INVESTIGATING THE IMPACT OF INFORMATION SYSTEMS PROJECT COMPLEXITY ON PROJECT SUCCESS DIMENSIONS

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Abstract: Information systems (IS) projects operationalize and achieve organizational strategy. The reality is that IS project success is challenged by complexity. This research adopts a rich approach and includes a broader array of project complexity and success constructs to establish how project complexity influences the multiple dimensions of project success in IS projects. The target sample was project team members who were actively involved in and had implemented any IS projects across any industry. The research analyzed 612 responses using partial least squares structural equation modelling. The findings revealed three constructs influence IS project complexity which in turn influence three dimensions of IS project success. An empirical model explained that IS project complexity significantly influences IS project process success and deliverable success. Furthermore, IS deliverable project success mediates the relationship between process success and strategic success. The paper provides a novel contribution by establishing the basis for developing an organizational framework where practices, policies, and procedures can be developed for managing IS project complexity. This would assist IS project managers and team members manage project complexity more effectively and realize actual business benefits.

Keywords: Information systems projects, project success, project complexity, project success dimensions, project complexity constructs, structural equation modelling, partial least squares

Introduction

Organizations across the globe have placed increased emphasis on the importance of assimilating and strategically aligning information systems (IS) projects and solutions to ensure optimal organizational performance (El-Telbany & Elragal, 2014). This can only be achieved if IS projects successfully deliver the promised benefits. The reality is that project success is challenged by complexity (Bakhshi, Ireland, & Gorod, 2016; Daniel & Daniel, 2018; Rolstadås & Schiefloe, 2017). A poor understanding of project complexity contributes to the failure of organizational projects (San Cristóbal et al., 2018). Articulating the relevant constructs and indicators of IS project complexity is imperative to understanding how they influence the subsequent success of IS projects. McKeen, Guimaraes, and Wetherbe (1994) arguably provided an oversimplistic view of IS project complexity. Xia and Lee (2005) and Williamson (2012) expanded this view but can be considered dated, while Poveda-Bautista, Diego-Mas, and Leon-Medina (2018) did not determine which constructs and indicators are relevant or not. Bosch-Rekveldt et al. (2011) argue that constructs should be as granular as possible to maintain and promote each construct's indicators' richness and importance.

Articulating IS project success is faced with a similar dilemma. The challenge, however, is that the theory primarily argues for project success in terms of performance criteria such as time, cost, and scope. These criteria represent short-term successes and only have immediate implications for an organization. Projects are more than short-term gains for an organization as they are strategic tools that facilitate economic benefits and competitive advantage (Sanchez, Terlizzi, & de Moraes, 2017; Zaman, 2020). Project success has evolved to include dimensions such as user satisfaction, system use, organizational impact, and industry impact (Bannerman, 2008; Petter, DeLone, & McLean, 2013). Understanding the relationship between project complexity and performance criteria is inadequate as this negates the medium and long-term success of projects should realize (Bannerman, 2008). Moreover, at a conceptual level, literature has argued that project complexity directly influences the overall success of a project (Baccarini, 1996; Bakhshi et al., 2016; Geraldi, Maylor, & Williams, 2011). Project success and complexity have an inherent link, but the extent of this link is questioned (Joseph, 2017; Marnewick, Erasmus, & Joseph, 2017; Mikkelsen, 2017).

Literature has empirically shown that project complexity negatively influences project success. For example, relationship studies were performed around general project management (Carvalho, Patah, & de Souza Bido, 2015; Floricel, Michela, & Piperca, 2016; Nguyen & Mohamed, 2020), IS projects (Williamson, 2012; Zaman et al., 2019), construction projects (Luo et al., 2017) and engineering projects (Bosch-Rekveldt et al., 2011). However, two main drawbacks exist in current literature regarding the relationship between project complexity and success. Firstly, project success is mainly operationalized as time, cost, and scope (Bosch-Rekveldt et al., 2011; Carvalho et al., 2015; Floricel et al., 2016; Nguyen & Mohamed, 2020) or aggregated into a single construct, thus negating the possible influence on individual dimensions (Luo et al., 2017). Secondly, project complexity in the IS project domain often focuses on technical constructs (Zaman et al., 2019) or does not provide a rich and granular view of the concept (Williamson, 2012).

This research adopts a rich approach and includes a broader array of project complexity and success constructs to establish how project complexity influences the multiple dimensions of project success in IS projects. This is important in the IS project domain, were articulating a project's success is challenging given its tangible and intangible implications (Aydiner et al., 2019; Williamson, 2012). The following research question is posed: How does project complexity influence the multiple dimensions of project success in IS projects? A new theoretical understanding of the effects of project complexity on project success dimensions would add to the current body of knowledge while providing further practical guidelines on the complexities associated with specific dimensions.

The theoretical contributions of this paper are three-fold. Firstly, the paper contributes to theory by arguing an updated view of IS project complexity and paves the way for evolving this research domain. Secondly, while the paper reaffirms that project complexity negatively influences project success, it also contributes to theory by depicting how complexity influences project success over time. Finally, the paper provides the basis for developing an organizational framework where practices, policies, and procedures can be developed for managing IS project complexity. Regarding practical contributions, the revised research model can serve as a tool for IS project managers and team members to manage project complexity more effectively and realize actual business benefits. Furthermore, the findings contribute to developing new curricula for project management training that can assist with training current and new IS project managers to manage complexity more effectively.

The paper is structured as follows: Firstly, the theoretical background for the research is discussed through a literature review of IS project success and IS project complexity. Secondly, the research methods are discussed. Thirdly, the results are presented, interpreted, and discussed. Finally, the paper concludes with theoretical and practical contributions, limitations, and avenues for future research.

Theoretical Background

IS Project Success

Prior studies had a generic view of project success with no clear emphasis on a specific project domain. Bannerman (2008) subsequently developed a five-dimensional view of IS project success that considers the strategic alignment of IS projects. The five dimensions are process success, project management success, deliverable/product success, business success, and strategic success. IS projects are fundamentally abstract and intangible, making them difficult to assess. Petter et al. (2013) investigated the concept at a more granular level by including multiple success criteria to supplement IS project success understanding. Their final model, however, explicitly focused on quality, user satisfaction, and net business benefits. Building on Shenhar et al. (2001) and with specific application to IS projects, Bannerman (2008) arguably has the most comprehensive view of IS project success as they argue success criteria across a timeline of tactical and strategic success, i.e., short, medium, and long-term successes. The inexplicable nature of project success is that each dimension can be viewed as success can exist in one dimension, not another. Bannerman and Thorogood (2012) refer to the Australian Department of Motor Vehicles Licensing and Registration System Project that was unsuccessful in the process, project management, and deliverable/product success dimensions but successful in the business success dimension. However, determining success at a specific point in time may negate successes associated with internal and external elements beyond a project. Walker, Davis, and Stevenson (2017) argues that projects could also realize unintended benefits and impacts that can either be exploited or require attention in future endeavors. While success dimensions are independent, there are theoretical arguments (Joseph, 2017) and empirical arguments (Marnewick et al., 2017) that IS project success dimensions are correlated.

