ruiz, L., & De Haes, S. (2022). Impact of IT governance process capability on business performance: Theory and empirical evidence. *Decision Support Systems*, 153, 113668. <https://doi.org/10.1016/j.dss.2021.113668>
- Judge, T. A., & Chandler, T. D. (1990). *INDIVIDUAL-LEVEL DETERMINANTS OF THE PROPENSITY TO SHIRK*.
- Kaen, K., & Kaen, K. (2011). A Framework for Implementing IT Service Management in the Field of Pre-hospital Emergency Management with an Integrated Approach COBIT Maturity Model and ITIL Framework. *日老医誌*, 19(1), 137–143.
- Kaplan, B., & Duchon, D. (n.d.). *Combining Qualitative and Quantitative Methods in Information Systems Research: A Case Study*[^].
- Kelemen, M. L., & Rumens, N. (2008). *An introduction to critical management research*. Sage.
- Kempter, A. (2019). *History of ITIL IT Process Wiki*.
- Kezsbom, D. S. (1992). Bringing order to chaos: Pinpointing sources of conflict in the nineties. *Cost Engineering*, 34(11), 9.
- Khalil, S., & Belitski, M. (2020). Dynamic capabilities for firm performance under the information technology governance framework. *European Business Review*, 32(2), 129–157. <https://doi.org/10.1108/EBR-05-2018-0102>
- King, R. (2023). *Digital Transformation Requires a NEW Bimodal Approach SDLC Partners*.

- Kituyi, G. M., & Kasse, J. P. (2016). Factors Affecting E-Government Service Utilization in Developing Countries Project View project Impact of ICT on Education in Developing Countries View project. *Global Advanced Research Journal of Social Science (GARJSS) Vol.*, 5(1), 010–019.
- Kizito, M. (2020). *Enacting Ambidextrous IT Governance in Healthcare*. University of Gothenburg.
- Kozhakhmetova, A., Zhidebekkyzy, A., Turginbayeva, A., & Akhmetova, Z. (2019). Modelling of project success factors: A cross-cultural comparison. *Economics & Sociology*, 12(2), 219–234.
- Kpebo, D., Coulibaly, A., Yameogo, W. M. E., Bijou, S., Hamidou Lazoumar, R., Tougrı, H., N'dour, M., & Kouanda, S. (2022). Effect of integrating maternal and child health services, nutrition and family planning services on postpartum family planning uptake at 6 months post-partum in Burkina Faso, Côte d'Ivoire and Niger: a quasi-experimental study protocol. *Reproductive Health*, 19(1). <https://doi.org/10.1186/s12978-022-01467-x>
- Kraemer, K. (2016). *V ill ^ rLwl I V MISQREV . EW Review : Information Technology and Organizational Performance : An Integrative Model of*. 28(2), 283–322.
- Krey, M., Keller, T., Harriehausen, B., & Knoll, M. (2011). Towards a classification of Information Technology governance frameworks for the development of a IT GRC healthcare framework. *2011 IEEE Consumer Communications and Networking Conference, CCNC'2011*, 34–38. <https://doi.org/10.1109/CCNC.2011.5766488>
- Kruger, W., & Rudman, R. (2013). Strategic Alignment Of Application Software Packages And Business Processes Using PRINCE2. *International Business & Economics Research Journal (IBER)*, 12(10), 1239. <https://doi.org/10.19030/iber.v12i10.8134>
- Laita, A., & Belassissoi, M. (2017). Information Technology Governance in Practice. *International Journal of Information Technology Project Management*, 3(3), 14–30. <https://doi.org/10.4018/jitpm.2012070102>
- Langley, M. (2017). Project Success Improves Europe, But More Progress is Needed. *European Business Magazine*.
- Lanter, D. (2019). COBIT 2019 Framework Introduction and methodology. In www.icasa.org/COBITuse.
- Lappi, T. (2019). *Digitalizing Finland: Governance of government ICT projects* [Doctoral Thesis, University of Oulu Graduate School]. <http://jultika.oulu.fi/files/isbn9789526222899.pdf>
- Lauesen, S. (2020). IT Project Failures, Causes and Cures. *IEEE Access*, 8, 72059–72067. <https://doi.org/10.1109/ACCESS.2020.2986545>
- Lech, P. (2013). Time, Budget, And Functionality?-IT Project Success Criteria Revised. *Information Systems Management*, 30(3), 263–275. <https://doi.org/10.1080/10580530.2013.794658>
- Letiagina, E., & Malov, D. (2021). Investment Risk Management under Conditions of Digitalization. *SHS Web of Conferences*, 93, 02006. <https://doi.org/10.1051/shsconf/20219302006>

