

CRITICAL INCIDENTS AND INTERVENTIONS IN DISTRESSED INFORMATION  
SYSTEM DEVELOPMENT PROJECTS

By

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(Under the Direction of Richard T. Watson and Marie-Claude Boudreau)

Over the last 50 years, most information system development (ISD) projects have failed. Even with seven out of eight IS projects failing and 97% not delivering a return on investment, organizations continue to invest significant resources and capital into these projects to pursue greater efficiencies (Wade and Shan 2020). By analyzing four U.S. Federal Government ISD projects, we contribute to the literature by identifying pertinent factors and structures that explain IS project outcomes, critical incident emergence, and interventions. Additionally, we provide five practical recommendations to assist ISD project managers and executives in intervening when critical incidents arise.

INDEX WORDS: Information System Development, Project Success, Project Failure, Critical Incidents, Interventions, Critical Realism

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## **DEDICATION**

I dedicate this paper to my beloved wife. Thank you for your love, support, and encouragement throughout my academic journey. Thank you for standing by my side, sacrificing with me, and always being there. You are my best friend. I love you.

I also dedicate this paper to my children. Your unwavering love and support have kept me going, even during the most challenging times. Thank you for understanding the long hours I spent studying, writing, and researching and always cheering me on. I hope you are encouraged to try hard things in life. I love you and am excited to see you grow up.

## TABLE OF CONTEXTS

	Page
LIST OF TABLES.....	vi
LIST OF FIGURES.....	viii
 CHAPTER	
1 Introduction.....	1
2 Literature Background and Review .....	5
2.1 <i>Project Management</i> .....	5
2.2 <i>Project Distress and Early Warning Signs</i> .....	18
2.3 <i>Interventions</i> .....	20
2.4 <i>Model of Interventions in Distress ISD Projects</i> .....	21
3 Research Approach.....	28
3.1 <i>Critical Realism</i> .....	28
3.2 <i>Critical Realist Case Study</i> .....	30
3.3 <i>Site Selection</i> .....	33
3.4 <i>Data Collection</i> .....	34
3.5 <i>Data Analysis</i> .....	36
4 Analysis and Findings.....	39
4.1 <i>Explication of Events</i> .....	39
4.2 <i>Explication of Structures and Contexts</i> .....	42
4.3 <i>Retroduction</i> .....	50
5 Theoretical Synthesis.....	135
5.1 <i>Critical Incident, Interventions, and Project Outcomes</i> .....	135
5.2 <i>Critical Incident Emergence</i> .....	137
5.3 <i>Intervention Outcomes</i> .....	140
6 Discussion and Conclusion.....	144
6.1 <i>Summary of Findings</i> .....	144
6.2 <i>Future Research</i> .....	152
6.3 <i>Limitations</i> .....	153
6.4 <i>Concluding Thoughts</i> .....	154
6.5 <i>Conclusion</i> .....	159
<b>References</b> .....	161
<b>Appendices</b> .....	168
<i>Appendix A – Semi-Structured Interview Guide</i> .....	168
<i>Appendix B – Failure Factors in IS literature</i> .....	170
<i>Appendix C - IS Success Literature</i> .....	172
<i>Appendix D – Event Descriptions</i> .....	179
<i>Appendix E – Truth Table</i> .....	349

## LIST OF TABLES

	Page
Table 2-1 Concept Definitions.....	5
Table 2-2 Categories and Perspectives of IS Project Failure and Success (adapted from Baghizadeh et al. 2020; Cecez-Kecmanovic et al. 2014; Fincham 2002) .....	6
Table 2-3 D&M IS Success Model Variables (DeLone and McLean 1992; DeLone and McLean 2003; Petter et al. 2013) .....	9
Table 2-4 Top Critical Success Factors (Somers and Nelson 2001) .....	11
Table 2-5 Four types of IS Failure (Lyytinen and Hirschheim 1987) .....	12
Table 2-6 Top Failure Factors (Schmidt et al. 2001).....	13
Table 2-7 Dominant Dozen Early Warning Signs (Kappelman et al. 2006) .....	19
Table 2-8 Common Project Factors Between Early Warning Signs, Project Failure, and Success .....	22
Table 2-9 Common Early Warning Signs and Failure Factors.....	24
Table 3-1 Description of Critical Realism Principles (Based on Wynn and Williams 2012) .....	31
Table 3-2 Data Collection.....	35
Table 4-1 Event Summary .....	40
Table 4-2 Event Categories.....	42
Table 4-3 Definitions of Social Actors .....	44
Table 4-4 Social Structure Definitions .....	45
Table 4-5 Organizational Processes.....	48
Table 4-6 Organizational Structures .....	49
Table 4-7 Contextual Environment Definitions.....	50
Table 4-8 System A Critical Events.....	52
Table 4-9 System A Critical Incident Categories .....	53
Table 4-10 System A Intervention Categories.....	53
Table 4-11 System B Critical Events.....	65
Table 4-12 System B Critical Incident Categories .....	66
Table 4-13 System B Intervention Categories .....	66
Table 4-14 System C Critical Events.....	79
Table 4-15 System C Critical Incident Categories .....	80
Table 4-16 System C Intervention Categories .....	81
Table 4-17 System D Critical Events.....	91
Table 4-18 System D Critical Incident Categories .....	93
Table 4-19 System D Intervention Categories.....	93
Table 4-20 Total Critical Incidents by Category .....	103
Table 4-21 Critical Incident Categories and Project Outcomes.....	104
Table 4-22 Common Critical Incidents.....	105
Table 4-23 Critical Incident Factors .....	107
Table 4-24 Total Interventions by Category.....	111
Table 4-25 Interventions by Project Outcomes .....	112
Table 4-26 Common Interventions .....	113

Table 4-27 Cross-Case Insights .....	127
Table 6-1 Other Insights .....	151

## LIST OF FIGURES

	Page
Figure 2-1 DeLone and McLean (2003) Updated Model of IS Success.....	8
Figure 2-2 Determinant of IS Success (Petter et al. 2013) .....	10
Figure 2-3 Process Model of De-escalation (Keil and Robey 1999).....	17
Figure 2-4 Hypothetical Early Warning Dependencies (Nikander and Eloranta 2001) .....	20
Figure 2-5 Transaction-Based Model of Stress (Lazarus and Folkman 1984) .....	26
Figure 2-6 Preliminary Model of IS Intervention and Project Distress .....	27
Figure 3-1 Event in ISD Project.....	32
Figure 3-2 Organizational Hierarchy .....	34
Figure 3-3 Data Analysis Process (Wynn and Williams 2012) .....	36
Figure 4-1 Explication of Events .....	40
Figure 4-2 Explication of Structures and Context .....	43
Figure 4-3 Social Structures.....	47
Figure 4-4 Retroduction Activities .....	51
Figure 4-5 System A Event Chain Timeline.....	59
Figure 4-6 System B Event Chain Timeline .....	72
Figure 4-7 System C Event Chain Timeline .....	85
Figure 4-8 System D Event Chain Timeline.....	97
Figure 4-9 Critical Incidents and Interventions Success.....	116
Figure 4-10 Critical Incidents and Intervention Failure .....	116

## 1 Introduction

Information Systems (IS) projects fail at alarming rates. According to the Standish Group Chaos Report (2015), success rates for IS development (ISD) projects between 2011 and 2015 were on average 29%, while rates of challenged and failed projects were on average 52% and 19%, respectively (Group 2015, p. 557). Furthermore, a recent report says seven out of eight IS projects fail, and 97% do not deliver returns on investment (Wade and Shan 2020). Project failure rates have led to squandering billions of dollars (Conboy 2010; Keil et al. 2000). Despite these depressing statistics, organizations continue to invest significant resources and capital into ISD projects to pursue greater efficiencies (Wade and Shan 2020).

Over the last 50 years, the IS project management literature has provided 53 early warning (EW) signs, 47 critical success factors (CSF), and 40 failure factors (FF) (Dwivedi et al. 2014; Nikander and Eloranta 2001; Petter et al. 2013). These streams of research have yet to solve the problem of failed and challenged ISD projects. Positivist researchers have provided extensive lists of static factors, but the presence or absence of these factors does not guarantee success or failure. Interpretivist researchers identified success and failure as a social construct, seen subjectively through the lens of different stakeholders (Baghizadeh et al. 2020; Cecez-Kecmanovic et al. 2014). Therefore, we know how to objectively and subjectively characterize success and failure in ISD projects but do not fully understand what leads to failure or success.

Project distress has received little attention among the factors contributing to IS project failure (Baghizadeh et al. 2020). Typically, IS projects experience some level of distress. Yet, there is little information on interventions for distressed ISD projects to put them back on track. We use the term *distress* to describe an ISD project experiencing harmful conditions that are

difficult to identify, comprehend, and resolve (Baghizadeh et al. 2020). Distress in an organizational context is similar to strain in an individual, defined as the outcome of stress (Lazarus and Folkman 1984). Stressors or critical incidents cause distress. *Critical incidents* are events, demands, or stimuli encountered by projects that create harmful conditions (Cartwright and Cooper 1997). To reduce project distress, organizations must identify critical incidents promptly and intervene.

An *intervention* in IS is defined as a purposeful action intended to solve a realized or emergent problem and is implemented to remove current stressors (Jasperson et al. 2005). In the IS literature, an intervention is typically the implementation of an IS to solve an organization's problem (Ward and Elvin 1999). For example, an organization may implement an enterprise resource planning system to increase business process integration and efficiency. We consider this a macro-intervention. Implementation of an IS is a significant expense, and the failure of the macro-intervention has far-reaching ramifications. Instead, we are examining interventions at a micro-level, i.e., actions taken within an ISD project that address or attempt to resolve critical incidents.

Prior research provides early warning signs for project failure and states managers do not "heed early warning signs" and apply the wrong corrective actions (Mähring and Keil 2008; Nelson 2007; Pan et al. 2008). Additionally, extant research identifies managerial mistakes as a fundamental problem of project failure (Nelson 2007). Citing that managers fail to "learn effective means" to solve problems (Lyytinen and Robey 1999). However, this line of research does not provide practical guidance to managers on how to recover from or avoid these mistakes. Furthermore, to our knowledge, researchers have yet to examine how managers intervene or what interventions redirect these projects toward success or keep them on a path toward failure.

We suggest that by examining critical incidents and interventions in distressed ISD projects, we can identify specific intervention mechanisms that lead projects out of distress and toward success.

This dissertation examines critical incidents and interventions in distressed ISD projects by identifying factors that explain the emergence of critical incidents and the success or failure of interventions. We seek to answer the following questions:

RQ1: What factors explain the emergence of critical incidents in ISD projects that label them as distressed?

RQ2: What factors explain successful or failed interventions in distressed ISD projects?

We take a critical realist explanatory case study approach to address these questions, similar to Williams and Karahanna (2013). We analyze four ISD projects with numerous embedded critical incidents and interventions (Eisenhardt 1989; Sarker et al. 2018; Wynn and Williams 2012; Yin 2018). Additionally, we employ components of grounded theory (Corbin and Strauss 2015) to retroductively identify factors for both critical incident emergence and intervention outcomes (Jopke and Gerrits 2019; Wynn and Williams 2020).

We contribute to theory in three overarching ways. First, we add to the IS project success and failure literature by demonstrating how critical incidents and interventions can explain IS project outcomes. This dissertation reveals that previous failure factors and CSFs are not static or permanent project characteristics but dynamic events that occur in a project's life. Moreover, we demonstrate that if distress occurs from the presence of factors, project managers can intervene to remove the current stressor, which may eliminate the failure factor. Second, we contribute to the escalation of commitment literature by identifying how successful and failed projects de-escalate commitment. De-escalation in literature is deemed an appropriate intervention in light of negative information. Yet, we find that de-escalation can be a critical incident that creates

significant distress within a project. Third, using a critical realism embedded case design (Yin 2018), we contribute to the IS literature by identifying relevant social and organizational structures and mechanisms that explain the emergence of critical incidents and intervention outcomes.

For the remainder of the dissertation, we review the relevant IS project management literature, including project success and failure, project distress, early warning signs, interventions, and escalation of commitment. Then we discuss our methods, findings, contributions, and recommendations. The findings offer valuable insights for project managers and executives, enabling them to leverage this knowledge to enhance their understanding of IS project outcomes and minimize the risk of future IS project failures.

## 2 Literature Background and Review

Early warning signs, project success, and project failure have been studied for over 50 years (Keil et al. 2020). However, IS project distress, incidents, interventions, and their outcomes have not been explicitly examined (Baghizadeh et al. 2020; Keil et al. 2020). This review begins with an overview of the relevant project management literature and then addresses project distress and interventions in the context of an ISD project. Below is a list of key concepts and definitions (Table 2-1).

**Table 2-1 Concept Definitions**

Name	Definition	Source
Critical Incident	Events, demands, or stimuli encountered by projects that create harmful conditions	Cartwright and Cooper (1997)
Project Distress	State of an ISD project experiencing harmful conditions	Baghizadeh et al. (2020)
Intervention	Purposeful action intended to solve a realized or emergent problem and to remove stressors	Jasperson et al. (2005), Ward and Elvin (1999)
Intervention Success	Purposeful action that achieves its intent by appropriately resolving the current stressors	Ward and Elvin (1999)
Intervention Failure	Purposeful action that does not achieve its intent by appropriately resolving the current stressors	Ward and Elvin (1999)

### 2.1 Project Management

IS Project Management is a foundational area of interest within the IS field and consists of seven areas:

- 1) project success/failure/performance,
- 2) project team management,
- 3) project estimation,
- 4) project risk management,
- 5) project escalation and de-escalation,

- 6) project contract management, and
- 7) project control (Keil et al. 2020).

We focus on project success/failure and escalation of commitment. We limited our review to key historical articles in the IS and management literature, concentrating on those with the most citations, as researchers have examined this area of study for more than 50 years.

**2.1.1 Project Failure and Success**

The literature on project failure and success identifies two main categories at the highest level (see Table 2-2): objective/rational and subjective/political (Cecez-Kecmanovic et al. 2014; Fincham 2002). Objective failure and success include both the rationalist and process perspectives, identifying failure/success as an event that can be measured and explained causally between different determinants. In contrast, the subjective category does not see failure or success through determinants or as an end-state but as an interpretation of narratives from various individuals, social groups, and stakeholders. This perspective includes the combination of the narrative and social constructionist perspectives (Cecez-Kecmanovic et al. 2014; Fincham 2002). We can separate these two categories based on whether project failure or success is an end state determined through measurable factors or interpreted through sensemaking (Baghizadeh et al. 2020).

**Table 2-2 Categories and Perspectives of IS Project Failure and Success (adapted from (Baghizadeh et al. 2020; Cecez-Kecmanovic et al. 2014; Fincham 2002)**

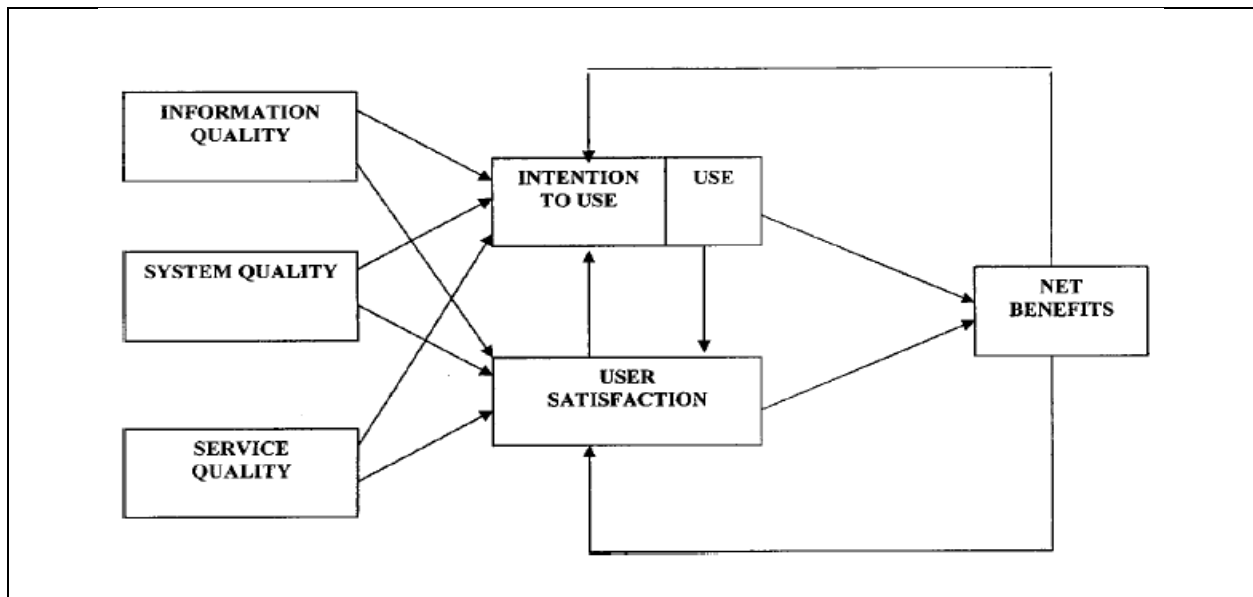
Project Failure/Success Definitions
<i>Objective/Rational:</i> An IS project success/failure exists as discreet and determinate states that can be objectively measured and represented
<i>Subjective/Political:</i> An IS project success/failure does not exist but results from processes of sensemaking and interpretation, organizational discourses, and political negotiations within particular socio-cultural and political contexts.

Perspectives		
<i>Rationalist</i>	<i>Process</i>	<i>Narrative/Social Constructivist</i>
<ul style="list-style-type: none"> <li>- Objective and polarized end states: either failure or success (not both).</li> <li>- Outcomes caused by technological, organizational, and social factors.</li> </ul>	<ul style="list-style-type: none"> <li>- An emergent, dynamic, and unpredictable outcome of sociotechnical interaction.</li> <li>- Socially and politically defined outcome of organizational processes and flaws.</li> </ul>	<ul style="list-style-type: none"> <li>- Failures/successes are narrated and socially constructed.</li> <li>- Interpretive flexibility of ISD projects.</li> </ul>
Methodological Focus		
<ul style="list-style-type: none"> <li>- Identify major factors causally related to ISD project failures, generalized across contexts and time.</li> </ul>	<ul style="list-style-type: none"> <li>- Sociotechnical interaction is often investigated through case studies.</li> </ul>	<ul style="list-style-type: none"> <li>- Narratives, rhetoric, and persuasion.</li> <li>- Interpretation and meaning-making by relevant social groups.</li> </ul>
Weaknesses		
<ul style="list-style-type: none"> <li>- Generic factors determining failure/success independent of context are not considered helpful in practice.</li> <li>- Considers failure/success as definite end states that exist objectively (independent of the observer).</li> </ul>	<ul style="list-style-type: none"> <li>- Objectifies ISD project flaws and their effect on organizational decision-making.</li> <li>- ISD project failure is seen as irreversible.</li> </ul>	<ul style="list-style-type: none"> <li>- No generalizable and actionable knowledge.</li> <li>- Focuses on social, discursive, and political aspects at the expense of technological aspects; considers human agency but not a technological agency.</li> </ul>

### 2.1.1.1 Objective/Rational and Process Perspectives

Rationalists test models to identify the causal relationship between project factors and project outcomes (Benschop et al. 2020; Fincham 2002). In comparison, the process perspective views success and failure as a sociotechnical interaction defined by organizational processes (Fincham 2002; Sauer 1993). These two positivist research areas define success or failure in terms of “discreet and determinant” end states. Thus, researchers search for key factors that characterize failure and success independently (Cecez-Kecmanovic et al. 2014; Lyytinen and Hirschheim 1987).

### 2.1.1.1.1 Rational Project Success



**Figure 2-1 DeLone and McLean (2003) Updated Model of IS Success**

The most prolific streams in the project success rationalist area are the DeLone and McLean (1992) IS Success Model (See **Error! Reference source not found.**) and critical success factors (CSF). DeLone and McLean (1992) began their line of research by identifying six success categories of dependent variables based on communication and information theories. These constructs attempt to reflect interdependencies. The six constructs are system quality, information quality, use, user satisfaction, individual impact, and organizational impact (see Table 2-3). There were five significant findings in this original manuscript (DeLone and McLean 2003):

1. IS success is “multidimensional and interdependent.”
2. Measures for success should be validated based on the context of the research.
3. Different measures should be reduced in order to compare and validate findings.
4. Future studies should include measures of organizational impact.