Present your perspective on the issues, controversies, problems, etc., as they relate to the theme and arguments supporting your position. Compare and contrast what has been or is currently being done as it relates to the article's specific topic and the central theme of the journal.

IS Project Complexity

There are many views regarding what constitutes complexity, which has resulted in no consistent definition of project complexity being developed. Three complexity constructs are arguably the most prevalent in the project management literature (Bosch-Rekveldt et al., 2011; Floricel et al., 2016; Geraldi et al., 2011; Luo et al., 2017): organizational complexity, technical complexity, and environmental complexity. Two additional constructs have emerged in the literature as they are now considered critical standalone aspects (Daniel & Daniel, 2018; Luo et al., 2017; Rolstadås & Schiefloe, 2017; San Cristóbal et al., 2018): uncertainty and dynamics. Uncertainty distinguishes a complicated project from a complex one as it becomes more challenging to articulate the unknowns in complex projects. Dynamics refers to the complexity around pre- and post-project change management.

Given the proliferation of project complexity studies, Bakhshi et al. (2016) show that the IS domain is underrepresented in project complexity at only 8%. Emphasis is placed on generic project management and engineering project management. This begs the question of how well IS project complexity is understood in the literature. Complexity research in the IS project domain is scarce and intermittent, as illustrated in works by McKeen et al. (1994), Ribbers and Schoo (2002), and Xia and Lee (2005). Models from McKeen et al. (1994) and Xia and Lee (2005) arguably only provide a slim basis for managing IS project complexity as they mainly take an abstract or high-level view. This is further compounded by the fact that these notions of IS project complexity are over a decade old. Morcov, Pintelon, and Kusters (2021) attempted to study IS project complexity as part of their multi-industry articulation of project complexity. While the findings provide some clarity, only eight interviews were conducted and they further argued that the data was insufficient to add any depth to IS project complexity theory. New theoretical foundation are therefore required to update our understanding of what constitute IS project complexity.

Relationship between IS Project Complexity and Success

At a conceptual level, literature has argued that project complexity directly influences the success of a project (Baccarini, 1996; Bakhshi et al., 2016; Geraldi et al., 2011). The concepts of project success and complexity do not exist in isolation, as there is an inherent link between the two. However, the extent of this link is questioned (Joseph, 2017; Marnewick et al., 2017; Mikkelsen, 2017). This has led to several empirical studies to validate these claims. Table 1 provides an overview of literature (2000 - 2020) exploring the relationship between project complexity and project success.

Tatikonda and Rosenthal (2000) studied the relationship in new product development projects and applied a quantitative approach in the form of surveys. They operationalized project success in terms of time, cost, and quality but only empirically validated a relationship between project complexity and cost. Bosch-Rekveldt et al. (2011) used interviews to gain a deeper qualitative understanding of the constructs and indicators of engineering project complexity and its relation to project success. After conducting 18 interviews across six cases, they determined that project complexity negatively influenced three cases. However, their study defined project success in terms of time, cost and scope. Williamson (2012) was one of the first major works in understanding the relationship in IS projects. They gathered quantitative data from surveys to determine the correlation between the concept of complexity and success. A negative and medium-strength correlation was found. However, this study also defined success in terms of time, cost and scope, thus limiting the possible implications of complexity on other success dimensions. Carvalho et al. (2015), Floricel et al. (2016), and Nguyen and Mohamed (2020) generalized the relationship in the greater project management context. Both Carvalho et al. (2015) and Nguyen and Mohamed (2020) used a quantitative survey approach, while Floricel et al. (2016) applied a sequential mixed method approach. Carvalho et al. (2015) and Nguyen and Mohamed (2020) complement each other as they both established that complexity influences time and cost.

One has to question the broader implications of project complexity on success if studies continue to assess success around the limited view of time, cost, and scope/quality. Floricel et al. (2016) arguably realized this and operationalised project success around time, cost, scope, project objectives, strategic intent, user satisfaction, and stakeholder satisfaction. While an updated project success view was operationalized, they only found significant relationships between project complexity and time, cost, scope, and project objectives. Luo et al. (2017) also took an updated view of project success and applied it to the construction domain using a quantitative survey approach. They discovered that project complexity negatively influences project success but aggregates success into a single construct, thus negating the possible influence on individual dimensions. Zaman et al. (2019)- is arguably an evolution of Williamson (2012) as they studied IS projects specifically and expanded the success dimensions operationalized. Through quantitative surveys, they discovered that project complexity negatively influences project success. Like Luo et al. (2017), the study aggregated the success dimensions into single constructs and did not facilitate an analysis of each dimension's influence.

Interrogation of literature and theory has revealed several vital contributions and limitations of prior work on the relationship between project complexity and project success. In table 1, other inconsistencies can be seen. Perceptions and interpretations of project complexity vary in literature as there are multiple views regarding complexity constructs and their inherent indicators. This can also be said for project success as there are varying views around what constitutes success while the concept has been studied significantly. This implies that theory is yet to demarcate what are acceptable descriptions of project complexity and project success.

Regarding the IS project domain, consistent and continuous studies are lacking as research is conducted intermittently. Furthermore, more recent IS project research (e.g., Zaman et al. (2019)) views project complexity from a technical perspective and negates other complexity constructs. Bosch-Rekveldt et al. (2011) argue that constructs should be as granular as possible to maintain and promote the richness and importance of each construct's elements and features. Joseph (2017) recognized the IS project complexity limitation and conceptualized 75 features of IS project complexity across five constructs. In the IS project success context, Bannerman (2008) and Bannerman and Thorogood (2012), and Petter et al. (2013) alleviated this limitation by conceptualizing the constructs of IS project success at a more granular level. This research adopts this rich approach and includes a broader array of project complexity and success constructs to establish how project complexity influences the multiple dimensions of project success in IS projects.