- Li, R., Curtis, K., Zaidi, S. T., Van, C., & Castelino, R. (2022). A new paradigm in adverse drug reaction reporting: consolidating the evidence for an intervention to improve reporting. *Expert Opinion on Drug Safety*, 21(9), 1193–1204. <https://doi.org/10.1080/14740338.2022.2118712>
- Lopes, S. F. S. F. (2021). The importance of the ITIL framework in managing Information and Communication Technology services. *International Journal of Advanced Engineering Research and Science*, 8(5), 292–296. <https://doi.org/10.22161/ijaers.85.35>
- Lubanga, S. (2019). *University of Nebraska - Lincoln DigitalCommons @ University of Nebraska - Lincoln Is Lilongwe Technical College ready to manage an Electronic Library ? November 2018.*
- Lynn, N. D., & Emanuel, A. W. R. (2021). Strategic Information Systems Planning for Higher Education in Uganda. *IOP Conference Series: Materials Science and Engineering*, 1096(1), 012015. <https://doi.org/10.1088/1757-899x/1096/1/012015>
- Macho-Stadler, I., & Pérez-Castrillo, D. (2021). Agency theory meets matching theory. *SERIES*, 12(1), 1–33. <https://doi.org/10.1007/s13209-020-00215-3>
- Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *All Ireland Journal of Higher Education*, 9(3).
- Mahaney, R. C., & Lederer, A. L. (2003a). An Agency Theory Analysis of Information Technology Project Success. *Amcis*, 167.
- Mahaney, R. C., & Lederer, A. L. (2003b). Information systems project management: An agency theory interpretation. *Journal of Systems and Software*, 68(1), 1–9. [https://doi.org/10.1016/S0164-1212\(02\)00132-2](https://doi.org/10.1016/S0164-1212(02)00132-2)
- Mahaney, R. C., & Lederer, A. L. (2003c). Information systems project management: An agency theory interpretation. *Journal of Systems and Software*, 68(1), 1–9. [https://doi.org/10.1016/S0164-1212\(02\)00132-2](https://doi.org/10.1016/S0164-1212(02)00132-2)
- Malone, T., & Crowston, K. (1994). the Interdisciplinary Study of Coordination. *Annals of the New York Academy of Sciences*, 138(2), 822–847. <https://doi.org/10.1111/j.1749-6632.1967.tb55024.x>
- Marcellus, R. L., & Dada, M. (1991). Interactive process quality improvement. *Management Science*, 37(11), 1365–1376.
- March, J. G., & Olsen, J. P. (1996). Institutional perspectives on political institutions. *Governance*, 9(3), 247–264.
- Marin-Garcia, J. A., & Lloret, J. (2008). Improving teamwork with university engineering students. The effect of an assessment method to prevent shirking. *WSEAS Transactions on Advances in Engineering Education*, 5(1), 1–11.
- Marshall, P., McKay, J., & Prananto, A. (2005). Business Value Creation from IT Investments: towards a process theory of IT governance. *Australasian Journal of Information Systems*, 12(2). <https://doi.org/10.3127/ajis.v12i2.91>