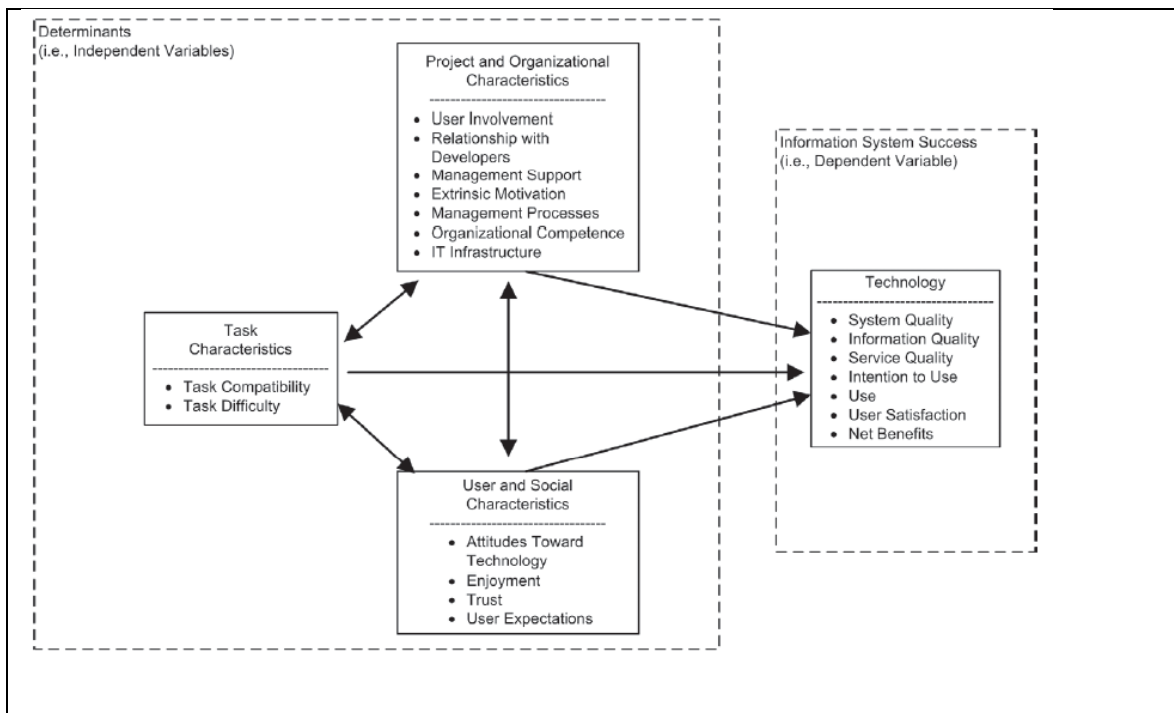
5. The IS Success Model needs to be empirically validated.

**Table 2-3 D&M IS Success Model Variables (DeLone and McLean 1992; DeLone and McLean 2003; Petter et al. 2013)**

<b>IS Success Variable</b>	<b>Definitions</b>
System Quality	Desirable characteristics of an IS.
Information Quality	Desirable characteristics of the system outputs (content, reports, dashboards).
Service Quality	Quality of the service or support that system users receive from the IS organization and support personnel in general or for a specific IS.
System Use	Degree and manner in which staff and customers utilize the capabilities of an IS.
User Satisfaction	Users' level of satisfaction with the IS.
Net Benefits	The extent to which IS are contributing to the success of individuals, groups, organizations, industries, and nations

The IS Success Model continues to be one of the most popular in the IS literature and has been empirically validated numerous times and extended to incorporate e-government, e-commerce, knowledge management systems, executive information systems, and more (DeLone and McLean 1992; DeLone and McLean 2003; Jeyaraj 2020; Petter et al. 2008; Petter et al. 2013; Petter et al. 2012; Rai et al. 2002; Urbach et al. 2009). Moreover, the interrelationships between the constructs were studied and validated at both the individual and organizational levels (Petter et al. 2008). Not all factors are interrelated, but this research highlighted forty-three

independent variables of IS success, with thirteen being deemed the most important (see **Error! Reference source not found.**). Identifying forty-three independent variables is where the D&M Model of IS Success overlaps with CSFs.



**Figure 2-2 Determinant of IS Success (Petter et al. 2013)**

CSFs, a popular area of research for IS success (Petter et al. 2008), are defined as essential characteristics of a project that must exist for the project to succeed (Rademacher 1989). CSF studies aim to identify the *fit* between organizational characteristics and environmental factors (Markus and Robey 1983). The extant literature identifies the five most essential CSFs (see Table 2-4) as top management support, project team competence, interdepartmental cooperation, clear goals and objectives, and project management (Al-Mashari et al. 2003; Biehl 2007; Doherty and King 2001; Holland and Light 1999; Plant and Willcocks 2007; Poon and Wagner 2001; Somers and Nelson 2001; Wang et al. 2008). Additionally, others

examined the importance of cultural factors, social skills, and cohesion (Rai et al. 2009; Singh et al. 2011; Wang et al. 2008) and reduced uncertainty and complexity (Ward and Elvin 1999; Xia and Lee 2005; Zmud 1980). Moreover, researchers have examined CSFs in the context of enterprise resource planning (ERP) systems (Holland and Light 1999; Somers and Nelson 2001; Umble et al. 2003), executive IS (Nandhakumar 1996; Poon and Wagner 2001; Salmeron et al. 2005), and customer relationship management (Kim and Pan 2006; King and Burgess 2006). CSFs are abundant and represent many distinct aspects of IS success.

**Table 2-4 Top Critical Success Factors (Somers and Nelson 2001)**

Top Management Support
Project Team Competence
Interdepartmental Cooperation
Clear Goals and Objectives
Project Management
Interdepartmental Communication
Management of Expectations
Project Champion
Vendor Support
Careful Package Selection
Data Analysis and Conversion
Dedicated Resources
Steering Committee
User Training
Education on New Business Process
Business Processing Reengineering
Minimal Customization
Architecture Choices
Change Management
Vendor Tools
Use of Consultants

In all, more than 40 CSFs have been identified across the extant literature to develop and implement a successful project (Petter et al. 2013). However, a few fundamental limitations exist in the identification of CSFs. One of the significant issues with CSF research is that the mere presence of these factors does not guarantee successful outcomes (Nandhakumar 1996). The list

is so vast and context-dependent that there is little to no evidence that organizations have experienced a higher probability of success by adopting these measures into practice (Doherty et al. 2012). Furthermore, the extant research only examines “static” CSFs, not examining how CSFs vary and how they link to performance outcomes (King and Burgess 2006). So, it does not provide insight into how organizations should intervene if they do not have one or more of the required CSFs, or what to do if the dynamic nature of the CSF begins to change. Therefore, CSFs are limited in their ability to ensure project success.

#### ***2.1.1.1.2 Rational Project Failure***

Project failure is traditionally recognized as the inability of any project to meet its objectives (Schmitt and Kozar 1978). However, there are multiple ways in which a project can fail. The IS literature traditionally recognizes four types of failure (Table 2-5): correspondence failure, process failure, interaction failure, and expectation failure (Lyytinen and Hirschheim 1987). Additionally, an alternate view of failure is abandonment. Abandonment signifies a system's anticipated or expected failure (Ewusimensah and Przasnyski 1991). IS project abandonment can occur in three ways: 1) total abandonment occurs when there is the complete termination of a project, 2) substantial abandonment is when a project is majorly simplified, 3) partial abandonment is de-scoping the project (Ewusimensah and Przasnyski 1991). Whether a project is labeled a failure or abandoned, it illustrates significant issues within the project or organization.

**Table 2-5 Four types of IS Failure (Lyytinen and Hirschheim 1987)**

<b>Failure Type</b>	<b>Definition</b>
Correspondence Failure	IS does not match goals Criteria: IS quality

Process Failure	IS not designed in time and cost; Criteria: Budget limits, cost, and resource allocation schemes
Interaction Failure	IS is not used; Criteria: user attitude surveys, interaction statistics
Expectation Failure	IS does not fulfill expectations Criteria: values of IS stakeholders and their perceptions

IS project factors of failures are similar to CSFs, in that they are numerous (Dwivedi et al. 2013). The failures can be categorized into six areas: project management, top management, technology, organization, size/complexity, and process (Al-Ahmad et al. 2009). However, each of these areas of failure can be broken down into many varied factors (see Table 2-6, exhaustive list in Appendix B). Nevertheless, project management factors represent the largest numbers of these failure factors (McManus and Wood-Harper 2007; Philip et al. 2009; Verner et al. 2008)

**Table 2-6 Top Failure Factors (Schmidt et al. 2001)**

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Lack of top management commitment to the project</li> <li>2. Misunderstanding the user requirements</li> <li>3. Not managing change properly</li> <li>4. Failure to gain user commitment</li> <li>5. Lack of adequate user involvement</li> <li>6. Conflict between user departments</li> <li>7. Changing scope and objectives</li> <li>8. Number of organizational units involved</li> <li>9. Failure to manage end-user expectations</li> <li>10. Unclear / misunderstood scope and objectives</li> <li>11. Improper definitions of roles and responsibilities</li> <li>12. Lack of frozen requirements</li> <li>13. Introduction of new technology</li> <li>14. Lack of effective project management skills</li> <li>15. Lack of effective project management methodology</li> <li>16. Lack of required team knowledge/skills</li> <li>17. Insufficient/inappropriate staffing</li> </ol> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Others have examined the dynamics of traditional project management in IS failure (Benschop et al. 2020; Conboy 2010; Dwivedi et al. 2013; McManus and Wood-Harper 2007; Nawi et al. 2011; Nelson 2007; Nelson 2008; Verner et al. 2008). For example, Nelson (2007) reviewed 99 retrospectives from 74 organizations over seven years and found that failure was attributed to 36 project manager “missteps” in four areas:

- (1) process mistakes (45%)
- (2) people mistakes (43%),
- (3) product mistakes (8%)
- (4) technology mistakes (5%)

Moreover, management failure factors include poor leadership, communication, estimation methods, insufficient support, poor decision-making, etc. (McManus and Wood-Harper 2007). Over time, researchers have identified more than sixty project factors of failure (Philip et al. 2009; Verner et al. 2008).

Rationalists identified factors and characteristics of failure; however, these studies lack an iterative view of emerging failure. They see managerial mistakes as the center of gravity of failure but do not provide insight into the developmental process of those mistakes. To resolve this gap, the process perspective focuses on sociotechnical interactions and understands “projects to be emergent, dynamic, political and social processes” (Baghizadeh et al. 2020, p. 127). Studies from this perspective often see project ‘flaws’ as “objective internal project problems, often technical, while failure results from decision-making and organizational processes” (Baghizadeh et al. 2020, p. 127). These decisions or processes take the form of project “drift” and a “sequence of mistakes” that lead to or accelerate project failure (Nelson 2007; Pan et al. 2008). Compared to the rationalist, the process perspective provides a deeper understanding of project failures by

not just measuring the end-state objectives based on predetermined estimations but provides insights into the managerial mistakes and governance associated with projects (Baghizadeh et al. 2020). Like the rationalists, these authors identify managerial mistakes when dealing with project issues but still do not answer why project managers choose specific interventions and what were the short-term outcomes.

The rational and process perspectives take a positivist approach, focusing on failure or success as an objective state based on a list of factors or organizational processes. Both views suggest that ‘decision-making,’ ‘missteps,’ and ‘mistake chains’ play a significant role as determinants of failure but provide little information on how to intervene when these characteristics are present or when mistakes are made. (Fincham 2002; Nelson 2007; Pan et al. 2008).

#### **2.1.1.2 Subjective/Political Success and Failure**

The subjective/political view, also referred to as the narrative and social constructive perspective of project failure/success, suggests that it does not occur in IS projects as a matter of determinants but is constructed through ‘interpretations and narratives (Cecez-Kecmanovic et al. 2014). This view takes the interpretive approach and considers the perception of failure and success as a negotiation of socially and politically motivated individuals, groups, and stakeholders that can co-occur (Baghizadeh et al. 2020; Cecez-Kecmanovic et al. 2014; Fincham 2002). For example, technology does not have to change in order to be viewed differently by various parties (Wilson and Howcroft 2002). Additionally, success and failure are not “polarized outcomes.” Both success and failure are found in the same project (Fincham 2002). Furthermore, failure as a dominant narrative can hinder an organization’s ability to learn from its mistakes or previous failures, leading to future failure (Bartis and Mitev 2008). The subjective/political

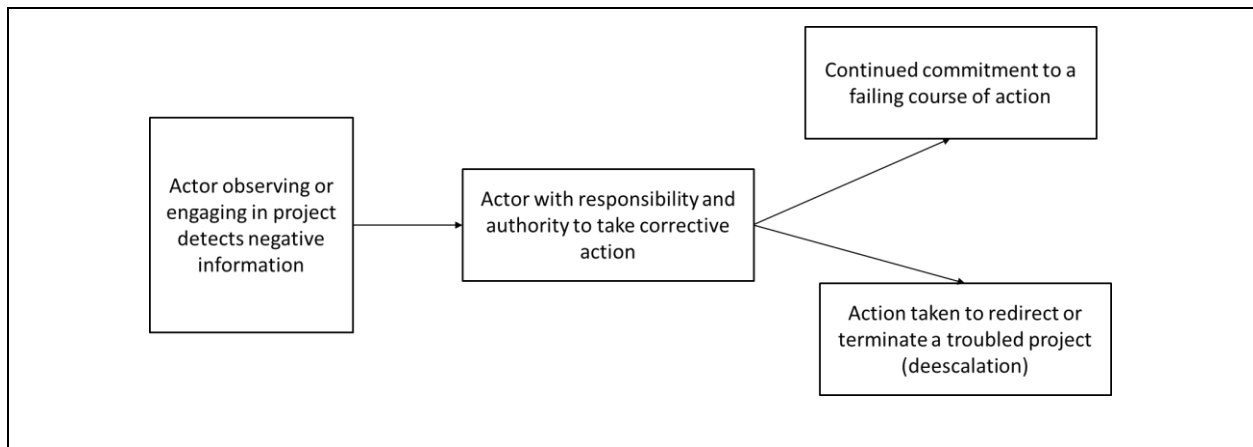
perspective does not assume failure as an overarching end-state but as a fluctuating narrative and perception throughout the life of the project (Baghizadeh et al. 2020).

The narrative perspective, though focusing on the nuanced approach to project failure and success, is criticized for its attention to the social environment rather than focusing on the sociotechnical interactions. Because failure or success in this context represents themes instead of determinant factors, it is challenging to identify practical interventions to ensure positive outcomes (Baghizadeh et al. 2020). The existence of *multiple realities*, and the associated ambiguity, may explain the difficulties of IS project development but complicate the process of learning previous lessons (Baghizadeh et al. 2020; Cecez-Kecmanovic et al. 2014). Due to these complexities, there is no cohesive view of success or failure and how to redirect a project once it exhibits signs of failure. Therefore, we will take a critical realist approach (Bhaskar 2013; Mingers et al. 2017; Williams and Wynn 2018; Wynn and Williams 2012; Wynn and Williams 2020), which links both positivism and interpretivism through its ontology and epistemology (Strong and Volkoff 2010).

### **2.1.2 Escalation/De-escalation of Commitment**

The closest the current literature comes to identifying emergent interventions is through the *escalation of commitment* studies. This phenomenon of escalation of commitment is “continued commitment in the face of negative information about prior resource allocations coupled with uncertainty surrounding the likelihood of goal attainment” (Keil and Robey 1999, p. 65). Thirty to forty percent of all projects escalate (Keil et al. 2000). This occurs because managers and stakeholders repeatedly intervene in projects that do not match the underlying problem (Mahring et al. 2008), thus failing to resolve the issue. The literature identifies four

factors that contribute to escalation: 1) Project Factors, 2) Psychological Factors, 3) Social Factors, and 4) Organizational Factors (Keil 1995). The basic premise for escalation of commitment is that eminent project failure is known objectively in advance (Cecez-Kecmanovic et al. 2014). Therefore, if organizations and stakeholders act rationally, they will redirect or terminate the project; this process is *de-escalation* (Keil and Robey 1999; Montealegre and Keil 2000).



**Figure 2-3 Process Model of De-escalation (Keil and Robey 1999)**

De-escalation concentrates on decision-makers recognizing and clarifying problems while determining suitable alternatives deemed acceptable to stakeholders (Montealegre and Keil 2000). The process of de-escalation (**Error! Reference source not found.**) helps provide a clearer understanding of the problem identification, solution conception, and implementation process. Additionally, it provides insight into de-escalation mechanisms through project abandonment or major project redirections (Mahring et al. 2008). However, de-escalation does not provide information on the emergence of interventions, types of interventions, or intervention success. It only states that because of redirecting away from a current course of action, there is a greater chance the organizations will de-escalate their commitment. Therefore, these studies'

goal is to reduce the level of commitment to a failing course of action, not to help organizations recuperate a distressed project.

## **2.2 Project Distress and Early Warning Signs**

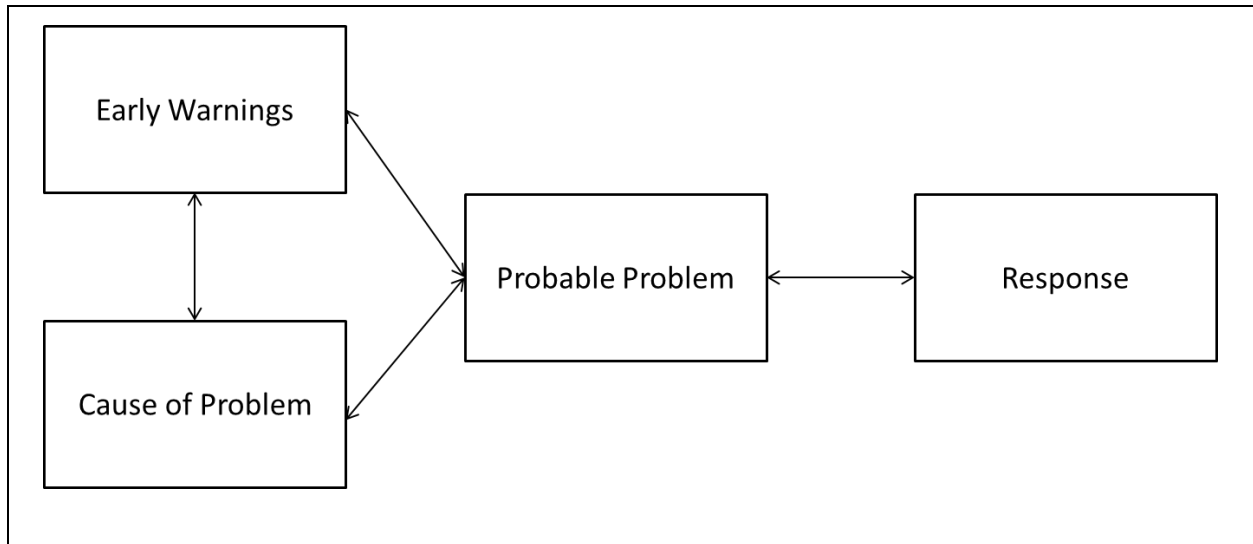
Project distress manifests itself through the emergence of stressors and early warning signs (Kappelman et al. 2006). A project in distress is defined as “harmful project conditions involving dynamic and fluid constellations of critical problems that are difficult to identify, understand and resolve” (Baghizadeh et al. 2020, p. 123). Project distress is presented in the IS literature under the heading ‘drift,’ ‘troubled project,’ and ‘project setbacks’ (Keil 1995; Keil et al. 2000; Keil and Robey 1999; Keil et al. 2014; Mahring et al. 2008; Montealegre and Keil 2000; Slesman et al. 2012). The antecedents of project distress are stressors, which, in the context of IS project distress, are “events, demands, stimuli or conditions encountered by [projects] as factors that create harmful conditions (Cartwright and Cooper 1997). These stressors lead to project distress, which then requires an intervention to prevent project failure. Stressors may take the form of a lack of critical resources, personnel issues, project management issues, etc. (Kappelman et al. 2006; Nikander and Eloranta 2001). Moreover, stressors may present themselves during the project before creating significant problems. The literature interprets these as *early warning signs*.

