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# A qualitative system dynamics perspective on the contribution of information technology credibility towards business and information technology alignment

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**Purpose:** The dynamic interdependence between the deployment of technological assets and organisational performance remains a challenge for modern enterprises. Organisations reinforce competitiveness and improve performance when business activities and information technology (IT) efforts are aligned. The credibility of the IT organisation is an important influence on alignment. This research guides managers and directs future research to improve IT credibility.

**Design/methodology/approach:** Interviews with senior leaders about factors influencing IT credibility provided rich data for analyses. The dynamic complexity of creating a credible IT function to ensure alignment was captured using qualitative system dynamic diagrams. A causal loop diagram was constructed to identify feedback loops and leverage points.

**Findings:** The analysis confirms the impact of three factors identified by prior research. It provides a new perspective on portfolio-level IT governance's contribution to establishing credibility. The value of using past failure to develop credibility through ownership and resolution emerged from the analysis.

**Practical implications:** The results provide guidelines to improve the IT organisation's credibility to improve business and IT alignment. Leverage points to improve credibility are provided, and research into resolving past failure as a mechanism to success is suggested.

**Originality/value:** While most of the extant literature focused on static alignment factors, causal loop diagrams provided insight into IT credibility's systemic nature. A new factor (resolving past failure), a new perspective (portfolio level governance), and confirmation of existing factors and identifying leverage points contribute to practice and science.

**Keywords:** business and IT alignment; business–IT alignment; strategic alignment; IT investment; IT value; IT credibility; dynamic complexity; qualitative system dynamics; causal loop diagram.

## Introduction

Nearly three decades ago, Brynjolfsson (1993) reasoned that the impact of information technology (IT) on productivity is widely deliberated but not well understood. Although extensive research has been conducted on IT's contribution towards organisational performance over the last 30 years, it remains a key challenge for organisations (Luftman, Lyytinen, & Ben Zvi, 2017). Appropriate IT investments remain an important consideration for modern organisations from an academic and practitioner perspective (Sha, Chen, & Teoh, 2020). Bender, Henke and Lamarre (2018) suggested that the advanced deployment of IT to create business value is the most important challenge for modern enterprises.

Business and IT alignment (BITA) is conceptualised as the congruence between business strategy and IT's contribution to achieving this through convergent intentions, shared understanding and coordinated processes (Queiroz, 2017). Business and IT alignment is key to unlocking the value of IT investments for organisations (Chumo, 2016). While significant progress has been made to understand how to accomplish BITA, several complications remain (Kijek & Kijek, 2018). Multiple BITA models aimed at gaining a higher degree of alignment between IT investments and strategic intent have been proposed. However, none have (to date) found universal appeal within academia nor have they seen widespread application in the

industry. Besides, these models often fail to account for the dynamic nature of BITA in modern organisations (Liang, Wang, Xue, Ge, & Ransbotham, 2018).

In a complex, fast-paced business environment, BITA is more than a mechanistic return on IT investment. Business and IT alignment requires managing a dynamic set of processes to continuously gain value from IT investments throughout their entire life cycle. Decisions about IT investments form part of the formulation of the strategy of the organisation. Information technology shapes strategy and plays an essential role in implementing the strategy.

# Literature review

## Prior research on alignment

Researchers searching for empirical support of IT value, often present conflicting results, either confirming or questioning IT investments' strategic value. As a result, researchers and practitioners are confronted with contrasting studies. For example, while Mithas, Tafti, Bardhan, and Goh (2012) concluded, after studying the data from more than 400 firms, that IT has a positive impact on profitability, Kijek and Kijek (2018) struggled to find conclusive evidence from empirical research, or even theoretical explanations, of productivity increase within organisations, business sectors or economies following IT investments.

Conflicting evidence about value from IT investments led to the realisation that value is not necessarily realised at the firm level but rather within the portfolio, or components of the portfolio of IT investments (Rahrovani, Kermanshah, & Pinsonneault, 2014). Thus, the search for IT value should be more granular and focus on conditions of success that may be present, or not, within the firm or investment. For example, two firms may implement the same software, yet only one of the firms' performance may improve. In addition, two different IT investments within the same firm may have directly opposite organisational value contributions (Kohli & Grover, 2008). Therefore, understanding the value derived from IT investments requires insights into the multiple firm- and project-level factors.

## Dynamic complexity

Seeking insights into the determinants of IT value requires a long-term view of the various IT investments and management decisions made throughout the investments' life cycle (Liao, Wang, Wang, & Tu, 2015). These IT investments are not made in isolation, and the interdependency leads to dynamic complexity. Senge (1997) described dynamic complexity as environments where the cause and effect are elusive. The results of interventions are present but not apparent over time, the same arguments made by researchers questioning IT value. Practitioner literature acknowledges the complexity brought about by the dynamic nature of aligning IT with the rest of the organisation, and the importance of dealing with this complexity (Khan, Reynolds, & Schrey, 2017).

Dynamic complexity arises when the same action has 'dramatically different effects in the short run and long run' (Senge, 1997, p. 56). This occurs in a complex situation where there are many possible interconnections between the different parts of a system. Significantly, these connections also change over time, leading to the sometimes perplexing results of interactions within dynamically complex systems. According to Neiger and Churilov (2004), being dynamic, tightly coupled, governed by (often non-linear) feedback, history-dependent and policy resistant, most real-life business systems are dynamically complex systems. This requires a new design paradigm for IT systems in the presence of dynamic complexity (Hanseth & Lyytinen, 2010).

## Alignment and alignment factors

Ensuring that IT activities are carried out according to the organisation's business needs has been the locus of discussion in the BITA literature (Coltman, Tallon, Sharma, & Queiroz, 2015). Numerous researchers (Chae, Koh, & Prybutok, 2014; Sha et al., 2020) confirmed that achieving strategic alignment between business and IT is essential to improving organisational performance.

Although the factors contributing to a higher degree of alignment have been actively researched, limitations remain. For example, Luftman et al. (2017, p. 26) lamented that most alignment models approach BITA as a 'static relationship in contrast to analysing the scope and variance of activities through which the alignment is (or can be) attained'. A significant part of the academic discourse in BITA continues to uncover new, or reconfirm existing success factors, often for a particular context.

Teo and Ang (1999) first established a list of widely recognised factors as antecedents for IT and business strategy alignment. Prominent BITA authors (Gunasekaran & Ngai, 2007; Peffers, Gengelr, & Tuunanen, 2003; Silva & Hirsheim, 2007) extended the initial work of Teo and Ang. An extensive, if not coherent, body of literature currently exists on BITA success factors (Amarilli, Van Vliet & Van den Hooff, 2016).