Table 1. Overview of project complexity and success relationship literature

Author	Industry	Research Method	Project Complexity Constructs (indicators)	Project Success Dimensions
Tatikonda and Rosenthal (2000)	New product development	Quantitative – survey	Technical (3)	Time, cost, quality
Moreover et al., 2020	Engineering	Qualitative – interviews	Technical (15) Organizational (21) Environmental (14)	Time, cost, scope
Williamson (2012)	IS	Quantitative – survey	Technical (5) Organizational (5) Uncertainty (1) Environmental (1)	Time, cost, scope
Carvalho et al. (2015)	General project management	Quantitative – survey	Financial (4) Contractual (4) Technical (2) Organizational (4)	Time, cost
Floricel et al. (2016)	General project management	Mixed methods – interviews -> survey	Technical (3) Organizational (4) Market (2) Institutional (2)	Time, cost, scope, project objectives, strategic intent, user satisfaction, and stakeholder satisfaction
Luo et al. (2017)	Construction	Quantitative – survey	Goal (6) Organizational (8) Task (7) Technological (5) Environmental (7) Information (8)	Time, cost, quality, health and safety, environmental performance, stakeholder satisfaction, user satisfaction, strategic value
Zaman et al. (2019)	IS	Quantitative – survey	Technical (4)	Time, cost, quality, user satisfaction, stakeholder satisfaction, project goals
Nguyen and Mohamed (2020)	General project management	Quantitative – survey	Environmental (3) Organizational (4)	Time, cost

Model Development and Hypotheses

Table 1 indicates several project complexity constructs that were empirically validated to contribute toward project complexity. However, IS project complexity representation is limited and requires further empirical validation. While table 1 indicates several constructs for project complexity, the conceptual model of Joseph (2017) is adopted in this research as it provides a rich and granular view of IS project complexity. Adopting the model of Joseph (2017) also allows the researchers to empirically validate the constructs and indicators of IS project complexity. IS project complexity is therefore conceptualized within five constructs: (i) organizational complexity, (ii) technical complexity, (iii) environmental complexity, (iv) uncertainty, and (v) dynamics. Organizational complexity relates to any organization's underlying structures and factors (Baccarini, 1996; Bosch-Rekveldt et al., 2011). Technical complexity has roots in technological complexity and was reclassified to reflect the technical considerations around the inputs, outputs, goals, scope and technology usage of a project (Baccarini, 1996; Zaman et al., 2019). Internal and external environments influence organizations Organizations and projects as they introduce various pressures that emerge as environmental complexity (Luo et al., 2017; Nguyen & Mohamed, 2020). Uncertainty is evident in any environment, including projects, as Geraldi et al. (2011) assert that decision-making is affected by the "*inevitable gap between the amount of information and knowledge*" available. Project complexity in terms of dynamics relates to the implementation and processes of change management practices (Geraldi et al., 2011; Maylor, Vidgen, & Carver, 2008). The following hypotheses reflect the conceptualization of IS project complexity:

- H1a – Organisational complexity contributes to IS project complexity
- H1b – Technical complexity contributes to IS project complexity
- H1c – Environmental complexity contributes to IS project complexity
- H1d – Uncertainty contributes to IS project complexity
- H1e – Dynamics contributes to IS project complexity

Seminal works such as de Wit (1988), Pinto and Slevin (1988), Shenhar, Levy, and Dvir (1997), and Baccarini (1999) have shown how project success has evolved into a multidimensional construct. This view is evident in table 1, where literature argues project success exists in multiple dimensions. Bannerman (2008) and Bannerman and Thorogood (2012) conceptualized IS project success, while Petter et al. (2013) sought to empirically validate the variables and underpin the multidimensionality of IS projects. Subsequently, the five-dimensional view of IS project success is considered for this research: (i) process success, (ii) project management success, (iii) deliverable success, (iv) business success, and (v) strategic success. However, the *project management success* dimension is defined in terms of time, cost and scope and was excluded from this research. The rationale was to steer away from the traditional triple constraint in search of a more robust and value-driven view of IS project success (Atkinson, 1999; Sanchez et al., 2017). Process success is measured based on the suitability of used processes, alignment between project purpose and processes, and the contribution of processes in achieving project goals Bannerman and Thorogood (2012). Deliverable or product success focuses on meeting requirements and stakeholder/user satisfaction when delivering an IS project Petter et al. (2013). Business and strategic success have a long-term focus. Business success envisions realizing business goals and benefits through IS projects, while strategic success envisions more significant market, industry, and competitive impact, amongst others (Luo, Zhang, & He, 2020). However, the reality is to articulate the influence of IS project complexity on IS project success. Williamson (2012) articulated the relationship with a narrow view of success, while Zaman et al. (2019) provided a limited view of complexity. The following hypotheses reflect the influence of IS project complexity on the dimensions of IS project success:

- H2a – IS project complexity influences the process success of IS projects
- H2b – IS project complexity influences the deliverable success of IS projects
- H2c – IS project complexity influences the business success of IS projects
- H2d – IS project complexity influences the strategic success of IS projects

While the success dimensions are independent (Bannerman, 2008), there are theoretical arguments (Joseph, 2017) and empirical arguments (Marnewick et al., 2017) that IS project success dimensions are inherently connected. IS project success cannot be seen as a black box, as this forfeits the interconnected nature of success (Pankratz & Basten, 2018). The following hypotheses reflect the interconnected nature of the IS project success dimensions:

- H3a – Process success influences the deliverable success of IS projects
- H3b – Deliverable success influences the business success of IS projects
- H3c – Business success influences the strategic success of IS projects

The research model and hypotheses adopted in this research are presented in figure 1.

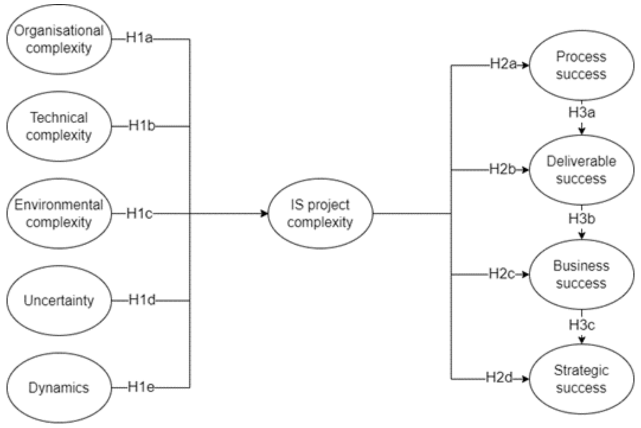

Figure 1. Research model

Research Methodology

The theoretical perspective adopted in this research was post-positivism, as it does not emphasize realizing a single truth for elaborating on the relationship between IS project complexity and success (Guba & Lincoln, 1994). Moreover, post-positivism allows researchers to generate a new objective perspective through multiple subjective views and the analysis of the hypotheses (Serrador & Turner, 2015). The aim is not to create fundamental laws governing IS project complexity and success but rather to elucidate new reality approximations in IS projects.

The research strategy is influenced by the theoretical perspective adopted in a research study as it forms the plan of how researchers intend to achieve their research goal (Saunders, Lewis, & Thornhill, 2015). Furthermore, the research model intends to determine the influence and effect of IS project complexity on the dimensions of IS project success. The analysis and modeling of variable relationships are facilitated by surveys and require large datasets from large individual groups in a standardized manner (Fowler, 2009). This research employed a web-based closed questionnaire to evaluate IS project complexity and its influence on IS project success. The questions for IS project success were developed around the work of Bannerman and Thorogood (2012) and Petter et al. (2013). Respondents were asked through Likert-scale questions about the extent to which they perceived each dimension's criteria achieved in the last project they worked on. A 5-point Likert scale was adopted for each criterion, viz. poor (1), fair (2), good (3), very good (4), and excellent (5). The theoretical constructs for IS project complexity are based on the constructs articulated by Joseph (2017) and presented in the research model (figure 1). Respondents were asked to indicate how complex they perceive the indicators of IS project complexity. A 5-point Likert scale was adopted for each feature, viz. simple (1), relatively simple (2), reasonably complex (3), complex (4), and very complex (5).