Early warning signs are “an indication that predicts, cautions, or alerts one of the possible problems” (Kappelman et al. 2006, p. 31). The early warning signs literature states that they are used for problem identification and risk mitigation and identified a list of fifty-three categorized by people-related and process-related (Kappelman et al. 2006; Nikander and Eloranta 2001). The top twelve signs (Table 2-7), named the “dominant dozen,” are similar to both the project failure and success factors (Dwivedi et al. 2015; Kappelman et al. 2006; Li 1997).

**Table 2-7 Dominant Dozen Early Warning Signs (Kappelman et al. 2006)**

<p style="text-align: center;"><b>People Related Risks</b></p> <p style="text-align: center;">Lack of top management support Weak project manager No Stakeholder involvement and/or participation Weak commitment of the project team Team members lack the requisite knowledge and/or skills Subject matter experts are overscheduled</p> <p style="text-align: center;"><b>Process-Related Risks</b></p> <p style="text-align: center;">Lack of documented requirements and/or success criteria No change control process Ineffective schedule planning and/or management Communication breakdown among stakeholders Resources assigned to a higher priority No business case for the project</p>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

The goal of an early warning sign is to identify distress in its infancy to intervene appropriately (Nikander and Eloranta 2001). In the case of project distress, an early warning sign may trigger a response before a project becomes thoroughly distressed. There exist dependencies (Figure 2-4) between the early warning sign, the cause of the problem, the possible problem, and the response. These dependencies may create a mismatch between the trigger and the response if the early warning sign, cause of the problem, and possible problem are not correctly distinguished (Mahring et al. 2008; Nikander and Eloranta 2001).



**Figure 2-4 Hypothetical Early Warning Dependencies (Nikander and Eloranta 2001)**

### 2.3 Interventions

Interventions are commonly identified as potential responses to project issues (Keil and Robey 1999; Nikander and Eloranta 2001). Additionally, interventions describe any actions taken by individual users, experts, and managers to “disrupt established patterns” (Jaspersen et al. 2005). We define interventions nominally as *purposeful actions intending to solve a realized or emergent problem* (Jaspersen et al. 2005; Ward and Elvin 1999). This term does not encompass risk mitigations but most closely aligns to issue management within distressed projects. As a risk meets the threshold of 100% likelihood, it becomes an issue. Therefore, mitigation mechanisms have failed, and an intervention is required.

Interventions in IS literature consider a system implementation as an intervention (Ward and Elvin 1999). We consider this type of intervention a macro-intervention in which an organization tries to solve an “emerging or realized” problem with an IS. However, the context of this study is investigating the *micro-intervention*. A micro intervention is when managers attempt to solve a realized or emergent problem while developing the IS. An organization develops and implements an IS (macro-intervention) and manages the macro-intervention

process of planned and actual content and outcomes. In our study, the micro-interventions fall within the macro intervention, where the organization needs to modify the plan because it will not deliver the desired outcome (Ward and Elvin 1999).

The extant literature finds that organizations identify and respond to early warning signs but are ineffective (Baghizadeh et al. 2020; Lyytinen and Robey 1999; Mähring and Keil 2008; Nelson 2007; Pan et al. 2008). Therefore, it is not the lack of problem identification or early warning but the wrong intervention or corrective action that leads to failure. So, short-term intervention failure or success leads to long-term positive or negative outcomes. Thus, the intervention's success or failure is whether or not the intervention achieves its intent by appropriately resolving the current stressors (Ward and Elvin 1999). Previous literature states that attempted corrective actions fall into two categories: project management and resource management (Keil and Robey 1999). Project management interventions revolve around the internal working of the project management office and project scope, while resource management interventions incorporate adding, removing, or enhancing resources. However, these two categories overlook the impacts of multiple other factors influencing the project's outcome.

#### ***2.4 Model of Interventions in Distress ISD Projects***

In the preceding literature review, we discuss IS project management, including project success, project failure, and escalation of commitment. Additionally, we examine the literature for project distress, early warning signs, and interventions. Below we synthesize the literature by identifying common characteristics of project success, failure, and early warning signs (Table 2-8) and presenting a preliminary model of IS interventions (Figure 2-6).

### 2.4.1 Commons Characteristics of Early Warning Signs, Project Success, and Project Failure

The IS literature on early warning signs, project success, and project failure is plentiful. Moreover, these streams of literature provide a total of 78 factors (see Appendices B and C) (Dwivedi et al. 2013; Kappelman et al. 2006; Li 1997). Therefore, we examined the similarities between the three types of factors and identified twenty-eight common factors, abstracted into four categories (Table 2-8): top management, technical, stakeholder management, and project management/team characteristics.

**Table 2-8 Common Project Factors Between Early Warning Signs, Project Failure, and Success**

<b>Common Factors</b>	
Top Management	Top Management Support and Commitment
	Project Resource Priority
	Approved Budget Less than Estimated Budget
	Top Management Personnel Changes
	Mandated Budget, Schedule, and Scope (Unrealistic)
Technical	Determine the inputs and outputs of the system
	Number of Interfaces
Stakeholder Management	Users Involvement and Cooperation
	Stakeholder Involvement
	Project Team and Stakeholder Communication
	Cultural Conflicts
	User's understanding of the system

	Stakeholder Decision Delay
	No written commitment for the project outside of the project team
	Significant changes immediately after project kick-off
Project Management/Team Characteristics	Documentation (Success, Performance, Scope, and Requirement Clarity)
	Change Control Process
	Project Team Commitment/Motivation
	Project Team Skill
	Project Manager Skills (Leadership, Communication, Project Management)
	Experience with Chosen Technology
	Project Status Reports
	Project Delays (Ignored or included in schedule)
	Undefined Roles of Team Members
	Risk Analysis process
	Performance Metrics Tracking Process
	Project Team Morale
	Key Member turnover after kick-off

Seventeen out of the twenty-eight factors are common across all three streams of literature, indicating that top management, project managers, and stakeholders can identify critical issues in a project early enough to remedy any negative characteristics or sustain the

positive ones. Furthermore, these factors lie on a continuum (King and Burgess 2006). Meaning they can change in both a positive and negative direction. For example, a project may begin with top management support, but that support may wax and wane throughout the development cycle. Moreover, the nature of the categories implies that the majority of factors associated with project failure and success are associated with management: top managers, stakeholders, or project managers (McManus and Wood-Harper 2007; Nelson 2007; Nikander and Eloranta 2001; Schmitt and Kozar 1978).

The eleven failure factors (Table 2-9) are common only to early warning signs and demonstrate that potential failure can be identified early (Nikander and Eloranta 2001). The mere presence of these eleven factors indicates a high probability that the project is on a path to failure. Additionally, the factors in the list of ten are ostensibly dichotomous, whereas the seventeen factors above lie on a continuum. So, if a project includes any of these ten characteristics or incidents, intervention is required, or failure is imminent. Interestingly, common factors between early warning signs and failure only represent three of the four categories. The technical category is not represented. This may be because of the dynamic nature of the technical factors, which are more representative of success than failure. In other words, technical factors may be easier to detect and intervene to ensure success. These twenty-eight factors may occur at any time during the life of a project affecting short-term and long-term project outcomes (King and Burgess 2006). Therefore, initially, using these four categories, we will seek to identify how project managers intervened to resolve these issues.

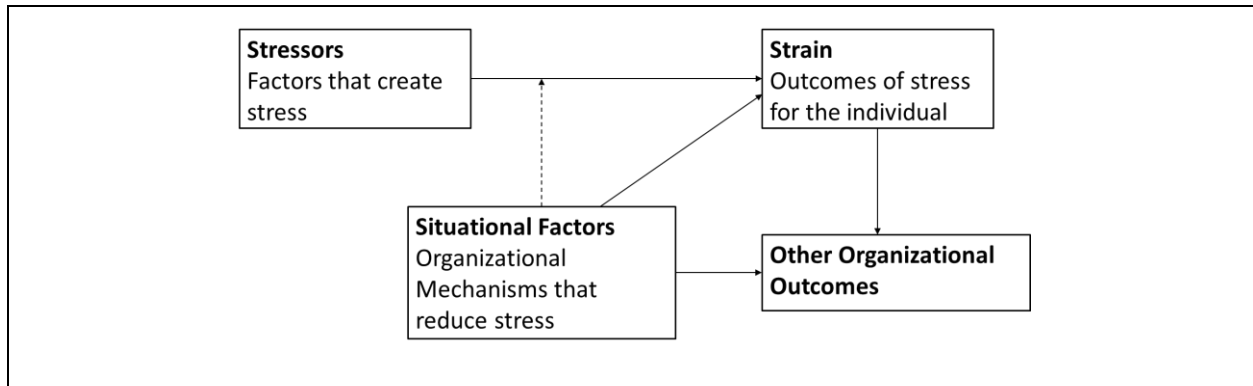
**Table 2-9 Common Early Warning Signs and Failure Factors**

<b>Common Early Warning Signs and Failure Factors</b>
-------------------------------------------------------

Top Management	Approved Budget Less than Estimated Budget
	Top Management Personnel Changes
	Mandated Budget, Schedule, and Scope (Unrealistic)
Stakeholder Management	Stakeholder Decision Delay
	No written commitment for the project outside of the project team
	Significant changes immediately after project kick-off
Project Management/Team Characteristics	Undefined Roles of Team Members
	No Risk Analysis process
	No Performance Metrics Tracking Process
	Project Team Low Morale
	Key Member turnover after kick-off

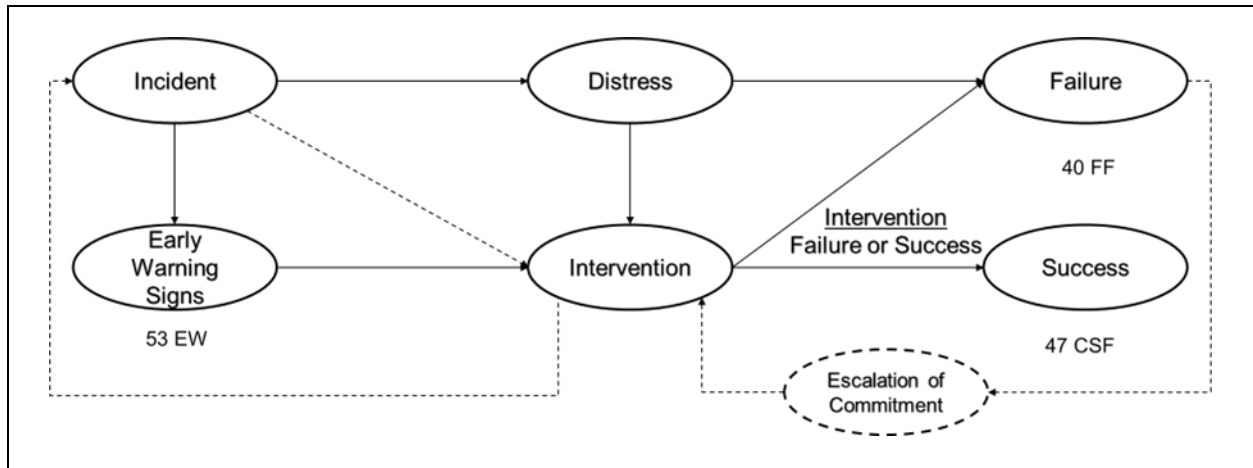
**2.4.2 IS Project Management, Distress, and Intervention**

Intervening in distressed IS projects resembles coping with critical project issues. However, there is a repeated “mismatch” between the problems and solutions (Mahring et al. 2008). The extant literature provides a starting point with early warning signs and endpoints with project success/failure factors but is missing what occurs between the two. Therefore, we developed a preliminary model (Figure 2-6) loosely resembling the transaction-based model of stress (Figure 2-5) (Lazarus and Folkman 1984) and the early warning dependency model (Figure 2-4).



**Figure 2-5 Transaction-Based Model of Stress (Lazarus and Folkman 1984)**

The transaction-based model of stress provides the baseline for research on stress (Ragunathan et al. 2008). The model centers around an individual's response to stressors and situational factors that lead to strain and organizational outcomes. In the context of our study (Figure 2-5), stressors are the events or conditions that create project distress (Cartwright and Cooper 1997). The early warning signs indicate those stressors (Kappelman et al. 2006). So an intervention occurs when a project identifies a critical incident or early warning sign (Nikander and Eloranta 2001) or experiences distress (Baghizadeh et al. 2020) and addresses the distress. If a project is experiencing distress and management doesn't intervene, it increases its risk of failure (Keil et al. 2013). However, we posit that if a project manager intervenes appropriately and the intervention is successful, the long-term outcome will be positive. Thus, we will examine how effective interventions emerge and what factors explain success or failure.



**Figure 2-6 Preliminary Model of IS Intervention and Project Distress**

A dashed line represents escalation of commitment in this model. By definition, escalation of commitment refers to the continued commitment to a failing course of action (Mahring et al. 2008). So the project is on a failing course, but managers and stakeholders continue to intervene in the hope of redirecting the project toward success. The dashed line, therefore, denotes a vicious cycle. Lastly, we added a dashed line between interventions and incidents to represent the linkage between interventions and incidents. Whereas future incidents may be caused by or contributed to by past interventions (Greiner 1998).

### **3 Research Approach**

The purpose of this dissertation is to generate mechanisms that explain the emergence of critical incidents and interventions in distressed ISD projects. We seek to answer the following questions:

RQ1: What factors explain the emergence of critical incidents in ISD projects that label them as distressed?

RQ2: What factors explain successful or failed interventions in distressed ISD projects?

To address these questions, we take a critical realist explanatory case study approach (Eisenhardt 1989; Sarker et al. 2018; Wynn and Williams 2012; Yin 2018). Additionally, we employ components of grounded theory (Corbin and Strauss 2015) to retroductively identify causal mechanisms for critical incidents and interventions (Jopke and Gerrits 2019; Wynn and Williams 2020).

#### **3.1 Critical Realism**

This research takes a philosophical approach based on critical realism (Bhaskar 2013; Mingers et al. 2017; Williams and Wynn 2018; Wynn and Williams 2012; Wynn and Williams 2020), which links both positivism and interpretivism through its ontology and epistemology (Strong and Volkoff 2010). Critical realism postulates that reality exists independent of one's ability to perceive it and views causality through the interactions of mechanisms (Mingers et al. 2017; Wynn and Williams 2020). This notion of reality exists in three ways: real, actual, and empirical. The "*real*" is the external world made up of structures and mechanisms that interact to generate events (generative causality resulting from a critical incident or intervention). Events are changes or incidents that occur due to the interaction of these mechanisms that have causal

powers (Bygstad et al. 2016). The *actual* includes the events that occur, and the *empirical* is the subset of the *actual* events that are observed and recorded to become researched (Mingers et al. 2017; Wynn and Williams 2020).

Critical realism's purpose is to identify structures and mechanisms that explain a particular phenomenon by addressing how one event links to another (Williams and Wynn 2018).

Structures are “the relational conditions underlying behavior” (Porpora 2015). Structures consist of internally related systems, rules, or processes that possess causal powers when combined (Wynn and Williams 2020). These causal powers are considered mechanisms that emerge through interactions from different structures. Mechanisms, observable or not, are present in the *real* and may be physical, social, or conceptual (Bhaskar 1979; Mingers et al. 2017; Williams and Wynn 2018; Wynn and Williams 2020). When analyzed, mechanisms possess the power to explain how and why a phenomenon occurred (Wynn and Williams 2012).

Critical realism is appropriate in studying interventions in distressed IS development projects because they are inherently objective and subjective. Critical incidents and interventions occur in reality, but their complex nature is constrained by the institutions, structures, and processes surrounding them (Jopke and Gerrits 2019; Miles et al. 2020). Thus, making the knowledge of their emergence socially constructed by those actors involved. The combination of both the objective and subjective allows for greater insight into the internal workings of IS development organizations to identify how managers at all levels perceive and respond to incidents that may cause distress and, ultimately, project failure. Fifty years of positivist and interpretivist research have yet to solve the problem of failing projects. We do not contend that critical realism is the silver bullet to this problem but that it will increase our understanding of the structures, contexts, and mechanisms associated with critical incidents and interventions.

In summary, we use the critical realist perspective to examine the social, organizational, and contextual structures which generate causal mechanisms that create incidents leading to interventions that may or may not be successful. Since our knowledge of these events is constrained by their inherently subjective nature, we focus on how incidents transpire and how interventions are constructed by mechanisms emerging from the structures, activities, and contexts in each project management office (Williams and Karahanna 2013). By bridging the views of positivism and interpretivism, critical realism gives us a new perspective to examine the nature of project success and failure through critical incidents and interventions.

### ***3.2 Critical Realist Case Study***

Case studies are considered the “best approach to explore the interaction of structure, events, actions, and context to identify and explicate causal mechanisms” (Ackroyd 2010; Easton 2010; Miles and Huberman 1994; Wynn and Williams 2012, p. 795). It is a “real life” in-depth empirical inquiry focusing on activities and behaviors encompassing certain phenomena (Ackroyd 2010; Yin 2003). The purpose of a critical realist case study is to reveal causal mechanisms that interact to generate events, and case studies are well suited to studying socio-technical phenomena (Wynn and Williams 2012). Thus, this critical realist case study is explanatory because we seek to identify and validate the causal mechanisms of critical incidents and intervention in software development projects.

Our case study is based on the five methodological principles of Wynn and Williams (2020). These include an explication of events, an explication of structures and context, a retrodution of mechanisms, empirical corroboration of hypothesized mechanisms, and adoptions of triangulation and multiple research methods (Table 3-1). This approach is an iterative process that begins with the explication of events. In the context of interventions,

explicating the events provides a narrative of the intervention and distinguishes it from the empirical experiences of the personnel involved. The second step identifies relevant social and organizational structures, contexts, and their relationship to the intervention. Third, retrodution is used to determine what causal mechanisms interacted to generate a failed or successful intervention. Fourth, empirical corroboration examines all the alternative mechanisms and identifies the mechanisms that have the best explanatory power. Lastly, triangulation and multi-methods support causal analysis by analyzing multiple data types, sources, and analytical methods.

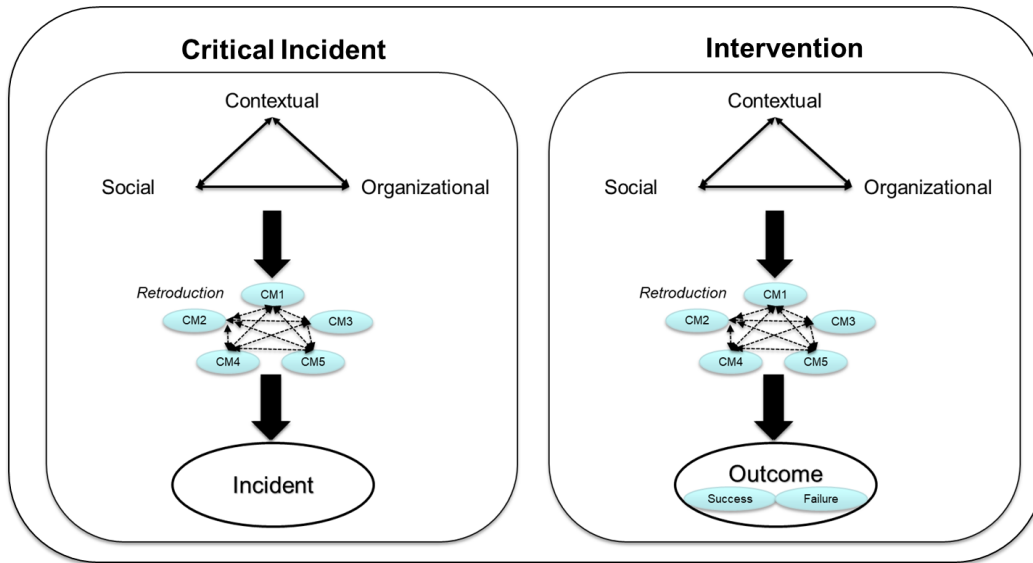
**Table 3-1 Description of Critical Realism Principles (Based on Wynn and Williams 2012)**

<b>Principle</b>	<b>Description</b>
Explication of Events	Identify and abstract the events being studied as distinguished from empirical experiences.
Explications of Structures and Context	Identify the social and physical structure components, the contextual environment, and the relationships between them.
Retrodution of Mechanisms	Identify and elaborate upon the powers/tendencies of structure that may have interacted to generate the explicated events.
Empirical Corroboration	Ensure that the proposed mechanisms have causal power and better explanatory power than alternatives.
Triangulation/ Multimethod	Employ multiple approaches to support causal analysis based on various data types, sources, analytical methods, investigators, and theories.