## Information technology credibility

This research deals with a vital alignment success factor, IT credibility, that is identified in multiple researchers' work (Chebrolu & Ness, 2013; Jonathan, 2018; Vermerris, Mocker, & Van Heck, 2014; Wagner, Beimborn, & Weitzel, 2014). Although these authors do not always use the term 'IT credibility', their arguments support the principle of credibility in the IT function.

Information technology organisations are reliable and credible when they have a history of delivering their commitments on time to positively impress business executives (Yayla & Hu, 2009). This positive impression's net result is business executives who will consult with IT executives in their endeavour to gain value from the technology. Conversely, an IT department unable to deliver

its promises is not consulted by business executives, and the role of IT can be marginalised to the disadvantage of the organisation (Yayla & Hu, 2009).

The lack of proven IT success is an inhibitor to continued interaction between business and IT, and it undermines believability, collaboration and backing from senior executives and users (Reich & Benbasat, 2000). When credibility is eroded, only those IT members who are thought to be capable are brought in to participate in planning sessions. This leads to misalignment, as they are the only ones who will be aware of the strategic direction that the company wishes to follow. Information technology executives need to leverage achievements to become an integral part of the organisation's decision-making team (Chan, Sabherwal, & Thatcher, 2006).

Teo and Ang (1999) found that the IT department's ability to keep up with the advances in the industry was another factor leading to IT credibility. Developments in the IT industry happen at a rapid pace and existing systems become obsolete quickly. The likelihood of success is increased by the knowledge of IT executives and their ability to seize upon advancements for their organisation's benefit. Creative ideas can be a source of competitive advantage for the organisation, which, in turn, affects the shared knowledge and confidence that the business executives have in the IT capabilities.

It is essential that the value added is evaluated from a business perspective (De Haes & Van Grembergen, 2005; Patterson, 2020). Wagner et al. (2014) stressed the difference between the availability of IT resources (often reported on) and the actual utilisation of IT (not often reported on) as the value is gained through use, not availability. They argued that the business value accruing from IT resources is dependent on how well employees use the systems to perform their duties (Wagner et al., 2014). Information technology use leads to operational effectiveness, improved business processes and ultimately operating efficiency, which should be primary indicators of long-term IT value (Wagner et al., 2014). However, there is a risk inherent in the efficiency-only mindset that could lose sight of the operating environment's fluidity and, thus, strategic intent. Information technology flexibility represents the responsiveness to changing business requirements and influences the actual and opportunity cost of potential value from IT-intrinsic innovations (Wagner et al., 2014). An effective alignment process must thus include the ability to adapt and rejuvenate in an environment of change (Huang & Hu, 2007). Information technology systems need to embrace the changes in business strategy to support the execution of the strategy (Jorfi, Nor, & Najjar, 2011).

A final contributor to IT credibility is appropriate governance. Governance consists of management processes and organisational structures that ensure that the organisation's IT systems sustain and enable the strategic intent (De Haes & Van Grembergen, 2005). In the opinion of De Haes and Van Grembergen, appropriate governance contributes to, and does not impede, flexibility. It thus ensures a balance between efficiency and flexibility. Information technology governance should be a business-orientated process, with a clear emphasis on the interests of the entire organisation and not a rigid regulation process, especially given the dynamic nature of strategic intent and IT investments in the modern business environment.

## Dynamic capabilities and transient advantage

The literature on IT value inevitably intersects with that of strategic management. Although multiple perspectives on strategic management exist, of particular interest is the capabilities-based view as technology investments enable organisations to position themselves differently with new products, services and distribution channels (Turel, Liu, & Bart, 2017). Conversely, IT investments also create strategic capabilities and impact organisational processes, creating new resources that enable organisations to perform at a different level (Turel et al., 2017).

Capabilities refer to an organisation's ability to deploy resources and establish processes to achieve the desired objective (Wang, 2014). Capabilities are the source of competitive advantage, and resources are the source of capabilities, in what became known as the capabilities-based view of strategic management (Grant, 1991). These are information-based, tangible or intangible processes that are firm-specific and developed over time through complex interactions among the firm's resources.

McGrath (2013) proposed overturning traditional assumptions about the strategy formulation and execution processes' temporal scope, using what she calls 'transient advantage'. Strategies were traditionally formulated to guide an organisation's behaviour for extended periods and were revised and re-formulated infrequently. McGrath (2013) argued that given how the current business environment has evolved, in no small measure because of the impact of IT, opportunities for leveraging competitive advantage are transient. In her opinion, this required a new perspective on formulating the strategic intent.

The ongoing deployment of the IT assets needs to align with the strategy, more often than not, in transition. This requires IT alignment processes that embrace the concept of dynamic complexity. Organisations should identify contextual factors that will enable the design of dynamic capabilities to adapt and support new dynamic strategies in an agile manner. The credibility of the IT organisation in a fast-changing environment is vital to ensure alignment between IT resources and organisational strategy. Thus, contextual factors, like credibility and trust, become imperative to create an environment for successful IT deployment.

## Complexity and systems dynamics

As propagated within complexity theories, complexity is about the emergence, dynamics, non-linearity and other behaviours present in systems of interrelated elements

(Geraldi, Maylor, & Williams, 2011), not unlike the use of multiple sets of technologies in organisations. However, existing techniques are often not practical to analyse complex multi-factor interactions involving non-linear relationships and have limited capacity to inform strategic alignment planning and implementation (Odiit, Mayoka, Rwashana, & Ochara, 2014). Systems thinking represents a holistic approach to analysing how a system's constituent parts interrelate over time and within the context of larger systems. It is an approach that yields insights into complex phenomena, not unlike the complex modern enterprise that at times struggles to align its future intentions with the ongoing investments in technology (Fang, Lim, Qian, & Feng, 2018).

System dynamics models explain behaviour by providing an influencing theory and enable management to use the approach to design interventions that change the resulting behaviour and improve performance (Lane, 2008). Furthermore, system dynamics enable decision-makers to understand various dynamic behaviours better and make decisions by testing different scenarios in multiple disciplines (Bureš, 2017). Fang et al. (2018, p. 1303) suggested using system dynamics as a 'tool capable of capturing the reciprocal and temporal causal mechanisms that underlie many complex and dynamic systems in IT research, for both theoretical development and practical application'.