- Martin, N., Gregor, S., & Hart, D. (2005). The social dimension of business and IS/IT alignment: Case studies of six public-sector organisations. *Australian Accounting Review*, 15(3), 28.
- Maruping, L. M., Venkatesh, V., Thong, J. Y. L., & Zhang, X. (2019). A Risk Mitigation Framework for Information Technology Projects: A Cultural Contingency Perspective. *Journal of Management Information Systems*, 36(1), 120–157. <https://doi.org/10.1080/07421222.2018.1550555>
- Matta, M., Cavusoglu, H., & Benbasat, I. (2022). Understanding the board's involvement in information technology governance. *Information Systems Management*, 1–21.
- McDonnell, M.-H., King, B. G., & Soule, S. A. (2015). A Dynamic Process Model of Private Politics: Activist Targeting and Corporate Receptivity to Social Challenges. *American Sociological Review*, 80(3), 654–678. <https://doi.org/10.1177/0003122415581335>
- McGrath, S., Ramsarup, P., Zeelen, J., Wedekind, V., Allais, S., Lotz-Sisitka, H., Monk, D., Openjuru, G., & Russon, J. A. (2020). Vocational education and training for African development: a literature review. *Journal of Vocational Education and Training*, 72(4), 465–487. <https://doi.org/10.1080/13636820.2019.1679969>
- Memon, M. A., T., R., Cheah, J.-H., Ting, H., Chuah, F., & Cham, T. H. (2021). PLS-SEM STATISTICAL PROGRAMS: A REVIEW. *Journal of Applied Structural Equation Modeling*, 5(1), i–xiv. [https://doi.org/10.47263/jasem.5\(1\)06](https://doi.org/10.47263/jasem.5(1)06)
- Michalska, J. (2008). Using the EFQM excellence model to the process assessment. *Journal of Achievements in Materials and Manufacturing Engineering*, 27(2), 203–206.
- Might, R. J., & Fischer, W. A. (1985). *Management Success*. 2, 71–77.
- Milano, P. D. I., & Brun, P. A. (2021). *SCHOOL OF INDUSTRIAL ENGINEERING AND INFORMATION MASTER OF SCIENCE IN MANAGEMENT ENGINEERING Supervisor : 879119*, 0–75.
- MoES. (2013). *TVET Implementation in the Albertine Region*. Ministry of Education and Sports.
- MoES. (2019). *The Technical Vocational Education and Training (TVET) policy* (Issue July).
- MoES. (2020). The Technical Vocational Education and Training Policy. *Ministry of Education and Sports, Uganda*.
- Mohamad, S., & Toomey, M. (2016). A survey of information technology governance capability in five jurisdictions using the ISO 38500:2008 framework. *International Journal of Disclosure and Governance*, 13(1), 53–74. <https://doi.org/10.1057/jdg.2015.5>
- Montoya, A. K., & Edwards, M. C. (2020). The Poor Fit of Model Fit for Selecting Number of Factors in Exploratory Factor Analysis for Scale Evaluation. *Educational and Psychological Measurement*, 81(3), 413–440. <https://doi.org/10.1177/0013164420942899>
- Moore, M. T. (2012). Hoyle CFA Chapter-Final. <https://www.researchgate.net/publication/251573889>

- Morgan, G. A., & Harmon, R. J. (2001). Data collection techniques. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40(8), 973–976. <https://doi.org/10.1097/00004583-200108000-00020>
- Moudoubah, L., Yamami, A. El, Mansouri, K., & Qbadou, M. (2021). From IT service management to IT service governance: An ontological approach for integrated use of ITIL and COBIT frameworks. *International Journal of Electrical and Computer Engineering*, 11(6), 5292–5300. <https://doi.org/10.11591/ijece.v11i6.pp5292-5300>
- Münch, R., & Wieczorek, O. (2023). Improving schooling through effective governance? The United States, Canada, South Korea, and Singapore in the struggle for PISA scores. *Comparative Education*, 1–18. <https://doi.org/10.1080/03050068.2022.2138176>
- Myers, M. D. (2019). *Qualitative research in business and management*. Sage.
- Myers, M. D., & Venable, J. R. (2014). A set of ethical principles for design science research in information systems. *Information and Management*, 51(6), 801–809. <https://doi.org/10.1016/j.im.2014.01.002>
- Ndagire, L. (2020). *IT GOVERNANCE FRAMEWORK FOR PUBLIC SECTOR ORGANIZATIONS IN DEVELOPING COUNTRIES : List of Acronyms*.
- Nelson, R. (2021). *IT Project Management Lessons Learned from Project Retrospectives 1999–2020*.
- Nfuka, E. N. (2009). IT governance in the public sector in a developing country. *Handbook of Research on ICT-Enabled Transformational Government: A Global Perspective*, 452–486. <https://doi.org/10.4018/978-1-60566-390-6.ch025>
- Nfuka, E. N. (2012). *Report Series / DSV 12-001 Edephonce Ngemera Nfuka*.
- Nfuka, E. N., Rusu, L., Johannesson, P., & Mutagahywa, B. (2009). The State of IT governance in organisations from the public sector in a developing country. *Handbook of Research on ICT-Enabled Transformational Government: A Global Perspective*, 452–486. <https://doi.org/10.4018/978-1-60566-390-6.ch025>
- Ngqondi, T., & Mauwa, H. (2020a). Information technology governance model for a low resource institution with fragmented IT portfolio. *South African Journal of Higher Education*, 34(3), 246–262. <https://doi.org/10.20853/34-3-3326>
- Ngqondi, T., & Mauwa, H. (2020b). Information technology governance model for a low resource institution with fragmented IT portfolio. *South African Journal of Higher Education*, 34(3), 246–262. <https://doi.org/10.20853/34-3-3326>
- Nguyen, B. (2010). *A comparison of the business and technical drivers for ISO 27001, ISO 27002, CobIT and ITIL*. Retrieved from truongbang86. blogspot. com: <http://truongbang86. blogspot. com>
- Nguyen, L. H., & Watanabe, T. (2017). The impact of project organizational culture on the performance of construction projects. *Sustainability*, 9(5), 781.
- NITA-U. (2013). *National IT Project Management Methodology*. 1–62.