### **3.2.1 Events, Structures, and Mechanisms**

Critical realism research answers the question of what components and their interrelationships explain the occurrence of a set of events (Bhaskar 1978; Wynn and Williams 2012). Events are specific incidents that occur when causal mechanisms are enacted or interact within the real domain (Wynn and Williams 2020). Therefore, the event is the outcome of the causal mechanisms. In the context of distressed ISD projects, events are the critical incidents that create distress and the intervention (**Error! Reference source not found.**). The event incorporates the structures and context, as well as the roles, relationships, procedures, and

activities of the initial incident and the intervention to resolve the incident and remedy the distress. The events provide evidence to support the chain of causality between the incident and successful/failed intervention.



**Figure 3-1 Event in ISD Project**

Structures consist of “internally related objects or practices” (Sayer 1992, p. 92). The structures typically consist of social structures, material artifacts, and rules and practices (Wynn and Williams 2020). For social structures, we focus on the internal and external relationships between the project management, top management, stakeholders, and the contractor. For the material artifact, we focus on the IS being developed. Lastly, for rules and practices, we focus on the internal and external standard operating procedures, and the budgeting and scheduling requirements external to the project management office. The three types of structures are used as the basis to generate the causal mechanisms associated with successful and failed interventions.

Mechanisms are the causal powers that emerge from structures to explain a specific outcome (Wynn and Williams 2020). Since mechanisms exist in the “real,” they cannot be accessed directly (Bhaskar 2013). Thus, we rely on retrodution as a mode of inference to expose

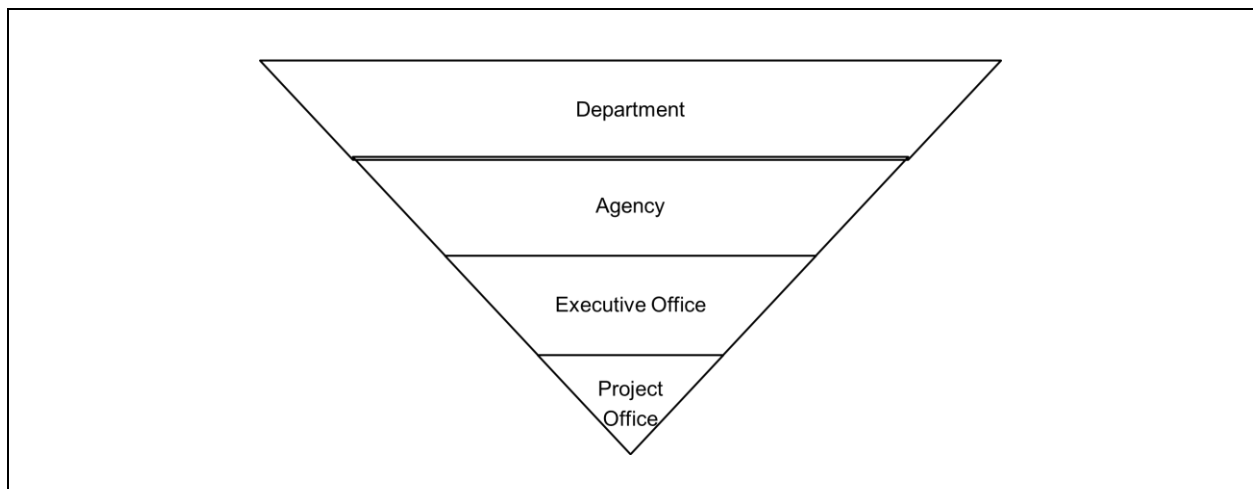
causal mechanisms using the underlying structures and the context in which it operates (Mingers et al. 2017; Williams and Karahanna 2013; Wynn and Williams 2020). Retroduction is a creative process of seeking out what “must be” in order to explain an event (Wynn and Williams 2012; Wynn and Williams 2020). This dissertation applies retroductive reasoning to discover causal mechanisms from the interaction of social and organizational structures to explain critical incidents and their interventions.

### ***3.3 Site Selection***

The organization chosen for this study is a large United States federal public institution responsible for developing information systems with an annual budget exceeding \$4 billion with personnel in over ten countries. The products are customized or configured commercial-off-the-shelf (COTS) software products that range from small to large development projects. This site was selected because the researcher has access to the organization, and it contains multiple distinct IS development projects that serve as a theoretical sample (Corbin and Strauss 2015; Miles and Huberman 1994; Strauss and Corbin 1998). Additionally, the sample of IS development projects contains numerous critical incidents and interventions during their development period that resulted in successful or failed interventions. With the diversity of outcomes, we were able to ascertain critical insights into the structures and mechanisms that generate successful or failed interventions.

We conducted a comparative multi-case embedded case study design (Yin 2018). We use theoretical sampling to select cases that replicate and extend emergent theory (Eisenhardt 1989; Yin 2018) and that, in this study, allow us to identify structures and mechanisms of successful and failing interventions. Our initial theoretical sample (Corbin and Strauss 2015; Eisenhardt 1989; Yin 2018) is four software development projects: two succeeding and two failing. They

are similar in that they have the same organizational environment, as well as the same constraints levied by statutes and policies. Additionally, they are affected by the same internal and external budgeting and decision-making process imposed by stakeholders and executives. All four cases are hierarchically organized in the same department (see **Error! Reference source not found.**). The organizations involved are at four levels: department, agency, executive office, and project office. Furthermore, the four projects experienced distress within their development.



**Figure 3-2 Organizational Hierarchy**

### **3.4 Data Collection**

Data collection took place for approximately fourteen months. The primary method of data collection is semi-structured interviews. Interviewees were from multiple hierarchical levels, including members of the project management office, functional team, and stakeholders. We interviewed the project manager to identify specific examples of critical incidents and interventions. We used the theoretical sampling strategy (Strauss and Corbin 1998) to identify key personnel from each level in the organization involved in the incident and corresponding intervention. Overall, we conducted 40 interviews with 36 interviewees. Each interviewee had first-hand knowledge of the incident or the intervention. The goal of the interviews was to gain a

clear and accurate understanding of how the underlying structures and mechanisms of each critical incident and intervention interact to generate a successful and failed intervention.

The semi-structured interviews seek to identify new themes and increase the flexibility of the interview (Myers and Newman 2007; Stofer 2019). Each interview lasted approximately sixty minutes. To provide context for the critical incident and intervention, we asked the interviewees to describe their background: role, decision authority, and years on the project. Moreover, we asked various questions about specific incidents, project distress, and interventions. For example, “Please describe a critical incident that created project distress; describe how distress was identified; describe what actions were taken; did those actions alleviate the distress?” The purpose was to ascertain a deep description of the critical incident and interventions and the structures and mechanisms that influence the incident and intervention.

**Table 3-2 Data Collection**

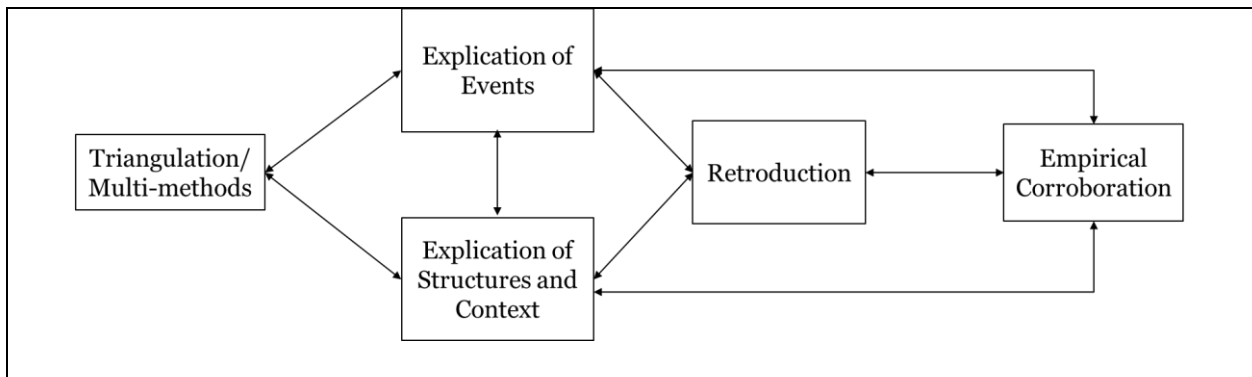
	Semi-Structured Interviews	Unstructured Interviews	GAO Reports	Legislative Reports	PMO Documents
<b>System A</b>	5	1	0	0	2
<b>System B</b>	8	1	0	0	6
<b>System C</b>	10	1	1	1	2
<b>System D</b>	13	1	2	1	8
<b>Total</b>	36	4	3	2	18

Additionally, we supplemented the interviews with documentation (Table 3-2) to triangulate and validate personnel actions and decisions regarding the critical incident and intervention. The documentation includes but is not limited to project review briefings, decision memoranda, planning products, and Government Accountability Office (GAO) reports. This supplemental data enabled us to triangulate and validate our interview data. Lastly, we conducted

a single round of unstructured interviews with a key informant to corroborate event timing and relationships.

### 3.5 Data Analysis

Data analysis focuses on identifying and explicating critical incidents associated with interventions and the elements of the social and organizational structures. Additionally, the analysis sought to identify relevant contextual factors, then, when combined with the social and organizational structures, generate causal forces to produce successful or failed interventions. We use Wynn and Williams (2012) approach to data analysis, using components of grounded theory, similar to Williams and Karahanna (2013).



**Figure 3-3 Data Analysis Process (Wynn and Williams 2012)**

Using a hybrid model of analysis, we employed both a theory-driven and grounded approach (Strauss and Corbin 1998; Williams and Karahanna 2013; Yin 2018). A hybrid model allows us to leverage the theoretical foundation of project failure, project success, and early warning signs in a “continuous dialogue” to develop new concepts through qualitative data (Corbin and Strauss 2015). Our initial set of codes includes four main codes and 28 sub-codes. The four main codes were abstracted from the literature, and the 28 sub-codes represent the

common Early Warning Signs, Critical Success Factors, and Failure Factors previously identified (Table 2-7, Table 2-8). The total 28 codes serve as the foundation for our coding.

After the initial coding and multiple readings of the transcripts, we used temporal mapping and event chain analysis (Langley 1999; Miles et al. 2020) to order the incidents and interventions, then linked the incidents and interventions using the network analysis tool in Atlas.ti v22. Incidents and interventions of a specific event are related causally, then incidents and interventions that are related to other incidents and interventions are categorized as “contributed to” or “associated with.” Two nodes are considered “contributed to” if one contributed to the incident or intervention. Similarly, two nodes were labeled “associated with” if the nodes shared portions of the incident or interventions but did not contribute to one another. Moreover, we identified the relationships between the incidents and interventions and determined whether interventions contributed positively or negatively to future incidents and interventions. Positive contributions were labeled green and negative contributions were labeled red. Once the network was constructed and the event chain analysis complete, a key informant from the project office validated the timing, outcomes, and relationships of the incidents and interventions. If relationships were incorrect, we made on-the-spot corrections. The output of the session was a validated temporally ordered network diagram depicting the relationships between the project’s incidents and interventions.

After visual mapping, to explicate structures, we used elements of Corbin and Strauss (2015) as a general grounded theory framework to identify structures and contextual elements by axial and selective coding through constant comparison. Constant comparisons find concepts that are similar and different from previously coded concepts (Corbin and Strauss 2015). Therefore, the objective was to identify the structures and contexts by abstracting concepts through

analyzing the “roles, relationships, rules, practices, actions, decision, and activities” related to critical incidents and interventions (Williams and Karahanna 2013, p. 938; Wynn and Williams 2012).

Once structures and contexts are identified, the process of retrodution begins by comparing how the structures and contexts appeared within and across the cases (Corbin and Strauss 2015; Wynn and Williams 2012). The comparison within and cross-case, using multiple thought trials, allows us to analyze the interactions between the structures and contexts and, through retrodution, identify causal mechanisms. The goal of this phase was to identify relevant structures, contextual factors, and, specifically, the causal mechanism.

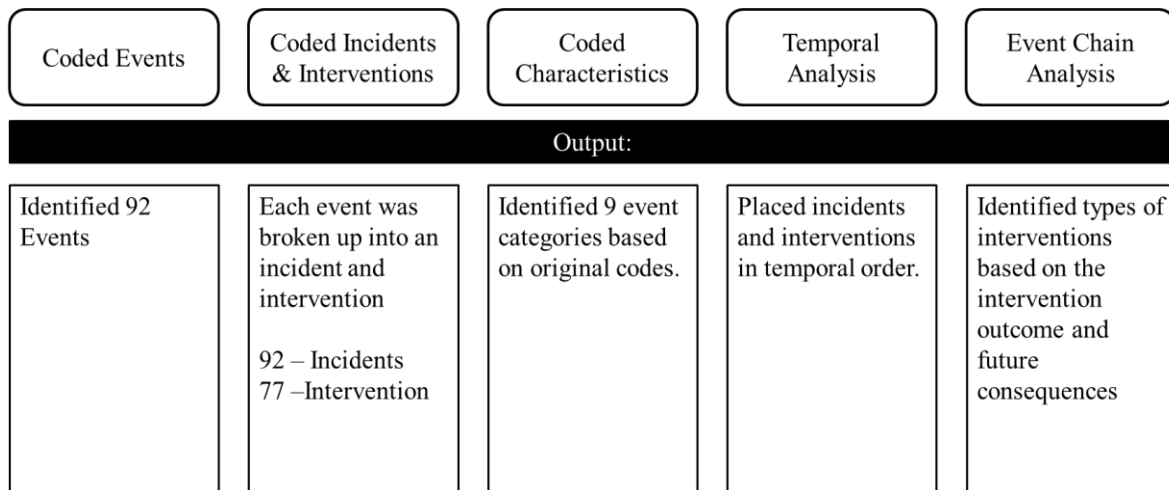
The last two phases of the coding process are empirical corroboration and triangulation/multimethod (Wynn and Williams 2012). Empirical corroboration examines all the alternative mechanisms and identifies the mechanisms that have the best explanatory power. Lastly, triangulation and multi-methods were used to support causal analysis by analyzing multiple data types, sources, and analytical methods. We used empirical corroboration and triangulation through multiple participants, events, and cases and validated that our mechanisms offer the best explanatory power.

## **4 Analysis and Findings**

This section provides the details of our analysis and findings. The first two sub-sections overview events across the four cases and define the event categories and structures. The last sub-section, *retroduction*, contains the within-case analysis, cross-case analysis, and generative mechanisms. To limit redundancy and confusion, we define upfront the terms related to the event categories, social structures, organizational structures, and contexts identified in the coding process. Then we consolidated the case descriptions and evidence for the structures in the within-case analysis. After the within-case analysis, we present our analysis and findings for the cross-case and the resulting generative mechanisms. This section provides a deep understanding of the analysis and findings.

### **4.1 Explication of Events**

This section provides a starting point to identify and explain events experienced by the participants (Wynn and Williams 2012). Figure 4-1 depicts the process and output from explicating events. Overall, we identified 92 events across the four systems. We then used three researchers to categorize the critical incidents and interventions. Nine categories were identified (Table 4-2). Lastly, we placed all the incidents and interventions in temporal order and analyzed them to determine how each incident or intervention contributed to future events (Langley 1999; Miles et al. 2020). The output of this phase is to have a “thick” understanding of the events that occurred, including their outcomes (Wynn and Williams 2012).



**Figure 4-1 Explication of Events**

In each case, we identified numerous occurrences of critical incidents and interventions. The detailed descriptions of the 92 events are presented in Appendix D. Table 4-1 summarizes the number of incidents and the success and failure of each intervention. Of the 92 incidents, there were 77 interventions and 15 incidents without interventions. Additionally, of the 77 interventions, 38 were successful, and 39 failed. Later sections provide an overview of the four cases, including system descriptions, the number of critical incidents and interventions, and their relationships. We discuss further insights into the success and failure of interventions from the four cases in the discussion portion of the dissertation.

**Table 4-1 Event Summary**

System	Incidents	Interventions	No Interventions	Success	Success%	Failed	Failed%
A (Success)	17	17	0	15	88%	2	12%
B (Failed)	26	17	9	2	12%	15	88%
C (Success)	15	13	2	11	85%	2	15%

D (Failed)	34	30	4	10	33%	20	67%
<b>Total</b>	<b>92</b>	<b>77</b>	<b>15</b>	<b>38</b>		<b>39</b>	

Based on the original 28 codes from the literature review, the 92 events were clustered into comparable groups to form nine descriptive event categories (Table 4-2). The nine categories are acquisition, financial, human resources, stakeholders, requirements, reframing, technical, internal support, and contractor. The 92 incidents and 77 interventions independently fit into each of the categories. For example, an incident may be in the financial category, and the intervention may be in the stakeholder category. The incident and intervention may fall into the same category, but it is not a requirement. The *acquisition* category incorporates all things related to government procurement regulation and processes, including acquisition oversight, contracting, and project management. The *financial* or funding category is related to adding or reducing financial resources, including threats to those resources. The *human resources* category incorporates the hiring, administration, and training of personnel, including the lack of critical skills or departure of personnel. *Stakeholders* encompass any event related to an individual, organization, or process that maintains an interest in the project's outcome, including help or pressure from top management, governance, or decisions to garner project support. The *requirements* category relates to the changing or state of articulated system capabilities, including determining if the capabilities are satisfied within the system. *Reframing* includes events related to project scope changes or external perceptions of the project. Reframing is purely an intervention category. The *technical* category includes events associated with the customization, configuration, or specific issues with the project's technical solution. *Internal support* relates to assistance provided within the government to other government or contractor organizations.

Similar to reframing, the internal support category only consists of interventions. Lastly, the *contractor* category is any event associated with the government’s prime contractor, including contractor performance or contractor support. These nine descriptive categories provide high-level themes to analyze the patterns between critical incidents and interventions (Miles et al. 2020).

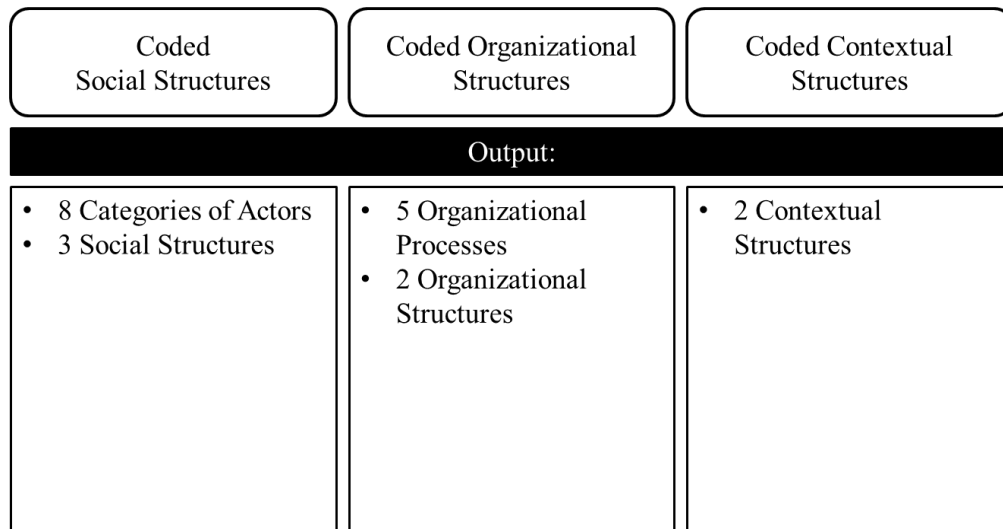
**Table 4-2 Event Categories**

<b>Category</b>	<b>Definition</b>
<b>Acquisition</b>	Includes government procurement regulations and processes. E.g., Acquisition oversight, contracting, and project management.
<b>Financial</b>	Related to the addition or reduction of financial resources, including threats to those resources.
<b>Human Resources</b>	The hiring, administration, and training of personnel, including the lack of critical skills or departure of personnel.
<b>Stakeholders</b>	Events related to an individual, organization, or process that maintains an interest in the project's outcome. Includes help or pressure from top management, governance, or decisions used to garner project support.
<b>Requirements</b>	Events related to the changing or state of articulated system capabilities, including determining if the capabilities are satisfied within the system.
<b>Reframing</b>	Related to the changing of project scope or external perception of the project.
<b>Technical</b>	Includes events associated with the customization, configuration, or specific issues with the project's technical solution.
<b>Internal Support</b>	Assistance provided within the government to other government or contractor organizations
<b>Contractor</b>	Events associated with the government's prime contractor. E.g., Contractor performance or contractor support.