## Research problem, design and methods

### Research problem

The performance of organisations with high levels of alignment between business and IT remains a challenge to achieve consistently (Liang et al., 2018). Therefore, it is beneficial for organisations to be knowledgeable about the factors over which they have influence, which could assist with the alignment of IT with other organisational structures and processes. To date, this emphasis has been on static factors and did not include models dealing with dynamic complexity. However, by taking a dynamic perspective on one known influencing factor, IT credibility, new insights can be gained about the actions required to improve BITA.

System dynamics is a technique able to capture the reciprocal and causal forces that define the behaviour of many complex and dynamic systems (Fang et al., 2018). System dynamics methods have not yet been sufficiently used to explore the dynamic complexity, nor the potential contribution, of IT credibility towards BITA. Although the extant literature supports IT credibility as a BITA driver, there is no systems view on the interdependence or the drivers of IT credibility. This research aims to present a systems view on the cause-and-effect relationships impacting IT credibility to assist practitioners in improving IT credibility and guide future research.

### Research design

Information technology researchers have recognised that fast-changing phenomena are challenging to investigate solely through traditional quantitative methods (Sarker, Xiao, & Beaulieu, 2013). Researchers have acknowledged that achieving BITA is complex, yet few have strived for methods and techniques outside the IT domain designed to deal with this complexity. System dynamics is one of the techniques suited to deal with complexity (Haraldsson, 2004) and dynamic relationships (Sales & Barbalho, 2018).

An inductive approach was followed to gain new insights into alignment by conducting in-depth interviews with managers having significant IT exposure. Their experiences and observations created a qualitative system dynamics diagram representing IT credibility factors. Causal loop diagrams (CLDs), a system dynamics technique, were used to model the dynamic complexity and analyse the system structure to gain new insights. The use of CLDs was prompted by the literature, highlighting the dynamic nature of alignment. Using a method that embraces dynamic complexity and seeking new insights from within this complexity are fundamental to the value of the research.

Causal loop diagrams provide a broad representation of a system's feedback structure to provide insight into the behaviour of the model parameters (Lane, 2008). Causal loop diagrams can help analyse complex issues effectively, and the practical value of system dynamics diagrams is immense (Vermaak, 2007). A CLD is a powerful means of communication because it represents a system's essence in a format that can be easily visualised, yet is rich in implications and insights.

### Data gathering

Multiple interviews were undertaken within different companies to ensure internal validity and the accuracy, trustworthiness and coherence of information. The interviewees all comprised management team members with significant exposure to IT, but not technical IT staff members. The purposive selection process dealt with potential respondents' prior exposure to IT decision-making processes about the investment and deployment of IT, and value from IT. It was decided to include participants from both business (those working outside IT) and the IT organisation (working in the IT line function), but only if they have sufficient insights into the decision processes.

Figure 1 presents the distribution of the 23 purposefully sampled senior managers with significant IT experience in the South African financial services interviewed. The financial services industry was chosen because of its considerable exposure to new technologies and the fluid nature of strategy in the decidedly dynamic sector.

A survey design could force an incorrect answer from a respondent. During an in-depth interview, it is possible and desirable for a participant to acknowledge that he or she does not know a particular aspect and is unable to answer. The interviewer searched for the various influences that led to a change in IT credibility levels using questions that prompted drivers from the literature and open-ended questions that

| Participant profile | | | Financial services industry | | | |
|---|---|---|---|---|---|---|
| | | | Other financial services | Wealth management | Insurance | Banking |
| BITA potential insight | | Participant profile weighting | Acceptable (1) | Satisfactory (2) | Preferred (3) | Preferred (3) |
| Role in business | IT leadership | Satisfactory (1) | I18 | I11, I20 | I15 | I14, I17, I23 |
| | Senior management with IT exposure | Acceptable (2) | I12 | I10 | I5 | I4, I9, I19 |
| | Senior management with IT role | Preferred (3) | I16 | I6, I8 | I3, I13 | I1, I2, I7, I21, I22 |

IT, information technology.

**FIGURE 1:** Final list of interviewees.

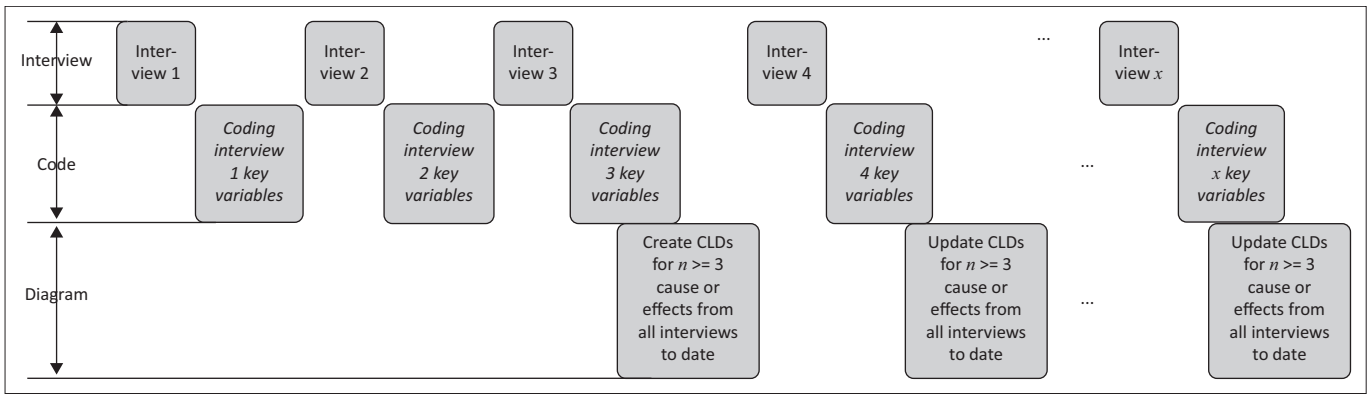


**FIGURE 2:** Research method for building causal loop diagram from interview data.

allowed freedom of expression. Interviewees and organisations were kept confidential to limit the bias in the responses.

### Data analyses

A qualitative system dynamics diagram was constructed based on interview data. Causal loop diagrams are typically created in a facilitated session through consensus or inductive argument by researchers building a simulation model. In this research, each of the 23 interviews was first transcribed. A confirmation factor of three independent interviewees stating the same relationship was used to capture dynamics relationships confirmed by multiple interviewees, as indicated in Figure 2.

Codes were created after each interview to use for subsequent coding and adjusted when required by new levels of granularity or emergent terminology. Because of the open-ended questions, the terminology and granularity of the answers provided some challenges during the coding exercise.