NITA-U. (2016). *National Information Technology Authority (NITA-) FY 2015 / 16 Annual Report*.
82. https://www.nita.go.ug/sites/default/files/publications/FY%2015.16%20ANNUAL%20REPORT_FINAL.pdf
http://www.nita.go.ug/sites/default/files/publications/FY%2015.16%20ANNUAL%20REPORT_FINAL.pdf

NITA-U. (2017). *National information technology authority- directorate of planning research and development* — *standards catalogue* . June.

Nofrida, E. R., Slamet, P. H., Prasojo, L. D., & Mahmudah, F. N. (2022). The Development of an Instrument to Measure the College Student Entrepreneurship Skills. *Pegem Egitim ve Ogretim Dergisi*, 13(1), 241–250. <https://doi.org/10.47750/pegegog.13.01.26>

Nurhidayah Yahya, Jamaliah Said, Nor Balkish Zakaria, & Kazi Musa. (2022). Assessing the Relationship of Corporate Integrity Practices With Accountability of Malaysian Statutory Bodies. *Journal of Modern Accounting and Auditing*, 18(1), 1–14. <https://doi.org/10.17265/1548-6583/2022.01.001>

Nwidobie, M. B. (2013). Agency Conflict And Corporate Dividend Policy Decisions In Nigeria. *Asian Economic and Financial Review*, 3(8), 1110–1121.

Nyameke, E., Haapasalo, H., & Aaltonen, K. (2020). *Formation of project identity in a multi-project environment*.

Nyeko, S. J. (2019). Information Technology Governance Effectiveness in Uganda's Public Universities. *ICT University*, 1(1), 41–57. http://www.ghbook.ir/index.php?name=فرهنگ+رسانه&option=com_dbook&task=readonline&book_id=13650&page=73&chkhask=ED9C9491B4&Itemid=218&lang=fa&tmpl=component%0Ahttp://www.albayan.ae%0Ahttps://scholar.google.co.id/scholar?hl=en&q=APLIKASI+PENGENA

Ominde, D., Ochieng, E. G., & Omwenga, V. O. (2021). Optimising ICT infrastructure performance in developing countries: Kenyan viewpoint. *Technological Forecasting and Social Change*, 169. <https://doi.org/10.1016/j.techfore.2021.120844>

Othman. (2011). *RESEARCH METHODOLOGY By Shaya'a Othman*.

Othman, M., Chan, T., Foo, E., & ... (2011). Barriers to information technology governance adoption: a preliminary empirical investigation. *... and Innovation-A Business*

Othman, M. F. I., Chan, T., Foo, E., Nelson, K., & Timbrell, G. (2010). Barriers to information technology governance adoption: A preliminary empirical investigation. *Knowledge Management and Innovation: A Business Competitive Edge Perspective - Proceedings of the 15th International Business Information Management Association Conference, IBIMA 2010*, 3, 1771–1787.