The target sample was project team members who were actively involved in and had implemented any IS projects across any industry. The reasoning was that these individuals would have first-hand experience and knowledge regarding IS project complexity, given their vested involvement (Pokharel, 2011; Vos & Achterkamp, 2006). Gaining objective, unbiased results from subjective perspectives is a crucial facet of post-positivism. Acquiring biased results would negate any practicality and applicability of this research. Probability sampling was, therefore, best suited to this study. This research emphasized simple random sampling as the realization of probability sampling, allowing an equal chance of selection from the more significant population.

The survey research strategy was adopted as a web-based questionnaire created on SurveyMonkey.com. Simple random sampling was executed by posting the questionnaire link on

LinkedIn and Twitter. The Twitter ling included project management-related handles (e.g., @PMInstitute, @ APMProjectMgmt, and @pmiagile) as these targeted individuals that follow project management-related content on Twitter. Using social media as an avenue for data gathering allows researchers to post easy-to-access questionnaires online and gain insight from a diverse array of individuals (Leiner, 2014). Given this approach, it was challenging to determine the response rate as no specific number of questionnaires were distributed, and participants could respond using their free will. A total of 612 valid responses were received after removing incomplete responses. An overview of the respondent demographics is presented in table 2.

Table 2. Demographics of respondents

Characteristic	N	%	Characteristic	N	%
Job Title			Industry		
Project Manager	114	18.7%	Financial Services	218	35.9%
Other	97	15.9%	ICT & Communication Services	126	20.7%
Senior Project Manager	80	13.1%	Public Administration	74	12.2%
Business Analyst	66	10.8%	Education & Training	45	7.4%
IT Manager	59	9.7%	Logistic Services	31	5.1%
Project Leader	40	6.5%	Wholesale & Retail	23	3.8%
Program Manager	36	5.9%	Healthcare	22	3.6%
Portfolio Manager	26	4.3%	Energy	21	3.5%
Assistant Project Manager	25	4.1%	Building & Construction	18	3.0%
Project Coordinator	23	3.8%	HR Services	12	2.0%
Iteration Manager	21	3.4%	Facility & Real Estate Services	11	1.8%
Project Implementation Manager	14	2.3%	Legal Services	5	0.8%
Project Consultant	10	1.6%	Agriculture	2	0.3%
Employment Domain					
IT management	208	34.1%			
The program, Portfolio and Project Management	133	21.8%			
Consulting	81	13.3%			
Financial management	44	7.2%			
General management	43	7.0%			
Other	34	5.6%			
Business development	32	5.2%			
Training / Education	23	3.8%			
Commercial management	12	2.0%			

Research Model Analysis Specification

Partial least squares structural equation modelling (PLS-SEM) was adopted for this research as it is a widely used method in IS research for estimating and testing causal relationships in quantitative data (Hair, Hollingsworth, et al., 2017). SmartPLS 3.2.8 was used to perform the PLS-SEM (Ringle, Wende, & Becker, 2015). SmartPLS is widely used in project management and information systems research (see Carvalho et al. (2015), Hair, Hollingsworth, et al. (2017), Bjorvatn and Wald (2018)). Figure 1 adopted PLS-SEM principles as part of the research model analysis specification. Model specification during PLS-SEM requires designing an inner model (structural model) and an outer model (measurement model). The inner model allows researchers to understand the relationship between latent factors (constructs/ dimensions), and the outer model shows relationships between indicator variables and their related latent factors (Hair Jr et al., 2014).

IS project success was determined to be a reflective model. It is argued in this research that each IS project success construct causes and explains the reflective indicators. Conversely, IS project complexity was determined to be a formative model as the indicators combine and cause the manifestation of each latent construct. In this research, IS project complexity is viewed as a higher order construct (HOC), a composite construct informed by the five lower order constructs (LOCs) of organizational complexity, technical complexity, environmental complexity, dynamics, and dynamics *uncertainty*. The five constructs were conceptually mapped to a HOC as each construct forms the foundation for conceptualizing IS project complexity (Bosch-Rekveldt et al., 2011; Geraldi et al., 2011; Joseph, 2017). This implies that the HOC was developed using a deductive approach since literature informed the constituents of the IS project complexity HOC (Hair et al., 2018). Hair et al. (2018) assert that operationalizing a HOC is logical when specifying complex models. Creating a HOC is practically sound and results in a more comprehensible model within the research context (Hair et al., 2018).

An overview of the overall research methodology and process is presented in figure 2.

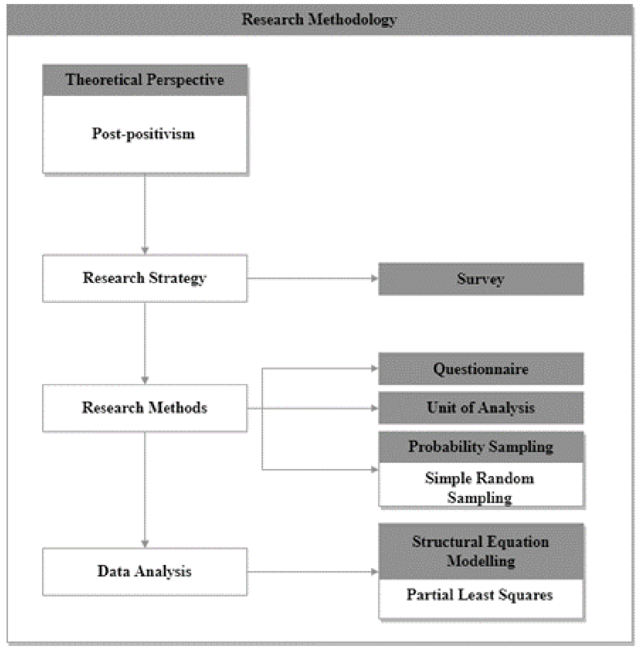

Figure 2. Research methodology and process overview

Results

Assessing the Results of the Measurement Models

The generated results need to be assessed to determine the reliability and validity of both the reflective and formative measurement models (Hair, Hult, et al., 2017; Hair et al., 2019). The following reflective model measures were assessed: internal consistency reliability, convergent validity, and discriminant validity (Hair et al., 2019; Ringle et al., 2018). Internal consistency reliability ensures that the correct indicators are used to capture a conceptual construct. Cronbach's Alpha and composite reliability (CR) are two measures to ensure internal consistency reliability, and the values should be above the 0.7 threshold (Hair et al., 2019; Ringle et al., 2018). Convergent validity examines the extent to which indicators are related to explain the same construct and is measured using the average variance extracted (AVE) and indicator loadings. Both the AVE and indicator loadings should be above the 0.5 thresholds. Discriminant validity determines how distinct a construct is from other constructs in the same model and is measured via the heterotrait-monotrait bias-corrected (HTMT BCa) confidence interval. The HTMT BCa value should be below the threshold of 1. The final results are presented in table 3.