In order to ensure the model is robust, it was decided to continue interviewing until two interviews failed to provide any new relationships. Interview 19 was the last to yield new relationships, containing the third instance of a relationship previously mentioned twice. Subsequent interviews 20 and 21 failed to provide new relationships fulfilling the criteria for saturation. Because interviews 22 and 23 were already scheduled, it was decided to continue with them. Interviews 22 and 23 provided additional insights; yet no new relationships, confirming saturation in the data.

The analyses of the CLDs looked at four different aspects. Firstly, key themes that emerged from the creation and inspection of the diagram were analysed and compared with the current literature (Figure 3). Secondly, the endogenous system loops were identified and analysed to understand systemic behaviour (Figures 4 and 5). Based on the feedback loops, the third element of analysis was the identification of systems archetypes that could lead to new insights (Bureš & Racz, 2016). Although there are four distinct feedback loops, none of the typical CLD archetypes were found in the system structure. The final aspect dealt with identifying potential points of leverage (Senge, 1997) that could be used for sustainable improvement of the system (Figure 6).

## Ethical considerations

Written informed consent was obtained from all participants prior to conducting interviews.

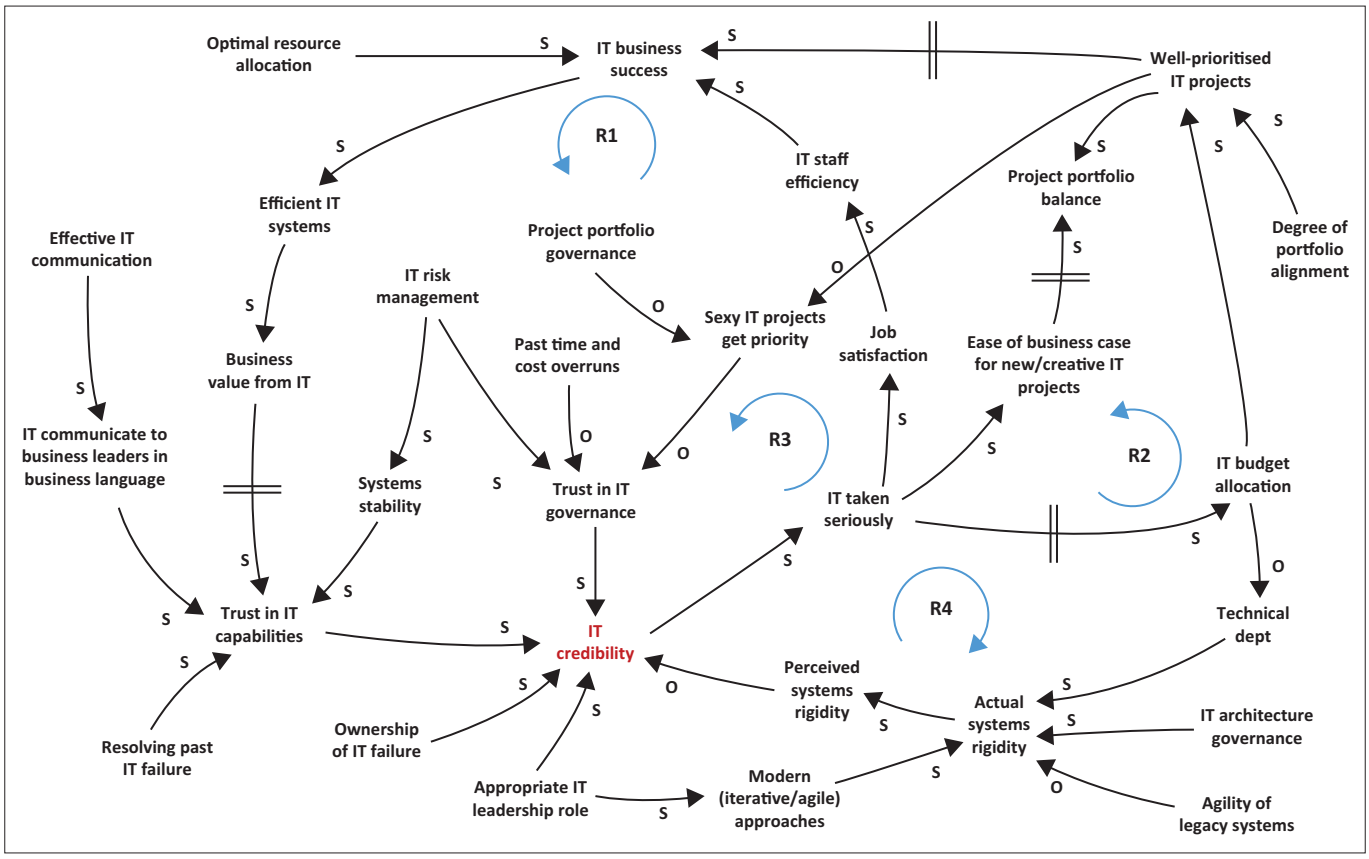


**FIGURE 3:** Information technology credibility diagram.

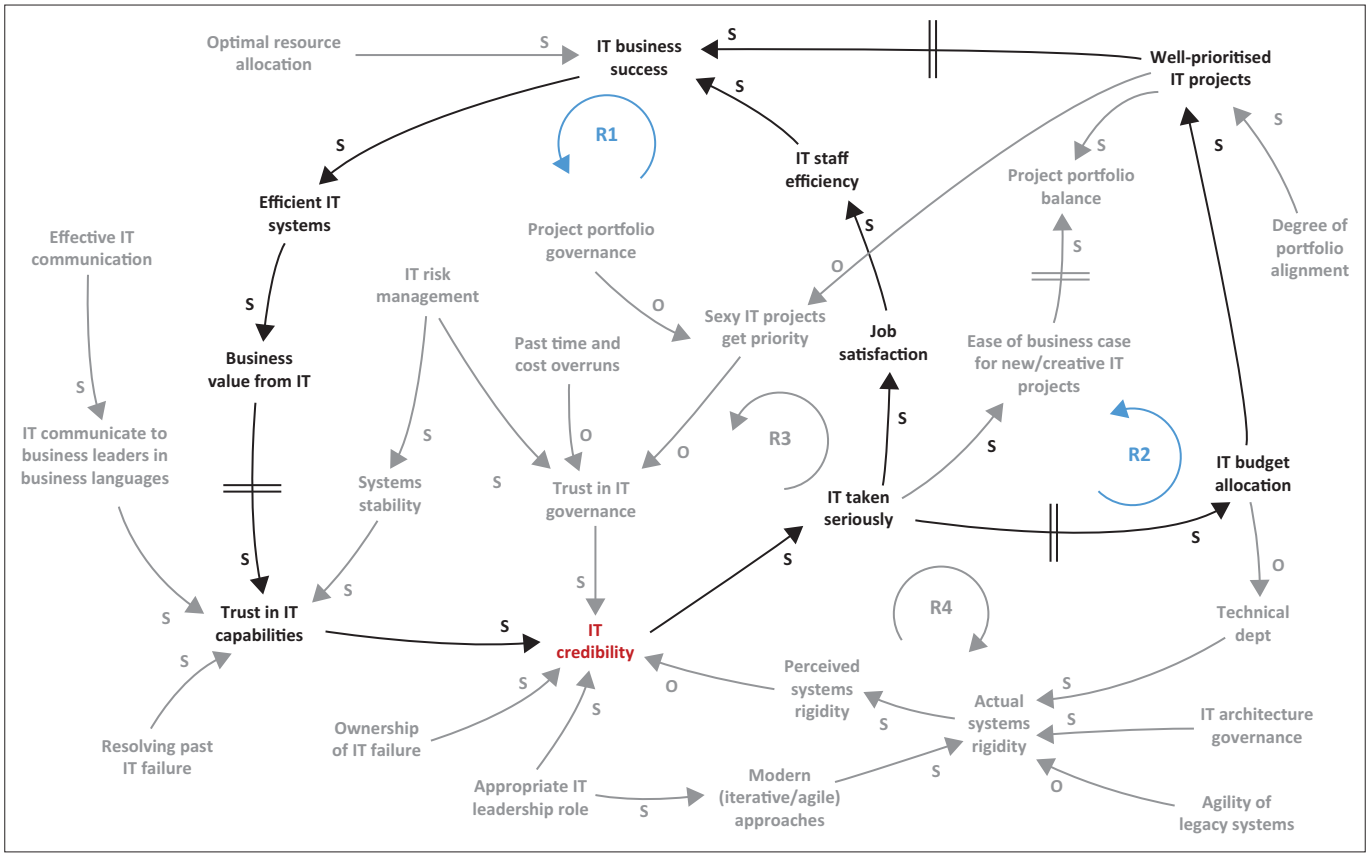


**FIGURE 4:** Information technology credibility reinforcing feedback loops R1 and R2.

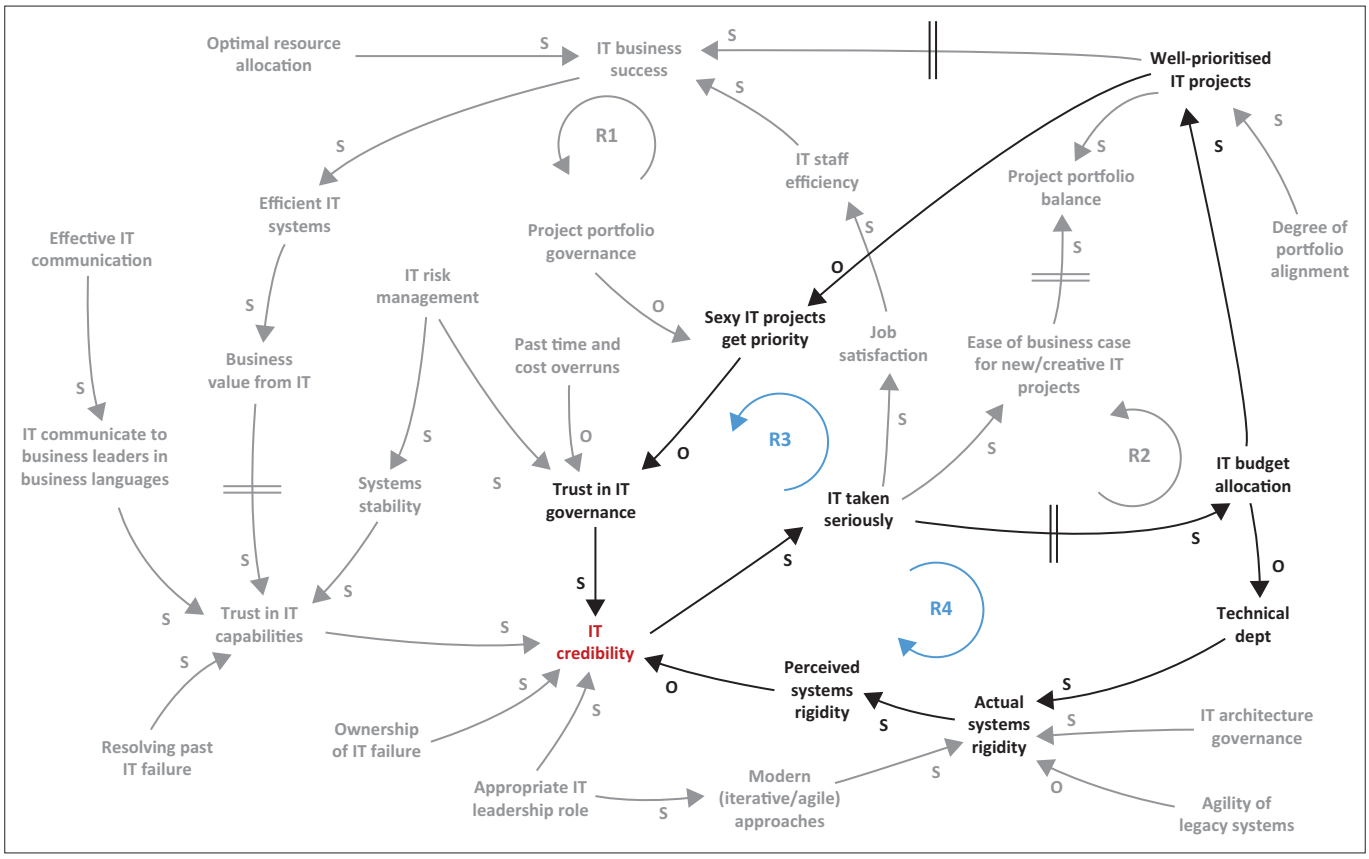


**FIGURE 5:** Information technology credibility reinforcing feedback loops R3 and R4.

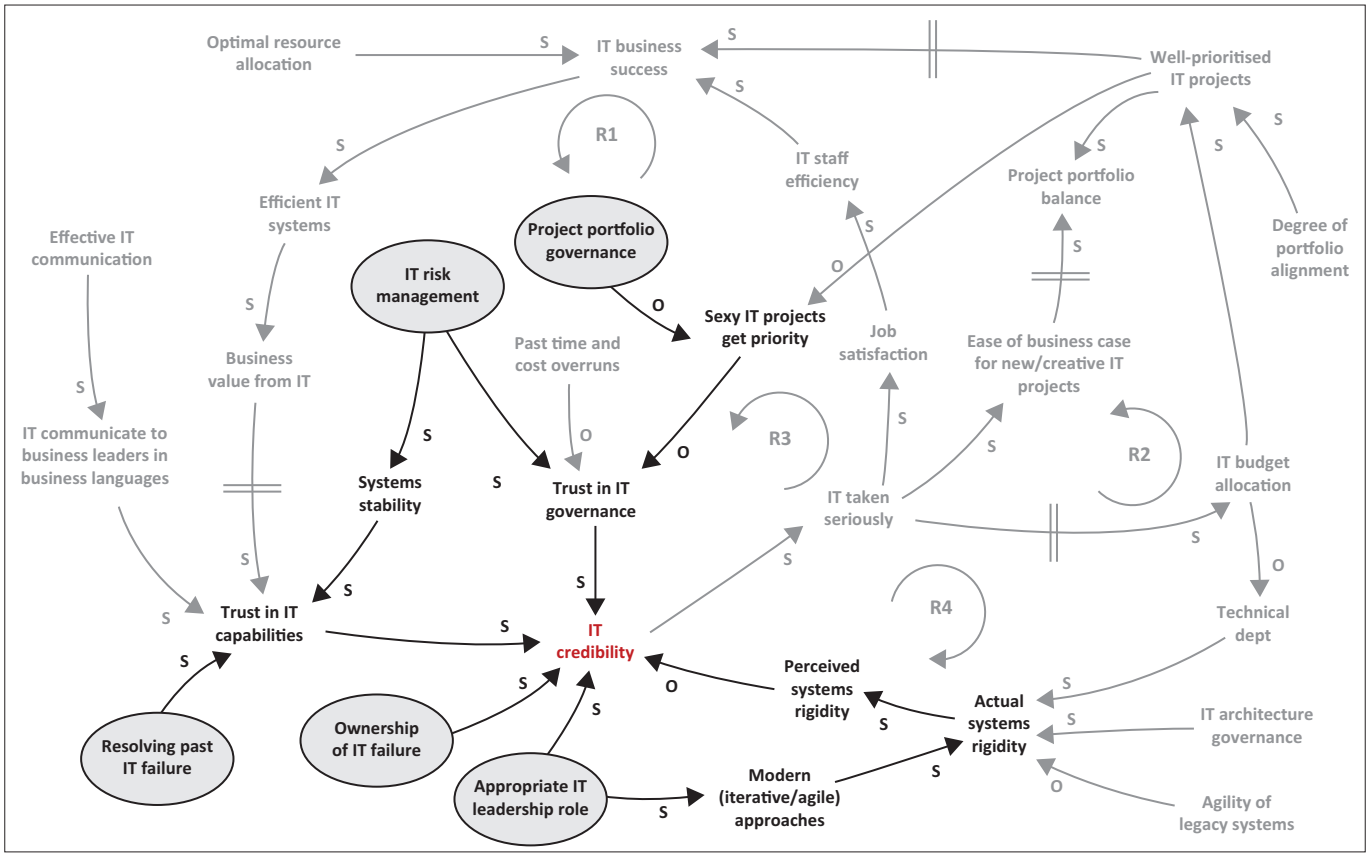


**FIGURE 6:** Leverage points for information technology credibility.