#### **4.2 Explication of Structures and Contexts**

Explications of structures and context seek to “identify and analytically resolve the components of the structure that are causally relevant” (Wynn and Williams 2012). Social and

organizational structures include the relationships between actors and procedures organized into a contextual environment of incidents and interventions in ISD projects. We aim to identify the structures' characteristics and the contextual setting that could produce the events (Sayer 1992; Williams and Karahanna 2013). Figure 4-2 summarizes our process and output.



**Figure 4-2 Explication of Structures and Context**

#### 4.2.1 Social Structures

Social structures include individual and organizational actors, including their relationships, relevant to the events (Wynn and Williams 2020). This section defines the social actors and structures of the organizations involved in incidents and interventions. We abstracted three social structures from eight categories of actors. The eight categories of actors include project management office personnel, acquisition oversight personnel, functional stakeholders, project champion, agency executives, department executives, congress, and the industry partner. Table 4-3 defines each social actor. The *project management office* represents any personnel internal to the project management office. Most notably, this includes the project manager or

deputy project manager, but it could also include other individuals. *Acquisition oversight* actors include the government personnel or executives associated with the overall management of the project. Acquisition oversight personnel exist at the executive office and agency level in the four cases. *Functional stakeholders* are members of the organization responsible for the requirements development and system acceptance. The *project champion* is the single person responsible for ensuring the project's success. The project champion may exist within one of the social actor categories but is the single point of responsibility. *Agency executives* are senior-level managers within the agency that exists at multiple echelons. These agency executives exert influence over the project.

Similarly, *department executives* exist at multiple echelons but influence the project at the department level. The *Congress* category includes members of the U.S. House of Representatives or U.S. Senate, including professional staff, that determine the funding and authorization of projects. Lastly, *industry partners* represent the contractor responsible for the development of the system. The eight categories of social actors do not operate independently but interact to form social structures.

**Table 4-3 Definitions of Social Actors**

Term	Definition
Project Management Office	Personnel internal to the project management office
Acquisition Oversight	Personnel and executives associated with the management of the overall acquisition process.
Functional Stakeholders	Members of the organization responsible for requirements development and system acceptance.
Project Champion	The person responsible for ensuring project success.

Agency Executive	Executives at multiple echelons and offices within the government agency.
Department Executives	Executives at multiple echelons and offices within the government department
Congress	Members of Congress, including professional staffers, that determine the funding and authorization of projects.
Industry Partner	The contractor responsible for the development of the system.

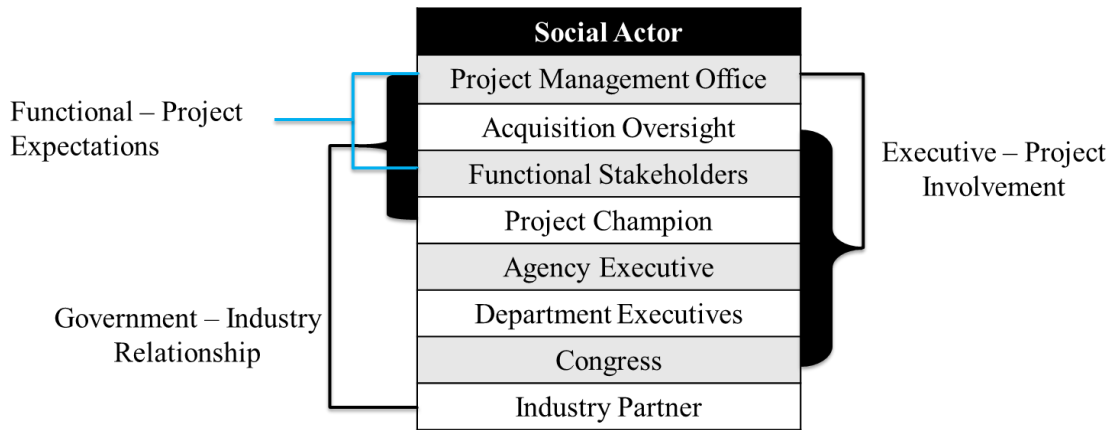
Abstracted from the eight categories of social actors are three relevant social structures representing the relationships between social actors or groups of social actors (Table 4-4). The first social structure is Government-Industry Relationship. *Government-Industry Relationship* describes the positive or negative relationship between the government and the contractor. As shown in Figure 4-3, the government-industry relationship includes the state of the relationship between the project management office, acquisition oversight personnel, functional stakeholders, and the project champion with the industry partner.

**Table 4-4 Social Structure Definitions**

<b>Social Structures</b>	
Government-Industry Relationship	Describes the positive or negative state of the relationship between the government and the contractor.
Executive Involvement in the Project	Describes the positive or negative impact Congress and executives have on the decision and direction of the project. (e.g., timelines, funding, and strategy.
Functional – Project Expectation	Describes the positive or negative impact the functional community has on the project. This includes the extent to which the product meets the presuppositions of the client community’s representatives, as well as the perceived authority of the functional.

The second social structure is Executive Involvement in the Project. *Executive Involvement in the Project* describes the positive or negative impact Congress and executives have on the decision and direction of the project. This includes the impact timelines, funding, strategy, etc. There are six executive actors associated with this structure: acquisition oversight executives, functional stakeholder executives, project champions, agency executives, department executives, and Congress. All six social actors, individually or collectively, impacted the project management office to instigate a critical incident (negative) or impact an intervention (positive or negative).

The third social structure is Functional-Project Expectation. *Functional-Project Expectation* describes the functional community's positive or negative impact on the project. This includes the extent to which the product meets the presuppositions of the user community's representatives and the perceived authority of the functional. Functional stakeholder involvement is vital in a project (Keil et al. 1998; McManus and Wood-Harper 2007; Nelson 2007; Sauer et al. 1997; Yeo 2002). However, the functional stakeholder's relationship with the project management office can positively or negatively impact the overall project by triggering an incident or supporting an intervention. The eight social actors and their interactions characterized by the three social structures begin to explain the occurrence of critical incidents and interventions.



**Figure 4-3 Social Structures**

#### 4.2.2 Organizational Structures

Organizational structures include rules and practices of the various organizations that interact with the social structures and contextual environment (Wynn and Williams 2020). We identified five organizational processes and two organizational structures relevant to incidents and interventions (Table 4-5). The five organizational processes are standard operating procedures, project management, funding, contracting, and governance. *Standard operating processes (SOPs)* are higher-level administrative processes embedded in an agency or department. SOPs include executive orders, human resource processes, policy development, etc. *Project management processes* are any process associated with the execution of the project. Project management processes include requirements development, cost estimation, source selection, software development methodology, etc. *Funding Processes* are financial resource allocation processes for a project, including funding cuts, congressional marks, budgeting, and other related activities. *Contracting Processes* are any process related to a government-industry partner contract, including performance evaluations, contract termination, stop payment procedures, and contract changes. Lastly, *governance processes* are any processes that involve

overseeing a project as a whole and coordinating with multiple actors. Through the analysis of these five processes, we identified two organizational structures.

**Table 4-5 Organizational Processes**

<b>Term</b>	<b>Definition</b>
Standard Operating Procedures	Administrative processes embedded in the organization of an agency or department. These include executive orders, human resources, policy development, etc.
Project Management Process	Any process associated with the execution of a project. Including requirements development, cost estimate, source selection, software development methodology, etc.
Funding Process	The financial resource allocation processes for a project include funding cuts, congressional marks, budgeting processes, and other related activities.
Contracting Process	Any process related to a government-industry partner contract, including performance evaluations, contract termination, stop-payment procedures, and contract changes
Governance Process	A process that involves overseeing a project as a whole and coordinating with multiple actors

After analyzing the five organizational processes related to critical incidents and interventions, we identified two structures of organizational processes (Table 4-6): rigid or flexible and supportive or unsupportive. *Rigid or flexible structures* describe the extent to which an organizational process is adaptable to different circumstances. Rigid structures may include source selections, government budgeting, fixed price contracts, etc. In contrast, flexible structures describe more adaptable processes such as agile development methodologies, cost-plus contracts, and specific risk management procedures. *Supportive or unsupportive structures* characterize the extent to which organizational processes assist or inhibit a project. Unlike rigid or flexible structures, a single organizational process may be supportive or unsupportive. For example, the federal government uses executive orders to issue directives. The directives may be

supportive in that they assist the project in intervening in a critical incident. However, an executive order may be unsupportive by causing an incident, inhibiting the ability to intervene, or limiting the type of available interventions. Further examples of organizational structures are described in the within-case analysis. Understanding the various organizational structures related to critical incidents and interventions is essential to explaining the success and failure of interventions.

**Table 4-6 Organizational Structures**

<b>Organizational Structures</b>	
Rigid or Flexible Structures	The extent to which an organizational process (e.g., budgeting, contracting, and governance) is adaptable to different circumstances.
Supportive or unsupportive Structures	The extent to which organizational processes assist or inhibit a project.

### 4.2.3 Contextual Environment

The contextual environment represents the settings in which the structures might interact to produce events (Sayer 1992). Our analysis identified two contexts (Table 4-7): formal hierarchy and path dependencies. *Formal hierarchy* describes the extent to which senior managers exercise project control without proper acquisition authority. Specifically, in the federal government and our cases, senior managers or executives, internal and external to the acquisition process, assert influence or direct specific actions to the project office. This includes executive orders, budgets, timelines, requirements, etc. In particular, the government agency we examined is more rigid compared to other government agencies and reflects a greater degree of formality within its organizational hierarchy. *Path dependencies* describe the extent to which

prior incidents and interventions positively or negatively impact future events. Path dependence refers to the idea that “history matters” and the organization's path is based on previous events (Teece et al. 1997). In our context, prior events include previous critical incidents or interventions that contribute positively or negatively to future critical incidents and interventions. The two contextual environments and social and organizational structures interact to produce incidents and successful or failed interventions.

**Table 4-7 Contextual Environment Definitions**

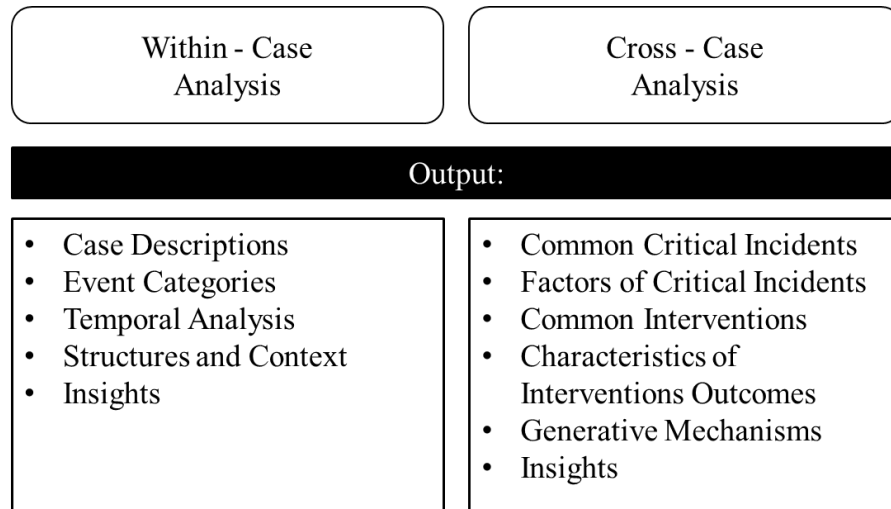
Term	Definition
Formal Hierarchy	Senior managers exercise control of a project without formal acquisition authority.
Path Dependencies	The extent to which prior incidents and interventions positively or negatively impact future events.

In this section, we identified and defined social and organizational structures, including two contextual environments that could produce the events (Sayer 1992; Williams and Karahanna 2013). In the following section, through the process of retroduction, we provide the results of our within-case and cross-case analysis.

**4.3 Retroduction**

Retroduction is a creative process of seeking out what “must be” in order to explain an event (Wynn and Williams 2012; Wynn and Williams 2020). In this section, we use the process of retroduction to analyze the underlying events, categories, structures, and contexts to expose causal mechanisms that explain the events (Mingers et al. 2017; Williams and Karahanna 2013; Wynn and Williams 2020). We apply within-case and cross-case approaches to analyze the data

to explain critical incidents and interventions (Figure 4-4). Truth tables corroborating the within-case and cross-case analyses are located in Appendix E.



**Figure 4-4 Retrodution Activities**

### 4.3.1 Within Case Analysis

#### 4.3.1.1 System A

##### 4.3.1.1.1 Description

System A is a decision-making platform that allows managers and executives to view comprehensive organizational data, analyze trends, and make data-driven decisions. This information system integrates billions of records from over 30,000 disparate data sets and numerous data centers across the United States. Additionally, it can incorporate data analytic tools and artificial intelligence applications to meet the requirements of this large public institution. Furthermore, System A supports the implementation of COVID-19 testing and vaccines, enabling executives to make informed strategic decisions.

At the time of interviews, the project was approximately four years into development and was implemented in all major sub-organizations within the institution. System A represents a successful project, though it experienced significant levels of distress during its development

stage. System A began with no financial resources and was forced to restart due to the expansion of the requirements. Moreover, System A dealt with numerous stakeholder and budgeting issues throughout its development. However, System A’s management intervened successfully to provide the public institution with a successful system.

#### 4.3.1.1.2 Critical Incidents and Interventions Categories

We identified seventeen events through the explication process (Table 4-8). Moreover, fifteen interventions were successful of the seventeen events, and two failed, giving System A an 88% success rate for interventions on critical incidents.

**Table 4-8 System A Critical Events**

Number	Incident	Intervention	Outcome
1	No resources to start project	Re-allocation of resources	Success
2	Pressure to execute quickly	Other transaction authority	Success
3	Expanded requirement	Restarted project	Success
4	Competing platform	Top management advocacy	Success
5	Selected expensive vendor	Stakeholder management/advocacy	Success
6	Lack of proper data skills	Hired data expert	Success
7	Lack of data owners cooperation	Issued executive order	Success
8	No definition of authoritative data	Defined authoritative data	Success
9	Other transaction authority approval	Parallel processing	Success
10	No funding for production	Prototype contract extension	Success
11	No authority to operate	Established internal responsibility	Success
12	Project manager leaves	Created project continuity	Success
13	Threat to cut budget	Re-branding	Failure
14	Top management turnover	New project champion	Success
15	No cross domain access to data	Created default viewable	Success
16	Demands for new requirements	Requirements management process	Success
17	Budget cuts	New Development Strategy	Failure

System A’s critical incidents fall into six categories ( Moreover, the categories with the most successful interventions are stakeholders and acquisition, with seven and four, respectively. However, unsuccessful reframing interventions were employed twice. The following paragraphs will further discuss the incident categories and their interventions.

), and interventions fit five categories (Table 4-10). The intervention columns in Table 4-9 represent the failure and success rates of the interventions within the respective critical incident category. While the intervention columns in Table 4-10 represent the success or failure of specific types of interventions. This description is constant for the remaining cases. Most incidents occurred in the financial category, with five incidents. The following highest categories were acquisition and technical. Interestingly, System A had no critical contractor incidents associated with the project. Moreover, the categories with the most successful interventions are stakeholders and acquisition, with seven and four, respectively. However, unsuccessful reframing interventions were employed twice. The following paragraphs will further discuss the incident categories and their interventions.

**Table 4-9 System A Critical Incident Categories**

	<i>System A</i>		
	<i>Incident</i>	<i>Intervention</i>	
		<i>Success</i>	<i>Failure</i>
<b>Acquisition</b>	3	3	0
<b>Financial</b>	5	3	2
<b>Human resources</b>	2	2	0
<b>Stakeholders</b>	2	2	0
<b>Requirements</b>	2	2	0
<b>Technical</b>	3	3	0
<b>Contractor</b>	0	0	0
<b>Total</b>	17	15	2

**Table 4-10 System A Intervention Categories**

	<i>System A</i>	
	<i>Intervention</i>	
	<i>Success</i>	<i>Failure</i>
<b>Acquisition</b>	4	0
<b>Financial</b>	1	0
<b>Human resources</b>	3	0
<b>Stakeholders</b>	7	0
<b>Requirements</b>	0	0
<b>Reframing</b>	0	2
<b>Technical</b>	0	0
<b>Internal support</b>	0	0
<b>Contractor</b>	0	0
<b>Total</b>	<b>15</b>	<b>2</b>

*Financial* incidents arose for two reasons: (1) the project did not have the required funding at the appropriate time (Incidents 1 & 10), (2) the perception that the selected product was too expensive (Incidents 5, 13 & 17). The project employed financial and acquisition interventions to address the lack of financial resources. System A’s project office successfully intervened by reallocating resources within the executive office and utilizing the contracting process to extend the contract to continue the project.

*Incident 10: At the end of those nine months, our funding had run up [...], so kudos to the [project office] at the time.*

*Intervention 10: They addressed this directly with the industry partner. And through some negotiating, they were able to work out some sort of bridge contract.*

The second reason for financial incidents was the perception from stakeholders at the agency, department, and Congress that the selected product was too expensive. This led to multiple rounds of threats to cut funding and eventual funding cuts. One of three interventions, for this reason, was successful. The primary occurrence of this incident was due to the “sticker shock” of the price. To address the perception of being overly priced, the project management office

worked with stakeholders to educate the executives on “what good software costs.” This worked initially in the short term but ultimately led to two future critical incidents with failed reframing interventions (Incidents 13 & 17).

*Incident 5: Software is expensive, even though people think it's not expensive. [...] But when we came in with our final cost figures, you know, it was kind of sticker shock. And still think it's sticker shock.*

*Intervention 5: A lot of conversations that were happening with multiple internal stakeholders*

Despite concerted efforts by the project office to alter perceptions of the project and its potential organizational impact, the interventions ultimately proved ineffective as stakeholders remained unconvinced of the project’s value proposition, unable to “defend the large price tag.” While most interventions aimed at mitigating critical incidents in the financial category were successful for System A, the two that failed to alleviate the project’s distress highlighted the limitations of such interventions in addressing deeper underlying issues.

The *acquisition* category critical incidents occurred for two reasons: (1) competing platform (Incident 4), (2) delayed approval process (Incidents 9 & 11). The first reason was the mandated use of a competing platform at the department level. The project office employed a key agency executive to defend the project and “push back” on the department, leading to a successful intervention.

*Incident 4: While we were building our [system], the [department] built another platform called [name]. And that is really, really focused around financial justice auditability. But it's a robust platform. And they put out a memo that says, Thou shalt use the [name].*

*Intervention 4: [Helping] senior leaders understand the value of the tool. [...] [Agency Executive] apparently has a very good relationship with the [Department] CIO and CDO, [Name], and has been very forthcoming and forthright.*

The second reason for critical incidents in the acquisition category is a delay in the approval process. The delay occurred twice in the project. Both interventions were successful but used two categories: acquisition and human resources. Utilizing individual capabilities and processes characterizes both successful interventions to address the critical incident. System A's successful interventions on three critical incidents in the acquisition category were instrumental in driving the project toward success.