Table 3. Final results and acceptance criteria for IS project success reflective measurement model

Latent Construct	Indicators	Internal Consistency Reliability		Convergent Validity		Discriminant Validity
		Cronbach's Alpha(> 0.7)	CR (> 0.7)	AVE (> 0.5)	Indicator Loading (> 0.5)	HTMT BCa Confidence Interval < 1
Deliverable Success	BS_Business_Realisation	0.916	0.916	0.524	0.751	✓
	BS_Business_Plan				0.767	✓
	BS_Goals				0.628	✓
	DS_Benefits_Realised				0.694	✓
	DS_Product_Used				0.613	✓
	DS_Requirements				0.753	✓
	DS_Specifications				0.742	✓
	DS_User_Acceptance				0.739	✓
	DS_User_Expectations				0.782	✓
	DS_User_Satisified				0.747	✓
Process Success	PS_Alignment	0.833	0.832	0.555	0.797	✓
	PS_Chosen				0.674	✓
	PS_Implemented				0.797	✓
	PS_Integrated				0.705	✓
Strategic Success	SS_Competitive_Impact	0.831	0.833	0.501	0.775	✓
	SS_Industry_Impact				0.758	✓
	SS_Investor_Impact				0.665	✓
	SS_Market_Impact				0.698	✓
	SS_Regulator_Impact				0.631	✓

The initial IS project success reflective model included 23 indicators across 4 constructs, and the breakdown is as follows: *process success* (4), *deliverable success* (7), *business success* (6), and *strategic success* (6). However, table 3 confirmed 19 indicators across 3 constructs. Interestingly, two constructs merged when assessing and validating the IS project success reflective model. *Deliverable* and *business success* were assessed as conceptually comparable constructs and were thus merged into a single construct (Joseph & Marnewick, 2021). The remaining indicators from business success were included in deliverable success as they reflected success criteria linked to realizing the business intent of the IS project deliverables. Therefore, the business success construct was removed from the research model, and the H3b hypothesis for IS projects' success was amended before assessing the structural model. Hypothesis H3b was amended to deliverable success influences the strategic success of IS projects.

The initial IS project complexity formative model included 75 indicators across the 5 constructs, and the breakdown is as follows: *organizational complexity* (34), *technical complexity* (12), *environmental complexity* (13), *dynamics* (6), and *uncertainty* (10). Two key measures were assessed for formative measurement models: collinearity between indicators and the significance and relevance of outer weights (Hair et al., 2019; Henseler, Ringle, & Sinkovics, 2009). Collinearity measures the extent to which formative indicators correlate and is measured via the external variance inflation factor (VIF). The outer VIF was accepted below the threshold of 5. Collinearity and the significance and relevance of outer weights are assessed with p values below 0.05, t stat above 1.96, and outer loadings above 0.5. Overall, the 75 indicators were reduced to 39 as follows: *organizational complexity* (6), *technical complexity* (8), *environmental complexity* (9), *dynamics* (6), and *uncertainty* (10).

Assessing the Structural Model Results

Assessing the structural model in PLS-SEM requires researchers to evaluate the inner collinearity or inner VIF values, path coefficient significance, coefficient of determination significance, coefficient of determination effect size significance, predictive relevance, and effect size (Hair et al., 2019; Ringle et al., 2018).

All inner collinearity values were below a VIF of 5. Table 4 shows the relationships between constructs. Only three path coefficients were insignificant: *dynamics* to *IS project complexity*, *environmental complexity* to *IS project complexity,* and *IS project complexity* to *strategic success*. The first two paths imply that the *dynamics* and *environmental complexity* constructs do not influence the *IS project complexity* HOC. The final insignificant path implies that the *IS project complexity* HOC does not influence the *strategic success* construct. While the remaining path coefficients were significant, an example of the practical explanation follows. *IS project complexity* has a direct and significant effect on *deliverable success.* This further implies that the complex constructs of organizational complexity, technical complexity, and uncertainty influence the success of the IS project output.

Table 4. Structural model path coefficients and significance

Hypothesis	Construct Relationship	Path Coefficients	T Statistics	P Values	95% Confidence Intervals	Significance (p < 0.05)
H1a	Organizational Complexity -> IS Project Complexity	0.355	2.267	0.023	[0.098, 0.713]	✓
H1b	Technical Complexity -> IS Project Complexity	0.567	3.040	0.002	[0.243, 0.836]	✓
H1c	Environmental Complexity -> IS Project Complexity	-0.274	1.718	0.086	[-0.546, -0.085]	×
H1d	Uncertainty -> IS Project Complexity	0.474	3.121	0.002	[0.173, 0.749]	✓
H1e	Dynamics -> IS Project Complexity	-0.027	0.183	0.855	[-0.316, 0.240]	×
H2a	IS Project Complexity -> Process Success	-0.307	5.656	0.000	[-0.367, -0.122]	✓
H2b	IS Project Complexity -> Del Success	-0.300	6.962	0.000	[-0.367, -0.188]	✓
H2d	IS project Complexity -> Strategic Success	0.119	1.909	0.056	[0.039, 0.259]	×
H3a	Process Success -> Deliverable Success	0.665	21.097	0.000	[0.621, 0.741]	✓
H3b	Deliverable success -> Strategic Success	0.710	16.485	0.000	[0.643, 0.808]	✓

The coefficient of determination (R^2) measures the contribution of predictor constructs to predicted constructs, *viz.,* how well a predicted construct is predicted by its respective predictors. Not all constructs, therefore, have a coefficient of determination value (table 5). However, there are instances where a predicted construct is also a predictor. For example, *IS project complexity* is predicted by several complexity constructs and *process success* (figure 1).

The R^2 values of 0.75, 0.5, or 0.25 are explained as substantial, moderate, and weak, respectively. The structural model R^2 values apply only to the predicted constructs, *viz. IS project complexity* (0.947), *process success* (0.094)*, deliverable success* (0.656), and *strategic success* (0.432). The results and their significance are presented in table 5. Firstly, this implies that the LOCs predicting *IS project complexity* have a substantial contribution to this HOC. This is, however, a model design anomaly as the HOC applied the repeated indicator approach and should arguably be well defined by the LOCs. Secondly, the *IS project complexity* and *process success* construct moderately contribute to *deliverable success*. Finally, the *IS project complexity* and *deliverable success* constructs have a weak contribution to *strategic success*. The *process success* result was below the lowest R^2 value, implying a lack of contribution from the *IS project complexity* HOC.