# Discussion of results

## The information technology credibility causal loop diagram

Figure 3 shows the CLD for IT credibility constructed from the interview data. The structure's complexity is testimony to the complex dynamics that influences IT credibility and the systemic challenges to achieve this. In the discussion that follows, the diagram's variables are indicated in bold for ease of reading. The analysis confirmed the importance of well-established factors in IT research, such as risk management and appropriate IT leadership roles. A different perspective that emerged, not well documented in the IT literature, was the impact of acknowledging and resolving IT failures on IT credibility. Conversely, the effect of more modern agile and iterative deployment methods of IT assets did not feature as strongly as expected, given their current prominence in the IT practitioner literature.

During the interviews, communication challenges came to the forefront, with comments such as '[*n*]ever use terminology more complex than required to get the job done' made by Interviewee 4, confirming the strong interdependency between effective communication and trust. Interviewee 7 corroborated this view when remarking that IT staff '… [*H*]ave to translate IT into their [*business*] vocabulary; they [business staff] have to understand what you [IT] bring to the table.'

Interviewee 16 provided an excellent analogy by stating:

> 'Don't expect business to understand IT. A good example is a power failure – everybody understands the requirement to have back-ups and servers running when there is no power. No-one gets it when a server farm or storage area network takes 10–15 min to be operational after failing. They never will.'

The closing comment of 'they never will' is important. It emphasises that IT leaders need to describe their challenges in business language. Unless IT staff can relate their complex technical world to non-IT staff so that they understand, they will always struggle with credibility. This confirms the Trust in IT capabilities perspective depicted in Figure 3 and evident from previous alignment literature (Huang & Hu, 2007) and the importance of clear and accurate communication from IT leaders.

A strong influence to improve credibility is systems agility, as expected from the literature. The impact of systems' reaction to a fast-changing business landscape is evident from the analyses. Interviewee 1 argued that the '… willingness of the CIO to break out of the rigidity trap is what gives credibility.' Interviewee 7 concurred by using the concept of technical debt known to describe the rigidity issues from infrastructure to development and systems deployment. He stated that the:

> '… [*T*]echnical debt is the cost of additional rework due to past shortcuts to save time and money, rather than doing things properly. In systems development, this is well known, so we have software architects, but in infrastructure, it is not that well appreciated, but we have exactly the same challenges. Non-scalable infrastructure based on past rushed projects or compromised infrastructure roll-outs not well funded or designed, create tomorrow's legacy systems today.'

Loop R4, indicated in Figure 5, deals with this challenge in detail. The potential rigidity of IT systems tightly aligned with strategy has attracted the interest of scholars in BITA (Liang et al., 2018).

One insight not explicitly dealt with in the literature is that IT credibility depends on resolving and owning past failure, as it is on past success. Coping with past failures and taking ownership could even be more important than the evidence of past achievements. The literature (Chan et al., 2006; Yayla & Hu, 2009) elaborated on the importance of past success, yet failed to acknowledge that failure is more visible and more easily shared than success. This provides an opportunity to build credibility that should not be underestimated, as indicated by the following comments:

- 'Credibility is not just about success; it is about how you dealt with challenges and stepped up to the plate when things got heated' (Interviewee 4).
- 'Do you want to be credible? Sort out the [*expletive indicating problems*]' (Interviewee 5).
- 'Credibility is not about past success; it is about taking ownership of past failure, and oh [*expletive*], do we have many of them in [*organisation name*]' (Interviewee 10).
- 'The perception of IT is more shaped around how we dealt with past challenges and failures than the previous successes' (Interviewee 16).
- 'Don't tell people what you've done in the past; they really don't care. Rather show them what was not done well in the past and how you fixed that' (Interviewee 18).