The three *technical* critical incidents (Incidents 7, 8, & 15) occurred because of the agency's lack of inter-organizational cooperation. In all three critical incidents, the project management office successfully leveraged executive stakeholders to compel the varying organizations to comply with the project's requests. Through their influence and power, the executive stakeholders and governance boards facilitated compliance among the relevant organizations involved in the project.

*Incident 7: The challenge with [System A] is the people that own the data are not sharing the data.*

*Intervention 7: It really took changing that mindset. And it took about a year because we had to write an [executive order] and have it published, and each data stored, you know, got graded on if they gave us their data or not. So it really was pulling them along, kicking and screaming in the beginning.*

System A experienced two critical incidents each in the *human resources*, *requirements*, and *stakeholders* categories. Human resource critical incidents (Incidents 6 & 12) occurred due to the project manager departing or lack of necessary skills. Both critical incidents were effectively intervened by implementing human resource strategies to fill or replace the required skill set, resulting in successful interventions. The two requirements for critical incidents (Incidents 3 & 16) arose from the desire for more capability. Both critical incidents had successful interventions, but one leveraged an acquisition intervention and the other, a stakeholders

intervention. The difference is mainly due to the level where the expansion of the requirements occurred. The project champion directed the initial requirement expansion. Therefore, the intervention addressed the acquisition approach to meet the project champion's desire. However, the later requirement expansion was from the client community's willingness to expand the system. The intervention included stakeholder involvement and governance. Lastly, System A's project champion was involved in two stakeholder category incidents (Incidents 2 & 14). System A's project champion directed the project to deliver capability before his departure in "an extremely fast manner." Moreover, the project champion, as well as a senior executive, left the agency, creating distress for the project office. The two interventions were successful but had different intervention categories. The first critical incident was a directive. Therefore the project office employed an acquisition direction to comply with the directive. The second critical incident utilized a stakeholder intervention because it required the support of a new project champion after the departure of the previous project champion. Overall, the interventions for *human resources, requirements, and stakeholder* categories were successful. The human resource interventions addressed the root cause of the critical incidents. The requirements and stakeholders critical incidents had successful interventions, but the type of intervention employed different structures associated with critical incidents and interventions.

*Incident 2: I mean, the biggest one was the [Project champion's] pressure to deliver this capability, like, in an extremely fast manner.*

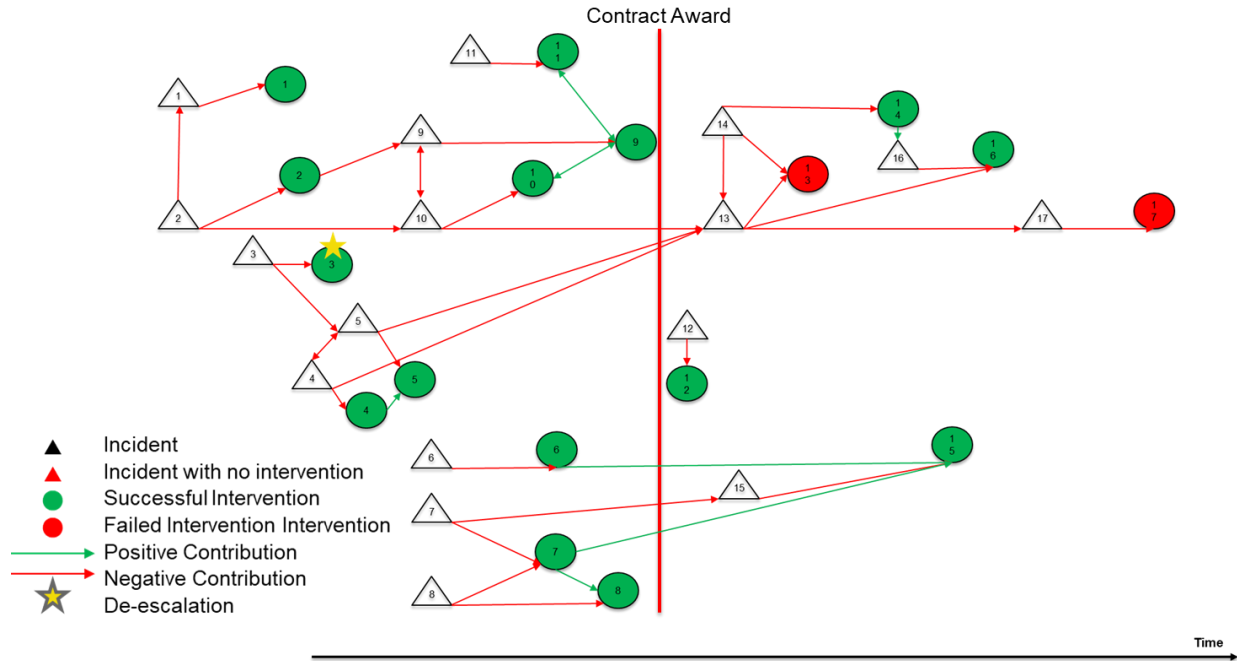
*Intervention 2: [We put] an acquisition authority or an acquisition strategy together, one that could be evolved over time. But putting one in place that would, you know, allow us to kind of evolve with the requirements. And quickly get to a decision point.*

#### **4.3.1.1.3 Temporal Analysis**

Using temporal and event chain analysis, we find that all but one critical incident was linked to other critical incidents or interventions (Figure 4-5). The event chain diagram

demonstrates the interrelated nature of critical incidents and interventions. We identified 38 relationships between the 17 critical incidents and events. Furthermore, ten incidents and two successful interventions contributed to future incidents. Uniquely, one successful intervention (Intervention 14) contributed positively to a future incident. In this case, the project champion left the position, and the project management office successfully sought a new project champion. Fortuitously, the new project champion had a greater vision for the system. Therefore, the client community increased, and the demand for new requirements increased.

Moreover, we find that eight incidents contribute to future incidents. Seven of the eight incidents contribute to an incident chain throughout the project's life. Within the incident chain, four incidents converge onto one incident (Incident 13). Specifically, a competing platform, an expensive vendor, no funding for production, and top management turnover contributed to the project receiving budget cut threats (Incident 13), which then contributed to the eventual budget cuts (Incident 17). These 38 relationships over 34 incidents and interventions demonstrate the interrelatedness of critical incidents in projects and how critical incidents and interventions can hinder or help future project events.



**Figure 4-5 System A Event Chain Timeline**

#### 4.3.1.1.4 Structures and Context

This section explicates structures and context to “identify and analytically resolve components of structures that are causally relevant” (Wynn and Williams 2012). In System A, the social and organizational structures include the relationships between actors and procedures organized into a contextual environment of critical incidents and interventions.

System A’s social structures include individual and organizational actors, including their relationships, relevant to the events (Wynn and Williams 2020). System A’s events included the social actors and structures previously defined in Section 4.2.1 Social Structures. Three events were associated with the government-industry relationship. The government leveraged its relationship with the contractor in the three events to intervene successfully. This includes the contractor helping to explain the system’s benefits (Intervention 5) and the contractor’s flexibility to adjust for government approvals and funding incidents (Interventions 10 & 11). The positive nature of the government-industry relationship contributed to successful outcomes.

System A experienced positive and negative effects from the organizational executive's involvement. Of seventeen interventions, nine times executive–project involvement structure was positive, and six were negative. The two failed interventions experienced negative executive–project involvements, where executives threatened to cut the budget (Incident 13) and then actually cut it (Incident 17). We identified four examples where the project experienced positive and negative executive–project involvement structures. In these four events, executives created the incident, but in three of them, other executives were able to help intervene. Thus, they are considered a net positive contribution. In one incident (Incident 2), the project champion directed a requirements expansion, and the project complied without the help of other executives, counting as a net negative executive–project involvement. Therefore, System A experienced executive–project involvement in 15 of the 17 events demonstrating executives' positive and negative impact on a project's critical incidents and interventions.

The last social structure in System A was the functional–project expectation structure. We identified seven events that involve the functional–project structure. Four of the seven events experience positive and three negative impacts on the functional–project relationships. In the positive cases, the functional representative contributed positively by assisting in the intervention, while in the negative cases, the functional representative contributed to the incidents. Therefore, in the context of System A, the functional representatives contributed more positively than negatively to critical incidents and interventions.

System A's events included the five organizational processes and two organizational structures previously identified. The first characterization of the processes describes the rigidity of the structure, and the second is the supportive nature of the structure. System A experienced rigid structures fourteen times in the seventeen events and flexible structures three times.

Moreover, System A had eleven events with supportive structures and six events with unsupportive structures. System A experienced three events with flexible and supportive structures with a successful intervention. Moreover, six events had rigid and unsupportive structures, of which two had failed interventions. Even though other factors explain intervention success or failure, the only two failed interventions are financial incidents with negative executive–project involvement and rigid and unsupportive structures. Lastly, eight events have rigid but supportive structures with all successful interventions. Overall, System A demonstrates that supportive structures might counteract rigid structures in the ability to intervene successfully.

System A operated within two contexts: formal hierarchy and path dependencies. The contextual environment represents the settings in which the structures might interact to produce events (Sayer 1992). Formal hierarchy characterized nine of the seventeen events. Thus, in nine events, executives without formal acquisition authority exercised control of the project, exhibiting the embedded nature of the organization’s formal hierarchy. The second context is path dependencies (see Figure 4-5), which describe the extent to which prior incidents and interventions positively or negatively impact future events (Teece et al. 1997). In System A, previous events contributed to eight future events. The links were previously described in the temporal analysis; however, it is relevant to note that past events contributed to 47% of events in System A. Moreover, the first failed intervention had four previous contributing incidents, and the second failed intervention occurred within the same path. These negative path dependencies are highlighted as red arrows in Figure 4-5, depicting how past critical incidents contribute to future critical incidents. Therefore, it’s essential to consider prior events when intervening in a current incident.

In this section, we sought to analyze the structures and contexts causally relevant to critical incidents and interventions in System A (Wynn and Williams 2012). Overall, the interaction of five structures and two contexts can explain the occurrence of critical incidents and intervention outcomes.

#### ***4.3.1.1.5 Insights into System A***

System A was touted as one of the most successful software projects in the agency's history. Three insights arose from the analysis. First, System A experienced the dual impact of a project champion. The critical success factor literature asserts that top management support, including a project champion, is essential to software project success (Petter et al. 2013; Petter et al. 2012) and similar claims that the lack of a project champion is a crucial factor in project failure (McManus and Wood-Harper 2007; Schmidt et al. 2001; Schmitt and Kozar 1978; Yeo 2002). However, in System A, we see both the project champion's positive and negative impacts. The project champion contributed positively to five interventions demonstrating that they are essential as an intervention tool to support organizational cooperation, funding, and performance. However, the project champion also contributed to four critical incidents. Precisely, the project champion directed the project to begin without any resources, required rapid execution, expanded the requirements, and then they left for another position within the department. Overall, the project champion was critical to intervention success, but the project champion also created significant distress. The literature suggests project champions are universally beneficial, but they have social and symbolic capital that they can wield positively and negatively.

The second insight identified from System A is the persistent nature of financial incidents. The literature suggests that limited resources and mandated or underfunded budgets are critical factors in failed projects (Benschop et al. 2020; Conboy 2010; Jones 2006;

Kawamura and Takano 2014; Keil et al. 1998; Nelson 2008; Pan et al. 2008; Verner et al. 2008). Even though System A is not a failed project, we see that the five critical incidents associated with financial resources plagued the project throughout its development and into sustainment. The project manager intervened successfully in three cases but failed in two, risking the project's future. For System A, there is no single recipe to ensure a successful outcome from a financial critical incident. Still, our case suggests that even if a project manager intervenes successfully in early financial incidents, the problem might reoccur. This is mainly due to the rigidity of the government funding processes and formal hierarchies. Therefore, underfunded projects or those with a mandated budget should seek to resolve their underlying financial issues as early as possible to forestall future financial incidents.

The third insight identified for System A is leveraging existing organizational processes to intervene in critical incidents. System A successfully used the organization's standard operating procedures (SOPs), governance boards, and contracting processes to intervene. System A's project manager used rigid structures in a supportive manner to benefit the project. Specifically, they used executive orders to demand project support, define authoritative data, and utilize the existing governing board to approve requirements, provide cross-domain data access, and ensure continued cooperation from stakeholders. By leveraging existing organizational processes, System A was able to intervene successfully. Advantageously exploiting existing procedures can reduce organizational friction generated by creative workarounds. The cross-case analysis and discussion discuss further insights.

#### **4.3.1.2 System B**

##### ***4.3.1.2.1 Description***

System B is a worldwide distributed learning system incorporating training management, enterprise scheduling, resource management, development, and learning content. System B enables and optimizes managers' and executives' ability to plan, prepare, execute, and assess employee training, education, and development. Furthermore, System B manages over 3,500 courses in IS and IT, Business, Leadership, and Personnel development, providing undergraduate college credit to public employees.

System B represents a failing project in our theoretical sample. It struggled during its initial development stage and continued to have issues at the time of the interviews. The project is approximately five years old, from the initial requirements to the interviews. The project began with a critical incident that directed it to operate at a lower oversight threshold. Right from the start, the project experienced distress. The distress continued as the project experienced critical incidents regarding stakeholders, funding, contracts, commercial product, and contractor performance. The project manager was unable to intervene successfully and terminated the contract. However, the contract termination intervention did not alleviate distress because Congress and agency stakeholders removed the project's funding. Therefore, System B continued to experience distress and is currently labeled a failed project.

#### ***4.3.1.2.2 Critical Incidents and Interventions***

We identified twenty-six events in System B (Table 4-11), including 26 incidents and 17 interventions, of which two were successful and 15 failed. Additionally, nine incidents did not have interventions, and the two successful interventions (Events 20 and 21) were associated with de-escalation and termination of the project. Overall, System B represents a failed project with an intervention success rate of 8%.

**Table 4-11 System B Critical Events**

<b>Event #</b>	<b>Incident</b>	<b>Intervention</b>	
1	Directed to be at a lower oversight threshold	Developed a realistic cost estimate	Failure
2	Critical functional stakeholder	Demonstrating success	Failure
3	Prototype funding cut by 60%	Rescoped prototype	Failure
4	PM against mandated transition from waterfall to agile	NA	NA
5	Non responsive government contracting officer	PM engagement and support	Failure
6	Inexecutable contract	NA	NA
7	Rushed source selection decision	NA	NA
8	COTS product did not meet the needs of the users	COTS product pivot (attempted)	Failure
9	Contractor onboarding delay	Government assistance	Failure
10	PM “checked out” prior to retirement	Deputy as acting PM	Failure
11	Inexperienced acting PM	Increased stakeholder engagement	Failure
12	Unable to define point release payments	Attempted to change the contract	Failure
13	Weekly requirements changes	Attempted to change the contract	Failure
14	Contractor delivered zero features in PI 1	NA	NA
15	Governance only approved requirement changes every 3 months	NA	NA
16	Unresponsive COTS development	NA	NA
17	Contractor delivered 3/20 features in PI2	NA	NA
18	Government and contractor animosity	NA	NA
19	Contractor delivered 0/29 use cases	Government issues letter of concern	Failure
20	System demonstration failed	Contract termination/de-escalation	Success
21	Contractor executive dishonest	Corrective action plan/termination	Success
22	Contract termination	New development strategy	Failure
23	Project changed government funding portfolios	NA	NA
24	Funding cut	Sought executive office support	Failure
25	Budget was marked by congress	Rescope project plan	Failure
26	Zero funding	Rescope/survival	Failure

System B’s critical incidents fall into seven of the nine event categories (Table 4-12). The two largest critical incidents categories are acquisition and contractor, with six critical incidents each. Additionally, the category with the most critical incidents without interventions is the contractor category. System B’s interventions fit six categories (Table 4-13), with the only

successful interventions occurring in the acquisition category. However, the acquisition category also contained the largest number of failed interventions (5). The following paragraphs will further discuss the incident categories and their interventions.

**Table 4-12 System B Critical Incident Categories**

	<i>System B</i>			
	<i>Incident</i>	<i>Intervention</i>		
		<i>Success</i>	<i>Failure</i>	<i>N/A</i>
<b>Acquisition</b>	6	0	4	2
<b>Financial</b>	5	0	4	1
<b>Human resources</b>	4	0	2	2
<b>Stakeholders</b>	2	0	1	1
<b>Requirements</b>	2	1	1	0
<b>Technical</b>	1	0	1	0
<b>Contractor</b>	6	1	2	3
<b>Total</b>	26	2	15	9

**Table 4-13 System B Intervention Categories**

	<i>System B</i>	
	<i>Intervention</i>	
	<i>Success</i>	<i>Failure</i>
<b>Acquisition</b>	2	5
<b>Financial</b>	0	0
<b>Human resources</b>	0	2
<b>Stakeholders</b>	0	3
<b>Requirements</b>	0	0
<b>Reframing</b>	0	3
<b>Technical</b>	0	0
<b>Internal support</b>	0	1
<b>Contractor</b>	0	1
<b>Total</b>	2	15

*Acquisition* incidents arose for two reasons: (1) organizational processes and (2) the written contract. Organizational processes constrained the project and contributed to two

incidents (Incidents 1 & 6) within the acquisition category. In both incidents, the project manager was forced to comply with organizational directives to either be at a lower oversight threshold or rush a decision to comply with organizational goals. The intervention failed in the first event, and no intervention was employed in the later event.

*Incident 1: This program is grossly underfunded. It was easily a \$400 million program at that time.*

*In the beginning, the reason they were driving to that \$250 million amount was to keep it in [low threshold project] because they didn't want the oversight.*

*Intervention 1: You know, we can do it. It's an [formal] organization. Right? Sir, Yes, sir. We'll make it happen.*

*They were making adjustments to their analysis in order to try and meet a \$250 million budget.*

The poorly written contract was the second reason for the acquisition critical incidents. In System B, the contracting office and the contract were responsible for four critical incidents, of which all interventions failed. The critical events began with a non-responsive government contracting office (Incident 5), and the issue continued throughout the project's development until contract termination (Incident 22). Based on the analysis, System B ineffectively intervened in the acquisition incidents with four failed interventions and two incidents with no interventions.

*Incident 12: My other problem was the contract that we had written. It was written in a very, very high-level and nebulous way. And what I mean by that is there were milestone payments that were written within the contract. None of the milestone payments were defined.*

*Intervention 12: When I found out the contract was poorly written, I went to the contractor and said, 'Would you mind helping me write the contract in a way that is more detailed, and I actually am able to articulate what it is you're delivering.' So, for instance, the part of the milestone payments. The contractor said, 'No, we agree with the way that this contract is written. This is what we agreed upon.' And at that point, I had zero flexibility to really correct what I was identifying and where I saw the pain points.*

Six critical incidents occurred within the *contractor* category. These incidents occurred for the following three reasons: (1) contractor onboarding issues (Incidents 9 & 14), (2) poor

contractor performance (Incidents 16, 17 & 19), and (3) a dishonest contractor executive (Incident 21). The first reason, contractor onboarding, was due to the complex nature of the government. The contractor was unable to obtain identification cards and gain access to the government systems, which further contributed to the contractor not providing any features for the first deliverable. The project manager intervened unsuccessfully by attempting to provide support but did not intervene when the contractor didn't deliver any features.

*Incident 9: [Took] a long time to get on boarded. And it took some time to get those financial, foundational pieces, the architecture, and everything. So they didn't actually start developing and delivering capability until maybe the second or third program increment.*

*Intervention 9: I mean, we did. I think we gave them some relief and schedule as it relates to those initial things. [...]. And then we had our government folks involved and, you know, working with the [organizations] that were responsible for the onboarding in the infrastructure and letting them know, Hey, this is really a priority that is impacting our development efforts. So just staying engaged with them.*

The second reason, contractor performance, occurred in three incidents, but only in the last incident did the project manager intervene. The intervention was a failure contributing to eventual contract termination.

*Incident 19: By [program increment] three, the contractor hadn't delivered anything of value.*

*Intervention 19: I went ahead and wrote a letter of concern because they weren't delivered. They hadn't delivered anything and PI one and PI two, I would have written that letter of concern back in PI one if I was with the program, but I came in three and a half months. I wrote my letter of concern to the contractor on a 232 million dollar contract. I wanted a corrective action plan from the contractor on how they were going to look at [requirements]. Because I realized that the requirements analysis was big, so I wanted them to fix how they were going to look at the decomposition of the requirements*

The last reason, executive dishonesty, occurred when the industry executive lied to an acquisition executive, resulting in contract termination. The contractor category demonstrates the

difficulty of intervening to increase contract performance or managing contractor incidents. This topic is further discussed in System B's organizational structures.