Table 5. Structural model coefficient of determination and significance results

	R^2	T Statistics	P Values	95% Confidence Intervals	Significance (p < 0.05)	Predictive Contribution
Deliverable Success	0.656	19.067	0.000	[0.572, 0.712]	✓	Moderate
IS Project Complexity	0.947	60.826	0.000	[0.939, 0.973]	✓	Substantial
Process Success	0.094	2.491	0.013	[0.008, 0.135]	✓	N/A
Strategic Success	0.432	9.770	0.000	[0.348, 0.517]	✓	Weak

Table 6. Structural model coefficient of determination effect size and significance results

Hypothesis	Construct relationship	f^2	T Statistics	P Values	95% Confidence Intervals	Significance (p < 0.05)	Effect Size
H1a	Organizational Complexity-> IS Project Complexity	1.265	1.300	0.194	[-0.278, -0.278]	×	N/A
H1b	Technical Complexity -> IS Project Complexity	3.533	1.968	0.049	[-0.347, -0.347]	✓	Large
H1c	Environmental Complexity -> IS Project Complexity	0.675	1.768	0.077	[-0.575, -0.575]	×	N/A
H1d	Uncertainty -> IS Project Complexity	2.739	1.823	0.068	[-0.177, -0.177]	×	N/A
H1e	Dynamics -> IS Project Complexity	0.007	0.029	0.977	[-0.262, 0.324]	×	N/A
H2a	IS Project Complexity -> Process Success	0.104	2.057	0.040	[-0.521, -0.521]	✓	Medium
H2b	IS Project Complexity -> Deliverable Success	0.237	2.791	0.005	[-0.457, -0.457]	✓	Medium
H2d	IS project Complexity -> Strategic Success	0.019	1.365	0.172	[-0.155, 0.088]	×	N/A
H3a	Process Success -> Deliverable Success	1.164	5.995	0.000	[0.537, 0.537]	✓	Large
H3b	Deliverable success -> Strategic Success	0.662	5.625	0.000	[0.546, 0.717]	✓	Large

The coefficient of determination effect size is assessed to provide more context to the R2 results. The R^2 values show how well the predictors predict a construct. Therefore, the effect size of the coefficient of determination details the influence and effect constructs have on each other. The f^2 values of 0.02, 0.15, or 0.25 indicate a small, medium, and large effect, in other words, the effect between the predictor constructs and the predicted construct. The coefficient of determination effect size and significance results are presented in table 6. Significant and large effect sizes were evident in the following relationship contributions: *deliverable success* and *strategic success* (f^2=0.662, p=0.000)*, process success* and *deliverable success* (f^2=1.164, p=0.000) as well as *technical complexity* and *IS project complexity* (f^2=3.533, p=0.049). Significant and medium effect sizes were evident in the following relationship contributions: *IS project complexity* and *deliverable success* (f^2=0.237, p=0.005) as well as *IS project complexity* and *process success* (f^2=0.104, p=0.040). This implies that there are only 5 significant effects when delving deeper into the contribution relationship between each predictor and predicted construct.

The use of predictive relevance and effect size is two-fold. Firstly, predictive relevance determines how well the structural model can be generalized outside the current sample dataset. Secondly, the effect size of the predictive relevance determines how generalizable the effects between constructs outside of the current sample dataset are. Any construct with cross-validated redundancy (Q^2) values above 0 indicates predictive relevance for predicted constructs. The results in table 7 imply that all Q^2 values are above 0 and that there is good predictive relevance. Therefore, the structural model results can be generalized outside the dataset used.

Interpreting the effect size (q^2) results in table 7 is done as follows: The first column represents the predictor constructs, and the first row the predicted constructs. The q^2 value indicates a predictor's effect size on a predicted construct. Like f^2 values, q^2 values of 0.02, 0.15, or 0.25 indicate a small, medium, and significant effect, respectively. Table 7 thus shows that *deliverable success* has a medium effect on *strategic success,* and *process success* has a medium effect on *deliverable success*. *IS project success* has a negligible effect on *deliverable success*. The Q^2 and q^2 results imply that there is good predictive relevance, but the predictive relevance effect size varies.

Table 7. Structural predictive relevance and effect size results

	Q^2	q^2 Effect Sizes			
		IS Project Complexity	Process Success	Deliverable Success	Strategic Success
Deliverable Success	0.284				0.197
Dynamics		-0.001	0.000	0.000	0.000
Environmental Complexity		-0.035	0.007	-0.003	0.000
IS Project Complexity	0.171			0.068	0.002
Organizational Complexity		0.010	-0.002	0.007	0.001
Process Success	0.047			0.242	-0.002
Strategic Success	0.183				
Technical Complexity		-0.021	0.015	-0.006	-0.002
Uncertainty		0.014	0.000	0.013	0.001

Final Model Interpretation

Interpretation and Discussion of IS Project Success and Complexity Structural Model

The final model presented in this section provides critical insight into the research question. Figure 3 shows the revised IS project complexity and success research model.

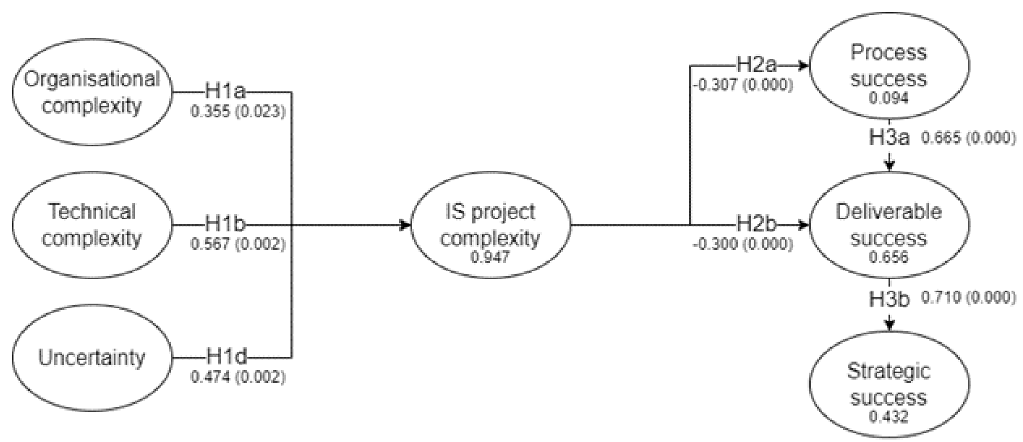

Figure 3. Revised Research model

The Influencing Constructs of IS Project Complexity

The results in figure 3 show that *organisational complexity* (0.355, p=0.023), *technical complexity* (0.567, p=0.002) and *uncertainty* (0.474, p=0.002) all have significant relationships with *IS project complexity*. Therefore, hypotheses H1a, H1b, and H1d were significant and accepted, while H1c and H1e were rejected as insignificant. This implies that the three significant and accepted constructs influence the level of IS project complexity.