The common theme of opportunity within failure is mostly absent in the IT literature and is a contribution of this research. It was also the aspect that triggered the most passionate responses from the interviewees. How failure is dealt with is a leverage point to gain higher levels of credibility for the IT leaders that will contribute towards BITA.

## Insights from endogenous feedback loops

The reinforcing feedback loops R1 and R2 are displayed in Figure 4. Loop R1 has an operational and staff efficiency perspective influenced by credibility, leading to efficiency resulting in higher degrees of success and ultimately Business value from IT. Over time, it grows trust and credibility. She believed that trust does not represent the highest order state between IT and business, as is often stated (Huang & Hu, 2007). Interviewee 18 noted that the first challenge is acceptance; trust cannot be created before accepting the role of IT. Following acceptance is trust. Although trust is essential, Interviewee 18 argued that respect is earned after the trust is established, and respect drives IT credibility. Once IT leaders are trusted by their peers, they should strive for the respect developed over time. This perspective did not materialise on the diagram (as part of loop R1) as three

interviewees did not explicitly mention it but are worth pursuing in future research.

Interviewee 12 provided a theoretical perspective on this by referring to social capital:

> 'There is a social capital theory that explains when IT and business actively work together, they create shared social capital and shared knowledge that contributes to how we think about digital's contribution to [*company name*].'

In Figure 4, the concept of social capital is best presented by the variable of IT taken seriously, common to both feedback loops R1 and R2.

IT taken seriously can be misconstrued as a leverage point. However, it is directly influenced by IT credibility and is common in all four reinforcing feedback loops. This confirms that multiple other factors influence IT taken seriously, making it difficult to change this through direct action. Nonetheless, when IT credibility is influenced in a desirable direction, it will affect this variable and the feedback loops that influence IT credibility.

Reinforcing feedback loop R2 deals with the impact of IT credibility and budget allocations. Appropriate funding impacts technical debt (see Figure 5 on the prioritisation of IT projects), but not necessarily on the number or magnitude of projects.

The concept of Well-prioritised IT projects warrants further scrutiny. Although it depends on the business defining the priorities of IT projects, as business executives do not have complete visibility of the multiple initiatives and neither sufficient insight on how projects address technical risk, the business cannot prioritise in isolation. The IT department and business executives need to define these priorities collaboratively. Interviewee 13 explained this by stating that it is:

> '… [*N*]ot just about IT priorities being set by business; it is also about business priorities, that business doesn't understand, correctly identified by IT. Cyber is a perfect example. Business has no idea about the potential threat or impact of cyber, but they expect us to be all over it and have systems operational 24/7 with no interruption. What the systems will do, that's business' baby, keeping them spinning over, now that is for us to prioritise.'

Reinforcing feedback loops R3 and R4 (Figure 5) deal with the impact of budget allocation, prioritisation and systems flexibility. Although the principles are interdependent, two distinct processes emerged from the data. Loop R3 deals with the prioritisation (discussed above) as it forms part of loops R2 and R3, but a new variable is introduced, namely, Sexy IT projects get priority. Although this is not the most professional term to use, it was first used by Interviewee 12 and subsequently received positively when shared with other interviewees when they struggled to verbalise their concerns about a lack of visibility on IT project prioritisation. Trust in IT governance features prominently in this loop and has a direct impact on IT credibility. Portfolio governance directly impacts projects being successfully prioritised and will contribute towards trust in the IT governance processes.

Reinforcing loop R4 provides insight into rigidity and technical debt. Interviewee 23 displayed meaningful insight into technical debt and contended that most financial institutions in South Africa are now stuck with some degree of technical debt because of successful previous investments. She argued that:

> '… [*L*]egacy systems are sometimes used as a swearword in [*organisation name*] but we forget they probably represented the best possible trade-off of available technology, time and money when they were implemented decades ago. It is possible that whatever state-of-the-art core banking systems we are implementing today, will be called legacy systems in 20 years' time. That does not mean we are not making the best possible decisions right now.'

It is evident that trade-offs are made when implementing new technology.

It is thus not surprising that Actual systems rigidity leads to reduced IT credibility. Multiple aspects, including Technical debt, IT architecture governance and Modern (iterative/agile) approaches, influence the rigidity of the systems. Interviewee 9 confirms the arguments from Yayla and Hu (2009) that an Appropriate IT leadership role directly affects IT credibility and indirectly via modern approaches and the impact on addressing real and perceived systems rigidity. He stated that:

> '[*I*]t is possible to break out of the inflexible IT systems, but that is completely up to the IT leaders in the organisation. Can they do it? Can they motivate the importance and secure the funding to do it?.'

This argument confirms the importance of appropriate IT leadership capabilities that build credibility, supported by robust governance processes identified by De Haes and Van Grembergen (2005).

The leverage points to improve IT credibility are multi-dimensional, as indicated in Figure 6. However, the multiple variables present in the reinforcing loops R1, R2, R3 or R4, which all impact the IT organisation's credibility, are not leverage points. Furthermore, with several interdependencies and delays present in all loops, any influence on a variable in R1, R2, R3 or R4 may take significant time to impact IT credibility. It is thus desirable to identify leverage points that could be manipulated to influence, without delay, the credibility of IT and stimulate the multiple reinforcing loops in the increasing (desirable) and not decreasing (undesirable) direction.

As indicated in Figure 6, five potential leverage points are discussed. Firstly, an increase in the application of Project portfolio governance could decrease the variable Sexy IT projects get priority, which, in turn, will increase Trust in IT

governance and ultimately IT credibility. This governance needs to be at the portfolio level and provides structure and guidance for adding investments, removing investments and balancing the portfolio of technology investments on an ongoing basis. Portfolio governance processes align with McGrath's (2013) transient advantage strategic perspective. The portfolio of IT investments needs to be balanced according to the strategic requirements of the organisation.

The following variable to leverage is IT risk management, which will also impact Trust in IT governance and Trust in IT capabilities that affect IT credibility. The risk management processes that emerged from data encapsulate business and technological risk. This risk should not be managed for an investment or even the portfolio of investments but rather as part of the organisational enterprise risk management processes.