Pakusadewa, P. G., Suryani, E., Ambarwati, R., & Bintang, M. R. (2021). Selection of Information System Strategy Recommendations in Information Technology Company. *Proceedings of the 2nd International Conference on Business and Management of Technology (ICONBMT 2020)*, 175, 184–194. <https://doi.org/10.2991/aebmr.k.210510.032>

- Park, J. Y., Sung, C. S., & Im, I. (2017). Does social media use influence entrepreneurial opportunity? A review of its moderating role. *Sustainability (Switzerland)*, 9(9). <https://doi.org/10.3390/su9091593>
- Parveen, R., & Chikhaoui, E. (2017). Legal issues and challenges in educational cloud computing in the kingdom of Saudi Arabia. *International Journal of Economic Research*, 14(20), 357–371.
- Patokorpi, E., & Ahvenainen, M. (2009). Developing an abduction-based method for futures research. *Futures*, 41, 126–139. <https://doi.org/10.1016/j.futures.2008.09.019>
- Pereira, R., & Mira, M. (2012). *A Literature Review : IT Governance Guidelines and Areas. October*. <https://doi.org/10.1145/2463728.2463789>
- Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: Models, dimensions, measures, and interrelationships. *European Journal of Information Systems*, 17(3), 236–263. <https://doi.org/10.1057/ejis.2008.15>
- Pitelis, C. N., & Teece, D. J. (2010). Cross-border market co-creation, dynamic capabilities and the entrepreneurial theory of the multinational enterprise. *Industrial and Corporate Change*, 19(4), 1247–1270. <https://doi.org/10.1093/icc/dtq030>
- Popper, K. R. (1959). The logic of scientific discovery Hutchinson. *Hughes, John,(1987). "La Filosofía de La Investigación Social"*, Breviarios, Fondo de Cultura Económica, México.
- PRINCE2. (2019). *PRINCE2 Processes - 7 Processes Of PRINCE2 Explained | UK*.
- Rajala, T., & Aaltonen, H. (2020). *Reasons for the Failure of Information Technology Projects in the Public Sector* (pp. 1–21). https://doi.org/10.1007/978-3-030-03008-7_78-1
- Rajkumar, G. (2013). Available Online at <http://www.journalofcomputerscience.com/> THE MOST COMMON FACTORS FOR THE FAILURE OF SOFTWARE DEVELOPMENT PROJECT MOST COMMON REASONS FOR. I(11), 74–77.
- Reid, E. M., & Toffel, M. W. (2010). The Effect of Firm Compensation Structures on the Mobility and Entrepreneurship of Extreme Performers. *Business*, 920(October), 1–43. <https://doi.org/10.1002/smj>
- Resad Setyadi, Aedah Abd Rahman, Aang Subiyakto, & Anwar Fattah. (2021). Trust of Information Technology Governance in High School Institution (HSI): A Conceptual Framework. *International Journal of Science, Technology & Management*, 2(3), 844–855. <https://doi.org/10.46729/ijstm.v2i3.189>
- Reyes-Santiago, M. del R., Sanchez-Medina, P., & Diaz-Pichardo, R. (2019). The influence of environmental dynamic capabilities on organizational and environmental performance of hotels: Evidence from Mexico. <Https://Www.Sciedirect.Com/Science/Article/Pii/S0959652619313368>.
- Ribeiro, A., Amaral, A., & Barros, T. (2021). Project Manager Competencies in the context of the Industry 4.0. *Procedia Computer Science*, 181(2019), 803–810. <https://doi.org/10.1016/j.procs.2021.01.233>

- Riyadi, A., Yennisa, & Sagita, L. (2021). *COSO's Conceptual Framework to Internal Control Management Risk in Higher Education Management*.
- Rodello, I. A., & Pádua, S. I. D. de. (2014). Performance Measurement of Information Technology Governance in Brazilian Financial Institutions. *Journal of Information Systems and Technology Management*, 11(2), 397–414. <https://doi.org/10.4301/s1807-17752014000200010>
- Rohn, S. (2022). *4 High-Profile Digital Transformation Failures (+Causes) - Whatfix*.
- Romero_Consulting. (2005). *Understanding the Challenge and Incredible Potential of IT Governance* defined.
- Rossi, B. (2015). *Indicators of a failing IT project*.
- Sah, R. K., & Stiglitz, J. E. (1984). *The architecture of economic systems: Hierarchies and polyarchies*. National Bureau of Economic Research.
- Salmela, H. (2008). Analysing business losses caused by information systems risk: A business process analysis approach. *Journal of Information Technology*, 23(3), 185–202. <https://doi.org/10.1057/palgrave.jit.2000122>
- Samchynska, Y., & Vinnyk, M. (2017). Decision making in information technologies governance of companies. *CEUR Workshop Proceedings*, 1844(May), 96–110.
- Sareen, P. (2013). Cloud Computing: Types, Architecture, Applications, Concerns, Virtualization and Role of IT Governance in Cloud. *International Journal of Advanced Research in Computer Science and Software Engineering*, 3(3), 2277.
- Saunders, Lewis, P., & Thornhill, A. (2007). Research methods. *Business Students 4th Edition Pearson Education Limited, England*.
- Saunders, Lewis, P., & Thornhill, A. (2019a). Research Methods for Business Students by Mark Saunders, Philip Lewis and Adrian Thornhill 8th edition. In *Research Methods For Business Students*.
- Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019b). “Research Methods for Business Students” Chapter 4: Understanding research philosophy and approaches to theory development. In *Researchgate.Net* (Issue January). www.pearson.com/uk
- Saxena, D. (2021). Regaining legitimacy after an information systems implementation failure: Case of a National Blood Bank Service. *Journal of Information Technology Teaching Cases*, 0(0), 2043886921991846. <https://doi.org/10.1177/2043886921991846>
- Schillemans, T., & Busuioc, M. (2015). Predicting public sector accountability: From agency drift to forum drift. *Journal of Public Administration Research and Theory*, 25(1), 191–215. <https://doi.org/10.1093/jopart/muu024>
- Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching*, 5(9), 9–16. <https://doi.org/10.5539/elt.v5n9p9>