Hypothesis H1a was accepted and confirmed that *organizational complexity* contributes to IS project complexity. Literature reveals the need for understanding and incorporating *organizational complexity* when executing projects (Bosch-Rekveldt et al., 2011; Joseph, 2017; Rolstadås & Schiefloe, 2017). This research implies that *organizational complexity* does influence *IS project complexity*. Although IS projects are temporary initiatives, they are not isolated from organizational influences (Joseph, 2017; Marnewick et al., 2017). This research asserts that complexities regarding the *number of different nationalities, experience with involved parties, project drive, stakeholder interrelations, team cooperation and communication,* and *work hours* are all indicators of *organizational complexity*. The authors, therefore, argue that if IS project managers, team members, and stakeholders are aware of these underlying indicators, they can manage and mitigate them accordingly. The reality is that these organizational complexities should not be prevented but rather embraced as they will occur regardless. Knowing these organizational complexities will ensure that the IS project maintains its trajectory and delivers its intended strategic goals.

The next significant relationship is the *technical complexity* construct, as hypothesis H1b confirmed its contribution to *IS project complexity*. This implies that *technical complexity* contributes to the complexity faced in IS projects. The initial conceptualization of *technical complexity* focused on technological complexities that could arise during a project (Baccarini, 1996; Joseph, 2017). Research has, however, evolved to be more inclusive and aware of other technical aspects associated with project execution (Bosch-Rekveldt et al., 2011; Floricel et al., 2016; Rolstadås & Schiefloe, 2017). The contributing indicators of *technical complexity* are *clarity of goals, conflicting norms and standards, experience with technology, goal alignment, number of goals, number of tasks, quality requirements,* and *scope scale*. Floricel et al. (2016) validate that *technical complexity* influences a project's performance, and Zaman et al. (2019) have proven the influence of this construct on software project performance. Furthermore, Marnewick et al. (2017) believe that *technical complexity* influences an IS project's process and project management success. This research supports and echoes these studies by proving that *technical complexity* influences project complexity. A holistic understanding of *technical complexity* will assist stakeholders in tackling its indicators during an IS project (Bosch-Rekveldt et al., 2011; Zaman et al., 2019).

The last significant relationship was that of the *uncertainty* construct, as hypothesis H1d confirmed its contribution to *IS project complexity*. The level of uncertainty influences the level of complexity in IS projects during an IS project. Project *uncertainty* poses multiple risks during a project and can negatively affect the project's performance (Floricel et al., 2016). It is, however, argued that *uncertainty* is inherently prevalent in projects and that there should be increased awareness of the various *uncertainty* indicators (Geraldi et al., 2011; Joseph, 2017; Walker et al., 2017). This research argues that the following *uncertainty* indicators apply to IS projects: *uncertainties in scope, uncertainties in cost, uncertainties in time, uncertainty in methods, task uncertainty, the uncertainty of goals and objectives, technological maturity and novelty, undisclosed participants, competency,* and *incomplete information.* Walker et al. (2017) and Um and Kim (2018) stress that *uncertainty* should not be viewed negatively as awareness of it creates an opportunistic environment for collaboration in terms of knowledge sharing and learning. Being more cognisant of *uncertainty* and its underlying indicators indirectly influences project performance and increases the need for information sharing between stakeholders (Um & Kim, 2018). Mitigating strategies can be developed to address ambiguity during an IS project (Walker et al., 2017).

The Influence of IS Project Complexity on IS Project Success

The results in figure 3 show that *IS project complexity* has a significant relationship with *process success* (-0.307, p=0.000) and *deliverable success* (-0.300, p=0.000). Therefore, H2a and H2b were accepted, while H2c and H2d were rejected for two reasons. Firstly, hypothesis H2c was rejected as it effectively fell away due to merging *deliverables* and *business success*. Secondly, hypothesis H2b was rejected for being insignificant.

Furthermore, *process success* has a significant relationship with *deliverable success* (0.665, p=0.000), which has a significant relationship with *strategic success* (0.710, p=0.000). Therefore, hypotheses H3a and H3b were significant and accepted.

Hypothesis H2a was accepted and confirms that *IS project complexity* influences the *process success* of IS projects. The influence of *IS project complexity* on *process success* is negative and implies that as the level of IS project complexity increases, the level of *process success* decreases. As discussed above, the constructs of *IS project complexity* affect the project's performance (Floricel et al., 2016; Um & Kim, 2018; Zaman et al., 2019). This result shows that IS project complexity negatively affects process success in selecting, aligning, integrating, and implementing project processes. It can be argued that poor articulation of *organizational complexity, technical complexity,* and *uncertainty* will result in poor selection, alignment, integration, and implementation of project processes. This result confirms and extends previous studies such as those by Joseph (2017) and Marnewick et al. (2017). While the R^2 of 0.094 implies that the influencing construct of *IS project complexity* explains 9.4% of the variance in *process success*, the effect size of *IS project complexity* on *process success* is medium (f^2=0.104, p=0.040). This further supports that the influence of *organizational complexity, technical complexity* and *uncertainty* cannot be underestimated when executing IS projects.

The next significant relationship is between *IS project complexity* and *deliverable success,* as hypothesis H2b was accepted. The negative relationship suggests that as *IS project complexity* increases, *deliverable success* decreases. It could therefore be argued that *organizational complexity, technical complexity,* and *uncertainty* contribute to successfully generating deliverables during an IS project. The effect size of *IS project complexity* on *process success* is medium (f^2=0.237, p=0.005) and implies complexity affects an IS project's deliverables. For example, *quality requirements* in *technical complexity* influence *specifications met,* and *requirements met* in *deliverable success.* Mendez Fernandez et al. (2015) believe that the quality of requirements directly influences the deliverables in an IS project. Furthermore, *incomplete information* in *uncertainty* could result in incomplete requirements that are poorly understood and do not deliver the realization of the expected benefits (Rajagopalan & Srivastava, 2018).

Hypothesis H3a was accepted and confirms that *process success* influences the *deliverable success* of IS projects. There is a significant positive relationship between *process success* and *deliverable success.* This implies that as *process success* increases, *deliverable success* also increases. Although success can vary in the different constructs, the results validate that *process success* contributes to *deliverable success*. For example, correctly selecting and aligning project processes facilitates requirements definition and achievement, facilitating the realization of business goals and benefits (Bannerman, 2008; Joseph, 2017; Um & Kim, 2018). The effect size of *process success* on *deliverable success* is large (f^2=1.164, p=0.000) and validates the instrumental role of processes in executing and developing IS projects.

Further interrogation of the *deliverable success* results shows that when interpreting the R^2 value of 0.656, it is clear that *IS project complexity* and *process success* explain 65.6% of the variance in *deliverable success*. This moderate contribution implies that the influencing constructs contribute two-thirds to *deliverable success. T*he remaining third is possibly explained by other indicators and constructs, such as the inherent socio-technical dimension in IS projects (Marnewick, Pretorius, & Pretorius, 2015).