*Incident 21: [The executive], he lost faith and mostly because the CEO of the VP we're not being honest.*

*Intervention 21: So [the executive] stopped work in September. And we terminated the contract 90 days later.*

The *financial* critical incidents category composes of five critical incidents. Critical incidents in the financial category arose for two reasons: (1) budget cuts (Incidents 3, 24, 25, and 26), (2) organizational processes (Incident 23). However, all the financial critical incidents within System B are related. The government manages projects by priority within funding portfolios. In System B's case, the project's funding was cut four times. The first time occurred prior to the contract award, and the other three were performance-related cuts after the contract was terminated. The project office intervened unsuccessfully by attempting to rescope the original plan and gain stakeholder support.

*Incident 3: I think they're actually like \$5 million prototypes apiece. And then I think it ended up being less than 2 million apiece.*

*Intervention 3: So we had [to re-scope] the prototype. Right. [...] We can't discount the prototype but told them hey, it's in your best interest to the kind of deliver as much as you can. Right, because that will give us more confidence in what our ability is.*

The second reason for financial critical incidents was due to a portfolio change within the government, making it more difficult for a "failed project" to "compete" for funding. The project office did not intervene in this incident, and it contributed to two future incidents. Like System A, the financial incidents occurred throughout the project's life and contributed to significant distress.

The *human resources* category accounts for four critical incidents in System B. Two interventions were unsuccessful, and the remaining two critical incidents did not have

interventions. Human resource critical incidents occurred for two reasons. The first was associated with the project manager (Incidents 4, 10, & 11). In these three incidents, three project managers lacked the skill or motivation to engage in the project. Executives attempted to intervene but created another incident by employing an inexperienced project manager.

*Incident 10: [The project manager] was retiring. And he was already out the door. I never got a day of mentorship from him. Now single day.*

*Intervention: He put [Name], who was a recently hired deputy [project] manager, she all of a sudden became the [project manager].*

The second reason was due to the individual relationships between the government and the contractor, and no intervention was employed. This is partially due to the timing of the incident, as well as a lack of motivation for both parties because “everyone was throwing rocks at each other.”

The last three categories with fewer than two critical incidents are *stakeholders (2)*, *requirements (2)*, and *technical (1)*. The stakeholder category consisted of two critical incidents (Incidents 2 & 15) associated with the expectations of the functionals in what the product could do and how it should be governed. The project unsuccessfully intervened by attempting to demonstrate success and neglected to intervene to address governance. The two requirements critical incidents occurred because of the government’s inability to change stated requirements and the contractor’s demonstration of not meeting them. The project manager intervened unsuccessfully by attempting to change the contract to better address changing requirements. The later intervention succeeded because the project office terminated the contract after the system did not meet the requirements. Lastly, the technical critical incident occurred because the commercial product “did not meet the needs of the user.” The project office attempted to convince the contractor to change commercial products, but this intervention ultimately failed. Although the stakeholder, requirements, and technical categories may represent a relatively

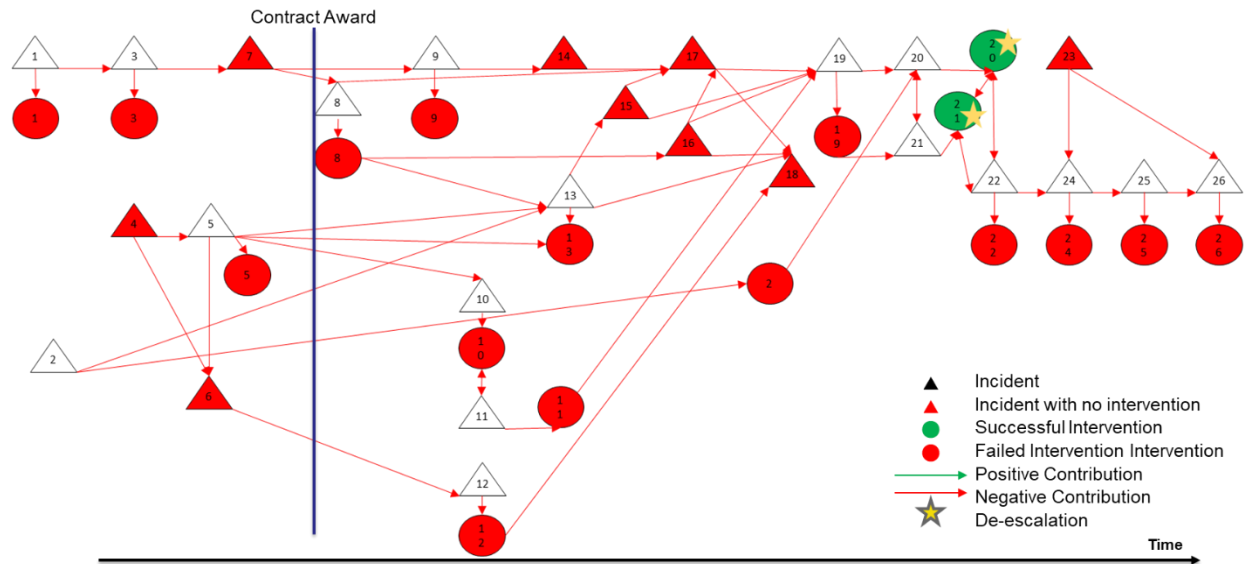
minor fraction of the total critical incidents, their impact is cumulatively amplified throughout the project's lifecycle.

*Incident 2: I also noticed [...] that the customer was extremely needy, extremely involved, and wanted what they wanted, period, without any real recognition of what was involved in developing large complex systems like they were ending up with.*

*Intervention 2: I tried to get the biggest things done first. Right. I mean, that's, you know, in my mind, that was, you know, what I attempted to do was trying to get the quick wins, right? Well, what can I demonstrate? I need to demonstrate something to get people to be excited about the program, which obviously didn't happen. But that was always kind of planned. Right? Because with the demonstration of functionality comes a level of trust.*

#### **4.3.1.2.3 Temporal Analysis**

Using temporal and event chain analysis, we identified 58 relationships between 43 incidents and interventions (Figure 4-6). All the incidents that did not have interventions contributed to future incidents. Specifically, seven of the nine incidents without interventions contributed to multiple future incidents. Additionally, seven interventions negatively contributed to future incidents. Of the seven interventions, five failed, and two succeeded. The two that succeeded were de-escalation interventions terminating the contract (Interventions 20 and 21). However, after contract termination, the project lost all funding (Incidents 24, 25, & 26). The temporal and event chain analysis allows us to visually depict the relationships and impact each incident and intervention has on future incidents and interventions. Therefore, we can infer from the temporal diagram two points of convergence: Incident 17 and Incident 19. Both incidents demonstrate the convergence of four negative event chains. Therefore, the past critical incidents accumulated to two related points, potentially representing significant signs of failure. Further analysis is discussed under System B's path dependencies and insights.



**Figure 4-6 System B Event Chain Timeline**

#### 4.3.1.2.4 Structures and Context

This section explicates structures and context to “identify and analytically resolve the components of the structure that are causally relevant” (Wynn and Williams 2012). The social and organizational structures include the relationships between actors and procedures organized into a contextual environment of incidents and interventions in ISD projects. Below we discuss the presence of the structures in System B.

The three social structures defined previously were present in System B’s events: Government-Industry Relationship, Executive-Project Involvement, and Functional-Project Expectations. The government-industry relationship structure was positive in one event and negative in ten events. The positive industry-government structure was present at the initial stages of the contract, where the government and contractor worked together positively to intervene (Intervention 9). However, the government and contractor could not work together shortly after the contract award, eventually contributing to relationship animosity, contract performance issues, and contract termination. In System B, four incidents associated with a

negative government-industry relationship did not have interventions, and the only successful intervention was contract termination. Interestingly, in System B's context, the government industry-relationship was positive prior to the first critical incident and remained negative afterward, suggesting that government contract reconciliation is difficult. This is further demonstrated in Incident 18, where government and contracting animosity was identified as a critical incident, but the project office did not attempt to intervene in any way. Overall, the government-industry relationship structure was negative and contributed to System B's project failure.

The second social structure, executive-project involvement, was present in thirteen events: four positive and nine negative. In the positive instances (Incidents 10 & 11), an executive helped to intervene in human resources and contractor-based incidents. The two interventions on the human resource incidents were unsuccessful, but the two contractor-based interventions were successful because the executive decided to terminate the contract. The nine negative instances of executive-project involvement were experienced at the project's beginning and end. The executives' negative involvement at the project's initiation was characterized as critical incident instigation. The executives directed the project office towards a funding profile, oversight level, and development strategy creating critical incidents. In contrast, the examples of executives' negative involvement towards the end of our investigation are associated with funding cuts after contract termination. Lastly, there are two events (Incidents 5 & 6) where social actors are not included within the social structures. This is due to the internal nature of the social actors. The social actors in these scenarios are internal to the project office and government agency, and the only two events in our study are not associated with the social structures. In System B, executives played both a positive and negative role but ultimately

contributed to the emergence of critical incidents and only two times contributed to successful interventions.

The final social structure in System B is the functional-project expectation structure describing the impact of the functional community on the project. There were seven examples of the impact of the functional community on critical incidents and interventions. In all seven, the impact was negative. From the start of the project, the functional stakeholders were “needy.” However, this was not addressed until much later in the project. The critical nature of the functional stakeholder was experienced in requirements and governance-related incidents. Moreover, these incidents contributed to the animosity between the government and the contractor (Incident 18). The negative impact of the functional-project expectation structure is demonstrated through these seven events across the project's life.

System B's events included the five organizational processes and two organizational structures previously identified. The first characterization of the processes describes the rigidity of the structure, and the second is the supportive nature of the structure. All of System B's events were associated with rigid structures. The three main processes categorized with rigid structures identified in the twenty-six events are acquisition, funding, and contracting. In each process, the project manager was constrained in their ability to intervene. Most notably, due to the fixed-price contract being deemed inexecutable (Incident 6), the project office could not change requirements, replace the commercial product, or address contractor performance. The only way the project office thought they could intervene was to terminate the contract (Intervention 20). This example is consistent with the funding and acquisition processes, where the project office was limited in its ability to intervene or the type of intervention to employ. Similar results are found in supportive and unsupportive structures.

Analysis of System B discovered six instances of supportive structures and twenty instances of unsupportive structures. Supportive and unsupportive structures describe the extent to which organizational processes assist or inhibit the project. Two of the six events (Incidents 20,21 & 22) with supportive structures were associated with intervention success. The interventions were contract termination from two critical incidents. Contract termination was the only supportive solution, given the rigidity of the contract. The remaining four events with supportive structures seem to allow the project office to intervene but did not contribute to a successful intervention. In one event (Incident 4), the project officer caused a critical incident because of the autonomy of the project manager to enact software development strategies. Therefore, the project manager's partial compliance with a congressional mandate was facilitated by the presence of a supportive structure. The twenty instances of unsupportive structures include eight incidents without interventions and twelve failed interventions. The eight incidents without interventions suggest that unsupportive structures contribute to the project's inability to intervene, but the remaining twelve indicate a relationship between the project's ability to intervene appropriately and the intervention outcome. For example, in Incident 12, the project office could not define "point release payment," they attempted to work with the contractor to modify the contract, but the contractor was unwilling. Therefore, the intervention failed. The remaining events have a similar story (see Appendix D). In summary, System B's events were characterized by rigid and unsupportive structures that caused critical incidents and limited the project's ability to intervene suitably and successfully.

System B operated within two contexts: formal hierarchy and path dependencies. The contextual environment represents the settings in which the structures might interact to produce events (Sayer 1992). Formal hierarchy characterized ten of the twenty-six events. Formal

hierarchy's effects can be seen in the project's direction and funding. In three events (Incidents 2, 4 & 15), senior managers without acquisition authority asserted control over the project by mandating oversight thresholds, development methodology, and requirements approval timelines. Additionally, in the remaining seven events, a formal hierarchy was exerted concerning funding critical incidents, causing significant levels of distress. Six of the ten events associated with formal hierarchy failed, and the remaining four incidents did not have interventions. The formal hierarchy represents the structures' setting, which may trigger an intervention when interacting with other structures.

Twenty-one events operated within the context of path dependencies, meaning twenty-one events were contributed to by previous events. More specifically, only four incidents occurred independently of the others, three of which happened at the project's start (Incidents 1, 2, & 4). Moreover, there are zero examples within System B's events or interventions that contributed positively to other incidents or interventions. Contrastingly, we find that six failed interventions contributed to future incidents, suggesting that failed interventions have larger impacts on the project than just failing to solve a problem. Moreover, as previously described, multiple events are negatively linked throughout the project. Lastly, the event links converge on incidents related to contractor performance and requirements, leading to project termination. The analysis of path dependencies in System B highlights the importance of contextual factors and historical events in explaining the emergence of critical incidents and interventions. A thorough analysis of structures and contexts yields indispensable insights into the nature of critical incidents and interventions.

#### ***4.3.1.2.5 Insights into System B***

System B is considered a failed information system project, even though it operates today with limited funding (Incidents 22, 24, 25, &26). The analysis in the previous section describes a gloomy picture of the system's history. However, four particular insights arise from analyzing System B. There appears to be a relationship between critical incidents, failed interventions, and project failure. System B faced significant challenges from the outset, experiencing a series of critical incidents that only intensified following the award of the contract. The distress was only alleviated once the contract was terminated. However, contract termination began another series of critical incidents. Therefore, project managers and executives should critically examine the impact of critical incidents and their associated interventions on a project's progress, as they may predict its success. In particular, they should recognize that negative incidents associated with a contract can be highly detrimental to project success.

Secondly, we found that not all critical incidents have interventions. Nine of twenty-six critical incidents did not have interventions, and all those critical incidents contributed to future critical incidents. Moreover, through our examination of structures and contexts, we find that critical incidents without interventions are more likely to be associated with rigid and unsupportive organizational structures in the contextual environment of a formal hierarchy. Additionally, critical incidents without interventions contribute to future critical incidents, and in the case of System B, those incidents clustered to converge on one critical incident (Incident 19). Based on System B, underlying issues associated with critical incidents do not cease but may increase the project's level of distress until an appropriate intervention is employed. Incidents without interventions are a red flag for the project and executive management.

Thirdly, we identified six examples of failed interventions contributing to future incidents. Interventions, by definition, are intended to solve a realized or emergent problem.

System B's implemented interventions failed to solve the initial problem or alleviate the present distress. They also had the unintended consequence of creating additional distress in the future. However, we see from the previous insight that critical incidents without interventions lead to future incidents. So, failed interventions and no interventions contribute to future incidents. Therefore, a meaningful and purposeful intervention should be employed to alleviate the distress from a critical incident. Incidents fester and, without appropriate treatment, infect the latter stages of a project.

Lastly, for System B, de-escalating commitment was a critical incident (Incident 22). Escalation of commitment is “continued commitment in the face of negative information about prior resource allocations coupled with uncertainty surrounding the likelihood of goal attainment” (Keil and Robey 1999, p. 65). De-escalation is the intervention associated with the escalated commitment of failing projects to “redirect or terminate” a project (Keil and Robey 1999; Mähring and Keil 2008). It is deemed as the appropriate solution in light of negative information. However, System B de-escalated commitment by terminating the project and was punished by having its funding removed by the agency and Congress. Project owners need to be aware of the consequences of de-escalation and manage the associated risk. The cross-case analysis will further discuss the de-escalation of commitment as an intervention and critical incident.

### **4.3.1.3 System C**

#### ***4.3.1.3.1 Description***

System C is a successful financial enterprise resource planning (ERP) system, providing secure financial transactions supporting national security. System C supports classified general ledger, revenue and accounts receivable, accounts payable, control, financial reporting, asset

management, and cost management, including payroll and time-tracking. System C is approximately five years old and has experienced significant distress during periods of development. System C is unique in that it de-escalated early in its development, terminating the 1<sup>st</sup> contract based on initial false assumptions about the complexity of the requirements. However, System C was able to maintain momentum through the use of a project champion, and it awarded a sole source contract, which then successfully developed the system. In the past, System C was viewed as both a success and a failure but is currently considered a success story.

**4.3.1.3.2 Critical Incidents and Interventions**

Table 4-14 lists System C’s 15 critical events, including 15 incidents and 13 interventions. Of the 13 interventions, 11 were successful, and two failed. Additionally, two incidents did not have interventions (Interventions 2 & 3). Therefore, System C had an intervention success rate of 85%.

**Table 4-14 System C Critical Events**

<b>Event #</b>	<b>Incident</b>	<b>Intervention</b>	<b>Outcome</b>
1	Multiple functional stakeholder communities involved	Created governance board	Failure
2	False assumption about system complexity	NA	NA
3	Mandated initial cost estimate	NA	NA
4	Immature requirements	Requirements decomposition workshops	Success
5	Directed to use small business integrator	Additional government support	Failure
6	Contractor unable to meet requirements	Contract termination	Success
7	Contract termination	Sole source contract	Success
8	Not enough funding to meet the requirements	Gained support of senior executive	Success
9	Data protection gap	Developed innovative technical solution	Success

10	Executive attempting to cancel the project	Developed stakeholder confidence	Success
11	Project management office turnover	Built team commitment	Success
12	No secure cloud environment	Found government partner	Success
13	Cost of cross domain solution	Created trade space with stakeholders	Success
14	Last minute critical requirement	Found a government-owned solution	Success
15	Initial failure of operational test	Adjudication and stakeholder management	Success

System's C critical incidents and interventions were seen in multiple event categories. Critical incidents fall into six categories (Table 4-15). The two largest categories with four critical incidents are requirements and technical. Similar to System A, System C did not have any contractor based critical incidents. Moreover, successful interventions fit the stakeholder, acquisition, technical, human resources, and requirements categories (Table 4-16). In comparison, failed interventions were seen in the stakeholder and internal support categories. The paragraphs below will further detail each incident category and its intervention.

**Table 4-15 System C Critical Incident Categories**

	<i>System C</i>			
	<i>Incident</i>	<i>Intervention</i>		
		<i>Success</i>	<i>Failure</i>	<i>N/A</i>
<b>Acquisition</b>	3	1	1	1
<b>Financial</b>	1	1	0	0
<b>Human resources</b>	1	1	0	0
<b>Stakeholders</b>	2	1	1	0
<b>Requirements</b>	4	3	0	1
<b>Technical</b>	4	4	0	0
<b>Contractor</b>	0	0	0	0
<b>Total</b>	15	11	2	2

**Table 4-16 System C Intervention Categories**

	<i>System C</i>	
	<i>Intervention</i>	
	<i>Success</i>	<i>Failure</i>
<b>Acquisition</b>	2	0
<b>Financial</b>	0	0
<b>Human resources</b>	1	0
<b>Stakeholders</b>	4	1
<b>Requirements</b>	1	0
<b>Reframing</b>	0	0
<b>Technical</b>	2	0
<b>Internal support</b>	1	1
<b>Contractor</b>	0	0
<b>Total</b>	11	2

The four requirements critical incidents arose for two reasons. The first reason was false assumptions about requirements (Incidents 2, 4 & 6). At the beginning of the project, agency executives and the functional stakeholder community had a false perception of the system requirements to meet the secure financial community’s needs. This contributed to immature requirements during the contract solicitation, and the industry contractor could not meet new validated requirements, leading to contract termination (Intervention 6).

*Incident 4: The requirements were not sufficient for this vendor to actually come on and do anything.*

*Oversimplification of the requirements from the jump.*

*Intervention 4: We got the contractor on board and let the contractor talk to the user community to decompose and define [the requirements].*

The second reason was a last-minute addition of a significant capability (Incident 14). However, the project office intervened successfully by identifying a government solution to address the new capability. In System C, most of the requirements critical incidents happened at the start of

the project, and the false assumptions and immature requirements led to a significant capability gap to be filled before deployment.