- Seddon, P. (1997). A Respecification and Extension of the DeLone and McLean Model of IS Success. *Information Systems Research*, 8, 240–253. <https://doi.org/10.1287/isre.8.3.240>
- Simon, H. A. (1996). *The sciences of the artificial* (Vol. 136). MIT press.
- Sims, T. (2022). Leadership Through Budgeting: Controlling Taxes and Increasing Services. *Certified Public Manager® Applied Research*, 3(1), 4.
- Sindre, G. (1996). *Aspects of Process Quality*.
- Sindre, G., & Sørumgård, S. (1996). *Aspects of Process Quality Multi-perspective modelling View project Secure electronic exam system View project Aspects of Process Quality*. <https://www.researchgate.net/publication/2764037>
- Sirisomboonsuk, P., Gu, V. C., Cao, R. Q., & Burns, J. R. (2018). Relationships between project governance and information technology governance and their impact on project performance. *International Journal of Project Management*, 36(2), 287–300.
- Sirisomboonsuk, P., Gu, V., Cao, R., & Burns, J. (2017). Relationships between project governance and information technology governance and their impact on project performance. *International Journal of Project Management*, 36. <https://doi.org/10.1016/j.ijproman.2017.10.003>
- Slocum, J. W., Cron, W. L., & Brown, S. P. (2002). The Effect of Goal Conflict on Performance. *Journal of Leadership & Organizational Studies*, 9(1), 77–89. <https://doi.org/10.1177/107179190200900106>
- Snipes, J. (2021a). Strategies Project Managers Use That Reduce Information Technology Project Failures in the Insurance Industry. *Dissertation*.
- Snipes, J. (2021b). *Walden University*.
- Spender, J. C., & Kessler, E. H. (1995). Managing the Uncertainties of Innovation: Extending Thompson (1967). *Human Relations*, 48(1), 35–56. <https://doi.org/10.1177/001872679504800103>
- Squires, V. (2023). Thematic Analysis. In *Varieties of Qualitative Research Methods: Selected Contextual Perspectives* (pp. 463–468). Springer.
- Steenkamp, J.-B. E. M., & Maydeu-Olivares, A. (2023). Unrestricted factor analysis: A powerful alternative to confirmatory factor analysis. *Journal of the Academy of Marketing Science*, 51(1), 86–113. <https://doi.org/10.1007/s11747-022-00888-1>
- Steuperaert, D., Huygh, T., De Haes, S., & Poels, G. (2021). Exploring the Dimensions and Attributes of A Maturity Model for IT Governance Organizational Structures. *Proceedings of the 54th Hawaii International Conference on System Sciences, November 2020*. <https://doi.org/10.24251/hicss.2021.730>
- Stinchcombe, A. (1990). Information and organizations. In *Information and Organizations*. University of California Press.
- Stoica, D. A. (2021). *MANAGEMENT OF THE PROJECT PLANNING ACTIVITY IN THE FIELD OF INFORMATION*.