The last significant relationship is between *deliverable success* and *strategic success.* Hypothesis H3b was therefore accepted and confirms that *deliverable success* influences the *strategic success* of IS projects. The positive relationship implies that as *deliverable success* increases, *strategic success* increases. The *strategic success* construct is viewed primarily as long-term success where the IS project addresses higher-level strategic intent (Bannerman, 2008; Joseph & Marnewick, 2021; Kalkan, Erdil, & Çetinkaya, 2011). The effect size of *deliverable success* on *strategic success* is large (f^2=0.662, p=0.000) and reiterates that project deliverables directly influence the long-term *strategic success* of an organization. Extensive *deliverable success* translates to *competitive, industry,* and *market impact,* where the organization benefits from new and/or improved competitive advantage (Yunis, Tarhini, & Kassar, 2018). Furthermore, *investor impact* is facilitated as investors are more inclined to invest in the organization after proven business benefits (El-Telbany & Elragal, 2014). More investment enables competitive advantage through improved coordination of information and processes and efficient governance of strategic initiatives (Hu & Quan, 2005). The impact from and on regulation is also influenced by *deliverable success;* the output of the IS project must adhere to current regulations and can also inform regulatory changes (Yunis et al., 2018). The R^2 value of 0.432 implies that *deliverable success* explains 43.2% of the variance in *strategic success*. A question for future research is what explains the remaining 56% of *strategic success,* as this could illuminate how organizations can realize the long-term success of IS projects.

Conclusion

The empirical model (figure 3) contextualized the constructs of IS project complexity, IS project success, and the inherent relationship between the constructs. An interesting picture is painted when comparing the model to table 1. The seminal work of Bosch-Rekveldt et al. (2011) provides some of the most robust foundations for general project complexity, while Williamson (2012) and Zaman et al. (2019) provide an IS project perspective. The findings presented in figure 3 arguably expand on Bosch-Rekveldt et al. (2011) by contextualizing project complexity and success within the IS project discipline. Alternatively, the findings include a richer projection of IS project complexity and success. The findings presented in this paper thus provide deeper insight into IS project complexity and success, like Luo et al. (2017) and Luo et al. (2020) within the construction discipline. A Scopus search of recent literature (2017-2022) reveals that the topic of project complexity influencing project success is predominantly within the construction discipline (e.g., Luo et al. (2017), Nguyen et al. (2019), Luo et al. (2020) and Ma and Fu (2020)). Subsequently, this research paper empirically validates studies such as Joseph (2017) and Morcov et al. (2021), given the IS discipline's scarcity. Moreover, this research paper provides inputs that can be used in practical complexity analysis models such as Martins de Andrade and Sadaoui (2021).

Theoretical Contributions

At the theoretical level, this research contributes in several ways. Firstly, literature has culminated in project complexity consisting of five constructs: organizational complexity, technical complexity, environmental complexity, dynamics, and uncertainty. This research, however, contributes to the theory by arguing that IS project complexity centers on three constructs: organizational complexity, technical complexity, and uncertainty. IS project complexity research is staggered and infrequent (Williamson, 2012; Zaman et al., 2019), while construction research has evolved and flourished (Dao et al., 2017; Kermanshachi, Rouhanizadeh, & Dao, 2020; Safapour, Kermanshachi, & Tafazzoli, 2019). These three constructs provide an updated view of IS project complexity and pave the way for evolving this research domain. That said, there could be other implications for the constructs not validated in this research. Environmental complexity moderates project complexity as it could influence organizational and/or technical complexity. Alternatively, dynamics could mediate IS project complexity as the change management practices and approach arguably determine the complexity of various project activities, tasks, and/or deliverables. These are possible avenues for future research.

Secondly, many arguments have been made in the literature to justify what constitutes project success. Table 1 argues that project success is determined by achieving the triple constraint and/or strategic value. This implies project success is a continuum where perceived success varies, and the success of a project has different implications over time. A key finding was that deliverable and business success should be merged when determining IS project success. Alignment between these dimensions seems logical, but this research affirms that they should be measured together and not at different points in time. It could be argued that business success has become a short-term success determinant in a world that requires continuous change and adaptability. While this research reaffirms that project complexity negatively influences project success, it also contributes to theory by depicting how complexity influences project success over time. Furthermore, IS project complexity moderates the relationship between process success and deliverable success. These theoretical implications are important as they signify the need to explore how individual constructs and indicators influence each dimension of IS project success.

Finally, Mikkelsen (2020) argues for the existence of five ideal research types in the project complexity and project success research domain. This research shows the possibility of merging two ideal types (positivistic modeling and ontological framework) to create an updated and clearer vision of IS project complexity and success. This research not only explored IS project complexity and IS project complexity but also operationalized the constructs and empirically validated construct relationships. The evolution of this research is that it can be applied to the organizational framework ideal type where practices, policies, and procedures can be developed for managing IS project complexity.

Practical Contributions

IS projects are infamous for their poor performance. The findings of this research could arguably assist in addressing the misnomer of IS project success. The model in this research can serve as a tool for IS project managers to manage project complexity more effectively and realize actual business benefits. Furthermore, making team members and stakeholders more aware of various indicators can serve as a benchmark for identifying, measuring, and monitoring complexity during an IS project. The aim is not to prevent the complex constructs and their indicators but rather to embrace them and mitigate them where possible to ensure that the IS project is executed efficiently. Constant evaluation and realization of these constructs and indicators will ensure that IS projects are delivered according to their initial strategic intent. Furthermore, understanding the relationship between IS project success and complexity contributes to developing new curricula for education and training institutions. These findings can assist with training current and new IS project managers to manage complexity more effectively.

Research Limitations and Avenues for Future Research

Although this research expanded on several philosophies within the broader field of project management, there are a few inherent limitations and avenues for future research. The first limitation is that a model dataset could have a response bias towards specific roles and job positions. Future research should collect data from respondents in different roles and job positions. The second limitation is that the project management success construct was excluded from the modeling process as it was operationalised in terms of the triple constraint of time, cost, and scope. The project management success construct should be zed and operationalized to determine how complexity influences it, and other IS project success constructs. The third limitation is that the model can only be generalized to IS projects. The dataset did not distinguish between the various IS project methodologies, e.g., agile vs. traditional. Future research should explore this possibility, adding to the debate of whether the agile philosophy is more effective for IS projects. Another limitation is that this research did not conceptualize size and its contribution to project success. Software sizing in IS projects has a material influence on project success and can be viewed together with or within project complexity. However, future research should expand on this paper and further explore the implications of software sizing within or within project complexity. With complexities in every aspect of what we do during an IS project, a clear paradigm and philosophical shift are required to manage these projects more effectively. Creating awareness of them is more valuable than trying to prevent them, especially if we do not know what they are. This research provides the basis for IS project researchers and practitioners to improve the delivery of IS projects moving forward.

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