Although Ownership of past failure and Resolving past failure are related, they represent different aspects. The latter is the ability and desire to resolve technology challenges when they occur, and the former is about ownership by the IT team when things go wrong. Interviewee 12 described this as:

> '… [*D*]on't go back and hide in your IT cave when things go wrong; own up, be visible, communicate and above else, accept that you're no more perfect than anyone else. Your mistakes are just more visible and at times more painful.'

These are two related but different points of leverage.'

A final leverage point, an Appropriate IT leadership role, is essential because it could significantly influence BITA. The data confirm the academic perspective that Appropriate IT leadership directly impacts IT credibility (Yayla & Hu, 2009). Interviewee 18 commented on the positive impact in their organisation after multiple IT leadership roles were elevated to the strategic level in the last 10–15 years. In his opinion, this is one of the biggest, '… if not the single biggest factor that grew credibility of digital and digital channels in [*organisation name*].' It also impacts the more modern approaches to IT systems and infrastructure development and deployments that directly impact IT credibility.

## Implication of results

### Managerial implications

This research confirmed known factors contributing to IT credibility, such as (1) sharing evidence of past IT success, (2) having appropriate IT leadership roles and (3) following enterprise-level IT risk management practices. It also highlighted a different perspective on (4) the governance requirements by emphasising portfolio-level governance processes. Most significantly, the analyses uncovered an essential and (as to yet) absent factor, namely (5) ownership and resolution of past IT failure to build IT credibility and contribute towards future success and alignment. Multiple interviewees from the business environment mentioned this factor.

Managers of technology intrinsic functions are presented with an opportunity within failure. Given the highly visible nature of failed or challenged IT projects or IT systems, they effectively have the 'negative attention' of the rest of the organisation and management team. By recognising the opportunity in the failure, managers could build credibility by resolving these issues, resulting in a more robust BITA. In addition, in a complex environment where multiple initiatives compete for limited resources, portfolio-level governance will ensure the alignment of the collective portfolio of IT initiatives with the strategic intent and not those deemed desirable from an individual perspective.

### Practitioner implications

Practitioners must ensure that IT leaders' deployment and development include their ability to communicate value from previous IT investments. From a structural perspective, appropriate seniority and communication lines within the executive function are essential for IT leaders to efficiently discharge their duties. Practitioners should review the quality and extent of IT risk management processes as they directly impact IT credibility. Appropriate portfolio-level governance is vital to ensure that the business has visibility on the collective IT portfolio and grows trust in the collective IT leadership's ability to prioritise IT initiatives. Practitioner maturity models need to account for portfolio-level maturity as an essential driver of alignment.

Importantly, and mostly absent in the literature, significant value can be derived from owning a past failure and providing evidence on how this failure or challenging situation was dealt with appropriately. The data indicated that business users are often more informed about IT failures than IT success. When the IT failures are seen as an opportunity to display ability, create confidence and improve IT credibility, it provides a new perspective on regaining value from challenged or failed IT deployments.

Technology consultants providing advisory services to organisations with significant technological deployments can expand on current maturity models and instruments to gauge the level of alignment and define appropriate actions based on this more accurate maturity assessment. Actions should be aligned to the dimensions within the alignment construct, exploit opportunities presented by IT failure and ensure portfolio level alignment metrics to ensure the collection of IT initiatives support the strategic intent and not only the individual components. Scarce technology resources are best utilised when the systemic alignment is optimised.

### Research implications

The research supports multiple factors known to contribute to IT credibility and alignment from an academic perspective. These factors include sharing evidence of past IT success, both from within the organisation and outside the organisation, to create a higher level of awareness of the transformative nature of IT. In addition, the importance of

appropriate IT leadership roles is emphasised to ensure that IT decisions are appropriately represented in the organisation's most senior decision-making structures. Finally, enterprise-level risk management processes remain essential to ensure that risk is dealt with at the appropriate level and not for individual IT projects or functions.

Two new drivers of alignment should attract interest from the research community and shape future research. The first driver is the ownership and resolution of past failure as a steppingstone to tighter alignment and improved value from IT. Researchers are encouraged to perform empirical work to determine the impact of IT leaders' ownership and resolution of past failures on IT credibility. This should provide a deeper level of insight into this newly identified relationship.

The second driver is governance at the portfolio level covering the entire IT investment life cycle. This includes identifying and compiling a business case, as well as operationalisation to achieve business value. Empirical work to determine the extent of governance in the technology space, project or portfolio-based, and its impact on IT credibility and business and IT alignment will expand the BITA body of knowledge.

# Conclusion

Organisations reinforce their competitiveness and improve operational performance when business activities and IT efforts are aligned. However, the dynamic interdependence between the deployment of multiple technological assets and organisational performance remains a challenge for most modern enterprises facing a fluid transactional environment. Although previous research identified alignment drivers, this was often carried out without acknowledging dynamic complexity.

A key driver to achieving alignment is vested in the credibility of the IT function. Although the benefits of a credible IT function are numerous, it remains embedded in a dynamic environment where cause and effect are often distant. While most of the extant literature in alignment focused on static alignment factors, causal loop diagrams used in this research to model dynamic complexity provided new insights into the systemic nature of obtaining credibility in the IT organisation and deployment of information systems.

Apart from re-emphasising extant alignment factors that also emerge when embracing the dynamic complexity, a new factor (resolving past failure), a new perspective (portfolio level governance) and the identification of multiple leverage points (appropriate IT leadership roles, IT risk management and ownership of past IT failure) emerged from this research. Practitioners can use these leverage points to improve the entire alignment system and increase the credibility of the IT organisation.

The research results emphasise that the value of a credible IT function transcends that of a single appropriate investment because it supports the drivers of alignment in a complex dynamic relationship. When the IT organisation is a credible partner to business, collaborative decision-making ensures informed decisions based on how IT contributes to business performance in a systemic manner.

The research is limited to organisations in the financial services industry. The sector was chosen because of the significant investment in IT and the fluid nature of strategy, operations and customer value in this fast-changing environment. The research did not empirically validate ownership of past failures. Nevertheless, it represents a crucial contribution that could find immediate application in the industry. Still, it needs to be corroborated by further research to test the validity of this finding under different conditions and within multiple industries.

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The author declares that no competing interests exist.

## Author's contributions

I declare that I am the sole author of this research article.

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## Data availability

The data that support the findings of this study are available upon request from the author. The data are not publicly available as they contain information that could compromise the privacy of research participants.

## Disclaimer

The views and opinions expressed in this article are those of the author and do not necessarily reflect the official policy or position of any affiliated agency of the author.


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