- Strassmann, P. A. (1990). *The business value of computers: an executive's guide*. Information Economics Press.
- Straub, D., & Gefen, D. (2004). Validation Guidelines for IS Positivist Research. *Communications of the Association for Information Systems*, 13. <https://doi.org/10.17705/1cais.01324>
- Straub, D. W., Gefen, D., & Boudreau, M.-C. (2005). Quantitative research. *Research in Information Systems: A Handbook for Research Supervisors and Their Students*, 1.
- Sulistiyani, E., & Tyas, S. H. Y. (2021). What is the measurement of the IT project success? *Procedia Computer Science*, 197(2021), 282–289. <https://doi.org/10.1016/j.procs.2021.12.142>
- Tabassum, N., & Nayak, B. S. (2021). Gender Stereotypes and Their Impact on Women's Career Progressions from a Managerial Perspective. *IIM Kozhikode Society and Management Review*, 10(2), 192–208. <https://doi.org/10.1177/2277975220975513>
- Taherdoost, H. (2016). Validity and Reliability of the Research Instrument; How to Test the Validation of a Questionnaire/Survey in a Research. In *International Journal of Academic Research in Management (IJARM)* (Vol. 5, Issue 3). <https://hal.science/hal-02546799>
- Takahashi, A. R. W., Bulgakov, S., Giacomini, M. M., & Santos, C. B. dos. (2016a). *Dynamic capabilities, political external relationship, educational technology capability and firm performance*.
- Takahashi, A. R. W., Bulgakov, S., Giacomini, M. M., & Santos, C. B. dos. (2016b). *Dynamic capabilities, political external relationship, educational technology capability and firm performance*.
- Tariq, M. I., & Santarcangelo, V. (2016). Analysis of ISO 27001:2013 controls effectiveness for cloud computing. *ICISSP 2016 - Proceedings of the 2nd International Conference on Information Systems Security and Privacy*, Icissp, 201–208. <https://doi.org/10.5220/0005648702010208>
- Tashakkori, A., Teddlie, C., & Teddlie, C. B. (1998). *Mixed methodology: Combining qualitative and quantitative approaches* (Vol. 46). sage.
- Teece, D. J. (2010). The Effect of Firm Compensation Structures on the Mobility and Entrepreneurship of Extreme Performers. *Business*, 920(October), 1–43. <https://doi.org/10.1002/smj>
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533. [https://doi.org/10.1002/\(SICI\)1097-0266\(199708\)18:7<509::AID-SMJ882>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z)
- TheDailyMonitor. (2018). *Six vocational colleges turned into centres of excellence Monitor*.
- The_East_African. (2009). *Uganda's Failed Rural ICT Projects Eat Up U*.
- TheNewVision. (2018). *12 technical institutes selected to act as centres of excellence - New Vision Official*.
- Thompson, J. D. (1967). *Organizations in action*.

- Thompson, J. D., Zald, M. N., & Scott, W. R. (2017). *Organizations in action: Social science bases of administrative theory*. Routledge.
- Tickle, P. (2018). *Doing it digitally—How tech-charged customer collaboration delivers market innovation CIO*.
- Trends, T. (2020). *DI_TechTrends2020*.
- Trochim, M. K., & Donnelly, J. (2006). The Research Methods Knowledge Base, 2nd Edition. *Atomic Dog Publishing, Cincinnati, OH*, Internet WWW. <https://doi.org/10.2471/BLT.05.029181>
- Turedi, S., & Zhu, H. (2019). How to generate more value from IT: The interplay of it investment, decision making structure, and senior management involvement in IT governance. *Communications of the Association for Information Systems*, 44(1), 511–536. <https://doi.org/10.17705/1CAIS.04426>
- UN. (2020). United Nations E-government Survey 2020. In *United Nations E-Government Surveys* (Vol. 1, Issue 1).
- Unesco IITE. (2021). *UNESCO IITE and NetDragon launch the joint project – UNESCO IITE*. UNESCO IITE and NetDragon.
- UNESCO-UNEVOC. (2010). *Increasing Public Awareness of TVET in the Philippines A Case Study*. UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training.
- UNESCO-UNEVOC. (2022). *Trends in digital skills training for TVET teachers and trainers*.
- USC. (2020). *Theoretical Framework - Organizing Your Social Sciences Research Paper - Research Guides at University of Southern California* (p. undefined-undefined).
- USDP. (2020). *USDP_Report*.
- Uusitalo, O. (2014). Research methodology. *SpringerBriefs in Applied Sciences and Technology*, 9783319068282, 25–39. https://doi.org/10.1007/978-3-319-06829-9_3
- Uysal, M., & Çetinkaya, E. (2021). Information Technology Governance Practices, Challenges and Effects on Enterprise Performance. *Acta Infologica*, 5(1), 65–78. <https://doi.org/10.26650/acin.832561>
- Vaishnavi, V., & Kuechler, W. (2004). *Design research in information systems*.
- Valentine, E., & Stewart, G. (2015). Enterprise business technology governance: Three competencies to build board digital leadership capability. *Proceedings of the Annual Hawaii International Conference on System Sciences, 2015-March*, 4513–4522. <https://doi.org/10.1109/HICSS.2015.539>
- van grembergen, W., De Haes, S., & Thorp, J. (2007). *Implementing Information Technology Governance: Models, Practices and Cases*. <https://doi.org/10.4018/978-1-59904-924-3>
- Vendraminelli, L., Macchion, L., Nosella, A., & Vinelli, A. (2023). Design thinking: strategy for digital transformation. *Journal of Business Strategy*, 44(4), 200–210.

- Vom Brocke, J., Hevner, A., & Maedche, A. (2020). *Introduction to Design Science Research* (pp. 1–13). https://doi.org/10.1007/978-3-030-46781-4_1
- Von Solms, B. (2005). Information Security governance: COBIT or ISO 17799 or both? *Computers and Security*, 24(2), 99–104. <https://doi.org/10.1016/j.cose.2005.02.002>
- Wade, M. (2018). *DIGITAL TRANSFORMATION : 5 WAYS IF WE 'RE ALL WORKING SO HARD ON DIGITAL TRANSFORMATION , WHERE ARE THE RESULTS ? CONSIDER WHETHER YOU FALL INTO ANY OF THESE.*
- Walakira, J. (2019). “*Implementation in crisis* ”: How can the National Transmission Backbone Infrastructure be realized ? 2019(July), 1–4.
- Wang, B., Liu, B., & Li, Y. (2023). A Dark Side of Trust: Examining the Influence of Environmental Risk Perception on Citizens’ Plastic-Avoiding Behavior. *IEEE Transactions on Computational Social Systems*.
- Wang, C., & Ahmed, P. (2007). Dynamic capabilities: A review and research agenda. *International Journal of Management Reviews*, 9(1), 31–51. <https://doi.org/10.1111/j.1468-2370.2007.00201.x>
- Wang, F., & Hannafin, M. J. (2011). Designing Technology Enhanced Learning Environments. *Instructional and Cognitive Impacts of Web-Based Education*, 53(4), 241–261. <https://doi.org/10.4018/978-1-878289-59-9.ch016>
- Wang, S. (2021). Research on design method of Energy Internet business model. *IOP Conference Series: Earth and Environmental Science*, 657(1). <https://doi.org/10.1088/1755-1315/657/1/012054>
- Weill, P., & Ross, J. W. (2004). *IT Governance How Top Performers Manage IT Decision Rights for Superior Results*.
- Weill, P., & Woodham, R. (2003). Don’t Just Lead, Govern: Implementing Effective IT Governance. *Massachusetts Institute of Technology (MIT), Sloan School of Management, Working Papers*. <https://doi.org/10.2139/ssrn.317319>
- Wheeldon, J. (2010). Mapping mixed methods research: Methods, measures, and meaning. *Journal of Mixed Methods Research*, 4(2), 87–102. <https://doi.org/10.1177/1558689809358755>
- William, H. D., & Ephraim, R. M. (2003). The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems*, 19(4), 9–30.
- Williams, B., Onsman, A., & Brown, T. (2010). Exploratory factor analysis: A five-step guide for novices. *Australasian Journal of Paramedicine*, 8, 1–13.
- Wilson, J. (2014). *Essentials of business research: A guide to doing your research project*. Sage.
- Wulandari, D., & Buliali, J. L. (2019). ITIL v3 and Van Grembergen Framework for System Transition Process. *IPTEK Journal of Proceedings Series*, 0(5), 426. <https://doi.org/10.12962/j23546026.y2019i5.6383>
- Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). sage.

Zerai, A. (2018). *African women, ICT and neoliberal politics: The challenge of gendered digital divides to people-centered governance*. Routledge.

Zhang, D., & Zhou, C. (2014). *Adoption of COBIT 5 and ITIL in Small and Medium Size Enterprises in China*. 00(vx), 27.