*Incident 14: So the next kind of big hurdle that I would say we faced was the fact that our deployments were being held hostage by these decisions required from this [forum] associated with contracting.*

*Intervention 14: We had a conversation with [external government organization]. And they had an automated contracting, finance combination solution that they used on, you know, for, for everything before [System C] was created. So we asked them to build or if we could build a, you know, interim contracted solution so that it wasn't as much manual work. But that it would be quick enough that we could get this development done.[...] So they ended up building that out so that the community could use that.*

All four of the technical critical incidents arose because of the need for an innovative technical solution (Incidents 9, 12, 13, & 15). The project office intervened successfully in the four incidents, with one of the interventions consisting of innovative technical solutions, one utilizing internal government support, and two stakeholder management. This suggests there are multiple paths to intervene in technical critical interventions successfully.

*Incident 12: I mean, the biggest, I think, the biggest problem and the only problem that we had, and it was primarily because we were the first we were blazing the trail, right? So there, and I don't want to say that we were the first or only ones to do this, we were one of the first to be in the cloud for the [department].*

*Intervention 12: We had to get our hosting space from a [government] partner. But there are partners across the federal government that have secure cloud access, and we were able to secure our environment through, like, you know, an agreement with them.*

Acquisition category critical incidents occurred three times for two reasons: executives directed courses of action (Incidents 3 & 5) and contract termination (Incident 7). In System C, an acquisition executive mandated a budget threshold and directed the project to utilize a small business integrator. The project did not intervene on the mandate threshold but attempted to

intervene with the small business integrator to augment the contractor with subject matter expertise. However, the intervention was unsuccessful, and the contract was terminated.

*Incident 5: It was [an executive] directive, where the [executive] directed all ERPs to utilize [the small business contract].*

*There was a strategy [directed] to use a small systems integrator, and it turned out that that was a there was a challenge with that.*

*We had so significant performance over the first, I guess, ten months or so, you know, about six months in, we really not seen it because really, I've done a lot a mindset, and we got to. We got a lot of indicators that they were they didn't have the skills in place.*

*Intervention 5: So I put, like, [government person] on it. And [government person] on it. And [government person] on it.*

The second reason's critical incident was directly associated with contract termination. After the project terminated the contract, they successfully intervened by using a sole source cost contract with an experienced contractor, which put them back on the path to project success. Overall, the outcomes for interventions with the acquisition critical incident category were mixed, but in the end, one successful intervention was able to change the course of the project.

*Incident 7: And so the whole process dragged on for it really a couple of years, as we decided how we're going to terminate that contract and put it together a strategy on how we bring in a systems integrator that was equipped to be able to deal with all those areas of complexity.*

*Intervention 7: We ended up going with a sole source contract to a large systems integrator that had a lot of good qualifications and understood the [System C] design and therefore had [ERP] experience had [Agency ERP] experience, and financials experience*

The remaining three critical incident categories are *stakeholders*, *human resources*, and *financial*, with two, one, and one critical incidents, respectively. The stakeholder critical incidents occurred because of the numerous different functional stakeholders (Incident 1) and two different executives attempting to cancel the project (Incident 10). The project attempted to

manage the functional stakeholders through governance structures but was unsuccessful. In contrast, the project office successfully intervened with the cancelation threat by developing stakeholder confidence and “buy-in.” The *human resource* critical incident, project management turnover (Incident 11), occurred due to threats to cancel the project. Still, the project manager built team commitment and continued the project. Lastly, the *financial* critical incident arose from insufficient funding for the newly expanded requirements (Incident 8). However, they successfully intervened by gaining the support of a senior executive who became their project champion. Even though the three categories represent a limited number of events with System C, they demonstrate how a single event can potentially change the direction of a project.

*Incident 10: After it got going the second time. We were [...] in a repeated cycle of [the agency] questioning whether or not it was going to be cost-effective for the government to continue the production. So there were many cycles of trying to kill the software development on that [project].*

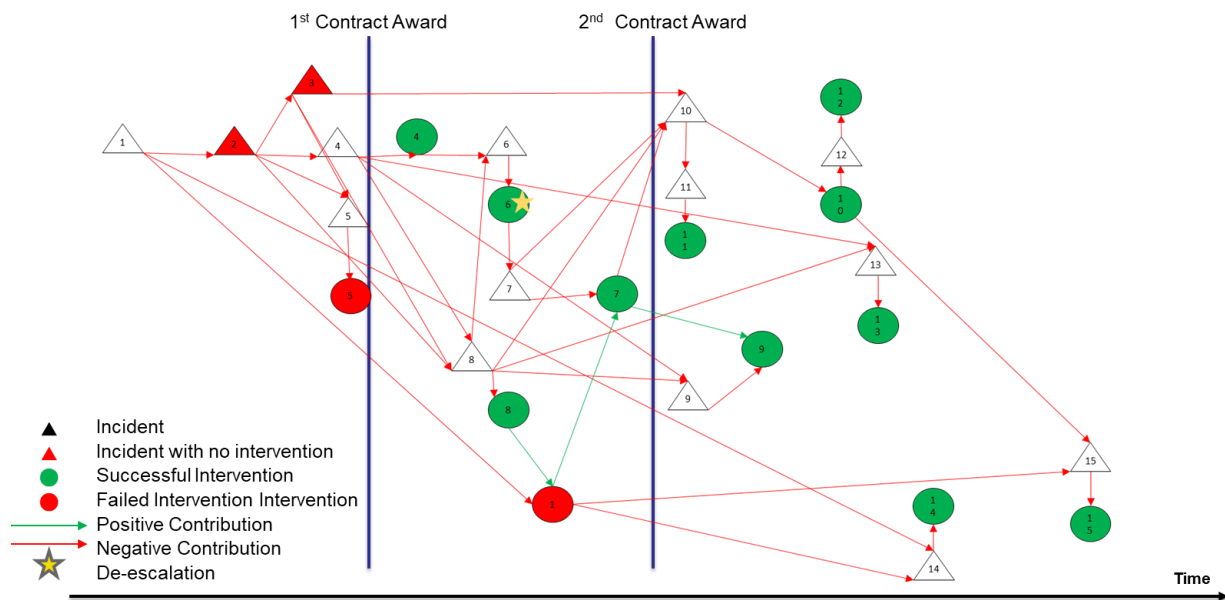
*Intervention 10: Eventually, over a long period of time and with a lot of work, we were able to significantly decrease the [cost estimate] to \$500 million or even less than that, as the program leadership identified a significant efficiency: migrating into the cloud, which meant significantly reduced costs; a revised timeline that addressed previous schedule delays to get back on glide path; and new-found relevancy, since [System] was to get into the cloud. [The executive] became supportive of the program then.*

In this section, we categorized each critical incident and intervention and discussed the outcomes of their interventions. The following section discusses the results of the temporal analysis.

#### **4.3.1.3.3 Temporal Analysis**

We identified 46 relationships between System C’s 15 critical incidents and 13 interventions (Figure 4-7). Two critical incidents (Incidents 2 & 3) with no intervention contributed to multiple future critical incidents. Moreover, one failed intervention (Intervention 1) contributed negatively to two future critical incidents (Incidents 14 & 15), three successful

interventions contributed negatively to a future critical incident (Intervention 4, 6, 7 & 10), and two successful interventions (Intervention 7 & 8) contributed positively to two future interventions (Intervention 1 & 9). One failed intervention (Intervention 1) contributed positively to a future successful intervention (Intervention 7). The event chain analysis demonstrates the diverse impact of failed and successful interventions on future critical incidents and interventions.



**Figure 4-7 System C Event Chain Timeline**

In addition to explaining the different relationships and impacts of critical incidents and interventions, we identified two points of convergence and three points of divergence. The two points of convergence were not enough funding to meet the new requirements (Incident 8) and executives attempting to cancel the project (Incident 10). The point of convergence depicts how multiple critical incidents combine to contribute to a future critical incident. These critical incidents have three or more critical incidents contributing to them. However, the project office was able to intervene successfully in both cases. The three critical incidents demonstrating

divergence are Incidents 1, 4 & 8, with Incident 8 as a point of convergence and divergence. The point of divergence demonstrates how one critical incident can impact multiple future critical incidents. In System C, two of three critical incidents had successful interventions (Incidents 4 & 8) but still negatively impacted multiple future events, suggesting that the intervention only successfully eliminated short-term distress. For example, System C's immature requirements were successfully intervened upon with requirements development workshops. Still, the incident contributed to a lack of funding (Incident 8), a data protection gap (Incident 9), and the need for a cross-domain solution (Incident 13). Overall, the temporal analysis provides us with a picture to analyze the relationships between critical incidents and interventions of the project's life.

#### ***4.3.1.3.4 Structures and Context***

This section explicates structures and contexts in System C. The social and organizational structures include the relationships between actors and procedures organized into a contextual environment of incidents and interventions in ISD projects. Below we discuss the presence of the structures and contexts in System C.

The three social structures defined previously were present in System C's events: Government-Industry Relationship, Executive-Project Involvement, and Functional-Project Expectations. We identified the government-industry relationship structure in eleven events, with two negative and nine positive examples of the structure. The two negative examples were associated with the contractor being unable to meet the new requirements and then being terminated. The remaining nine examples were positive. Moreover, all eleven of the interventions associated with this structure were successful. One might conclude, in this case, that the government-industry relationship is not essential for intervention success. We argue that the two successful interventions with a negative relationship regarding the termination of the

contractor, explaining why it was a poor relationship. Therefore, the government-industry relationship in System C was crucial to an intervention's success.

The executive-project involvement structure was experienced in twelve of the fifteen events. Seven occurrences of this structure were positive and related to contract termination, funding, technical, and requirements. In these events, executives successfully assisted the intervention. In the remaining five events, executives contributed to the critical incident, with three of the events limiting the intervention (Incidents 2, 3 & 4). However, in two other incidents (Incidents 10 & 11), the executives were trying to cancel the project, and employees were leaving, but the project office intervened successfully against the negative impacts of the executives. The analysis demonstrates stakeholders' positive and negative impacts on the projects and how the project mitigated those negative impacts.

The remaining social structure, functional-project expectation, was present in thirteen of fifteen events. Eight events had a positive structure, where functional stakeholders assisted or supported the intervention. In each of the eight examples, functional stakeholders supported the acquisition strategy, technical direction of the project and worked with senior executives to build confidence in the project. Only one of the interventions (Intervention 5) failed, but not due to the support of the functional community. Five instances of the negative functional stakeholder structure related to assumptions about the level of effort and a last-minute capability before testing. The representatives impacted the project negatively, contributing to a failed intervention, and two incidents without interventions directly contributed to contract termination. However, the project office successfully intervened in the contract termination and last-minute requirement. Therefore, further demonstrating the importance of stakeholder management and buy-in when intervening in critical incidents.

System C's events included the five organizational processes and two organizational structures previously defined. The first characterization of the process describes the rigidity of the structure, and the second is the supportive nature of the structure. Twelve of fifteen events from System C were associated with rigid structures. The three main processes categorized with rigid structures identified in the twenty-six events are acquisition, funding, and contracting. In each process, the project manager was constrained in their ability to intervene. Similar to the previous system, twelve of the events experienced a rigid structure with official directives from executives, government bureaucracy, and contracting mechanisms limiting the flexibility of the project to intervene. However, in eight events, the project office used a supportive aspect of the rigid process to intervene successfully. While in two other events (Incidents 3 & 5), present unsupportive structures limited the project's ability to employ an intervention or intervene successfully. Flexible organizational structures were present in three events, except two were paired with unsupportive structures contributing to no intervention and a failed intervention, and one flexible-supportive structure experienced a successful intervention. In System C, unsupportive structures were related to no interventions and failed interventions, then the rigidity of the structure. However, it appears that a rigid structure can support a successful outcome, but when a rigid structure is paired with an unsupportive structure, the outcome is either no intervention or failed intervention. The findings are related explicitly to System C and will be further analyzed within System C's contextual environment.

System C operated within two contextual environments: formal hierarchy and path dependencies. Formal hierarchy characterized the setting in eight of the twenty-six events. In each of the seven events, executives without acquisition authority exercised control of the project. Especially at the start of the project, contributing to critical incidents and negative

intervention outcomes. Nevertheless, a formal hierarchy was related to successful interventions with technical and requirement-related critical incidents. In addition to the formal hierarchical environment, we examined the impacts of path dependencies. In System C, the only critical incident that did not have a path dependency was Incident 1. Therefore, every critical incident is interrelated across the project's development. The following section will provide insights from analyzing the events, their relationships, structures, and contexts.

#### ***4.3.1.3.5 Insights into System C***

System C is a notable case study given its unique trajectory from early failure to success. System C project's remarkable journey underscores the significance of adopting flexible and adaptive approaches to project management, including applying the government's social and organizational structures to intervene successfully in critical incidents. Two insights arose from the previous analysis. The first insight is that projects can recover from failure or de-escalation. System C's strenuous history provides an example of how to de-escalate after the awarded vendor fails and quickly pivots to another vendor. System C began with false assumptions and immature requirements, but through a successful intervention, they could test their assumptions and develop new requirements. Due to the rigidity of the firm-priced contract, the contractor could not adjust and accommodate the new direction. Therefore, the government was forced to de-escalate. However, due to positive executive involvement, the project was able to pivot towards a sole-source cost contract to begin the development of the system. This demonstrates that it is possible to recover from a de-escalation of commitment with the support of executives but also suggests that the only option within rigid structures is to de-escalate and terminate the contract. Structures and norms that support making a major mid-course correction for a failing project can benefit future success.

The second insight from System C's analysis regards the combined positive relationships between the project office, contractor, functional stakeholders, and executives. In a third of all the events, all the social actors contributed positively to the successful interventions. This is true even in the face of rigid organizational processes and path dependencies. This underscores previous research providing stakeholder management as a factor for project failure (Keil et al. 1998; McManus and Wood-Harper 2007; Nelson 2007; Sauser et al. 2009; Schmitt and Kozar 1978; Verner et al. 2008) but goes beyond support for the project into support to limit critical intervention and assist in intervening. Successful projects depend on the willingness of the major stakeholders to cooperate and have strong social connections.

#### **4.3.1.4 System D**

##### ***4.3.1.4.1 Description***

System D is a contract management system intended to provide a full spectrum of procurement-related activities, including requirements identification and contract closeout. System D replaces three legacy systems, one over 50 years old. Its goal is to provide an integrated, auditable, data-driven procurement management system that expedites the contracting process to support tens of thousands of employees across the United States. System D does this by standardizing, consolidating, and visualizing institutional procurement data.

System D represents a failing project in our theoretical sample. System D experienced significant distress nine years before the start of the interviews. The system experienced critical incidents associated with stakeholders, project managers, a commercial product, contractor performance, etc. The project started with an unqualified project manager and circumstances that caused an executive to halt the project and remove the project manager. Once a new project manager was in place, the project experienced success for a while. However, once a contractor

was on board, the project experienced significant distress due to the product, contractor, contract, and stakeholders. Just before the interviews, System D terminated its primary contractor and pivoted towards a government-owned contract management solution.

**4.3.1.4.2 Critical Incidents and Interventions Categories**

In System D, we identified 34 incidents and 30 interventions (Table 4-17). Of the 30 interventions, 10 were successful, and 20 failed. Additionally, System D has four incidents that did not have an intervention. Therefore, System D’s intervention success rate is 26%.

**Table 4-17 System D Critical Events**

Event #	Incident	Intervention	Outcome
1	1st PM lacked requisite skills	External support/ removed	Success
2	Directed to be at a lower oversight threshold	Developed a low cost estimate	Failure
3	Functionals desire for a perfect system	Requirements review board - governance	Failure
4	Transition government acquisition process	External support/ requirements decomposition	Success
5	Senior executive halted project	Fixed programmatic issues	Success
6	Legacy system sunset dates	NA	NA
7	Pressure to execute source selection	Created realistic schedule	Success
8	Congress marked budget	Agile pilot project	Failure
9	Vendor submits draft document during source selection	Government - vendor exchanges	Failure
10	Required functional staff denied	PMO augmented functional staff	Failure
11	Inexperience contractor personnel	Government hired additional personnel	Failure
12	Demonstrated COTS software disappeared	NA	NA
13	Product did not meet self certified requirements	Start from "scratch"	Failure
14	Vendors BPM contract ceiling	Change baseline product	Failure
15	2nd project manager leaves	Replace with acting project manager	Failure
16	COTS product did not meet requirements	COTS configuration	Failure
17	Combined department project	MVP	Failure
18	Preliminary design review	Accepted PDR due outs	Failure

19	Antagonistic relationship	Personnel collocation and team building	Failure
20	3rd project manager skill	External support/removed	Success
21	Unresponsive COTS developer	Leader engagement	Failure
22	Agile pilot project/MVP	Shifted iterative development strategy	Failure
23	Service executive funding cut threats	Agile pilot project/MVP	Failure
24	Contractor changed baseline schedule	Government hired expert schedulers	Failure
25	Contractor could not meet the contract requirements	Stop work/ get well plan	Failure
26	Fight between executive and 3rd PM	NA	NA
27	Low PMO morale	Climate survey	Failure
28	PMO personnel turnover	NA	NA
29	Significant defects during system test	More government oversight/switch to waterfall	Failure
30	Downgrading defects	Risk based governance	Failure
31	Failed MVP deployment	Parallel work/stop payment	Failure
32	Contractor dishonest about defects	Risk based governance	Success
33	Contractor gave up	Contract termination/de-escalation	Success
34	Contractor failed the operational test	Contract termination	Success

System D's critical incidents and interventions were seen in multiple event categories. System D's critical incidents occurred in six categories (Table 4-18), with 15 of the critical incidents in the *contract* event category, making this category 44% of the critical incidents. Of 34 critical incidents, the project office intervened 30 times across six categories (Table 4-19). The largest number of interventions occurred in the acquisition category, with 11. However, five of the eleven interventions failed. The four in the remaining categories experienced both successful and failed interventions. These numbers suggest causal asymmetry exists between the outcomes of different intervention categories. This will be discussed during the cross-case analysis.

**Table 4-18 System D Critical Incident Categories**

	<i>System D</i>			
	<i>Incident</i>	<i>Intervention</i>		
		<i>Success</i>	<i>Failure</i>	<i>N/A</i>
<b>Acquisition</b>	3	2	1	0
<b>Financial</b>	2	0	2	0
<b>Human Resources</b>	6	2	2	2
<b>Stakeholders</b>	7	3	3	1
<b>Requirements</b>	0	0	0	0
<b>Technical</b>	1	0	1	0
<b>Contractor</b>	15	3	11	1
<b>Total</b>	34	10	20	4

**Table 4-19 System D Intervention Categories**

	<i>System D</i>	
	<i>Intervention</i>	
	<i>Success</i>	<i>Failure</i>
<b>Acquisition</b>	6	5
<b>Financial</b>	0	0
<b>Human Resources</b>	0	3
<b>Stakeholders</b>	2	2
<b>Requirements</b>	0	0
<b>Reframing</b>	0	0
<b>Technical</b>	0	1
<b>Internal Support</b>	2	5
<b>Contractor Issues</b>	0	4
<b>Total</b>	10	20

There are fifteen critical incidents within the *contractor* category, of which three interventions were successful, eleven failed, and one critical incident did not have an intervention. Critical incidents emerged for three reasons within the contractor category: contractor personnel, contractor software products, and contractor performance. Each of the three factors for the contractor category is relationally dependent and contributes to one another (see Figure 4-8). System D experienced critical incidents with contractor personnel due to the lack of

expertise, dishonesty, unresponsiveness, motivation, and animosity. Similarly, the contractor's commercial product did not meet the client's needs, which created issues with configuration, customization, and third-party applications. These two overarching issues combined contributed to the contractor performance incidents leading to defects, test failure, deployment failure, and contract termination. The three successful interventions associated with the critical contractor incident category were all related to de-escalation. The project office successfully intervened by tracking defects more closely to validate and terminate the contract. However, the remaining interventions failed, contributing to project failure.

*Incident 11: I don't know why they didn't hire people that were capable. I don't know what problems they had internally. But I know they never did meet our expectations*

*They were focusing on hiring people that they could pay less, rather than hiring, you know, paying the funding for strong software developers.*

*Intervention 11: So that means the government really had to have their [subject matter experts] in the room to manage, you know, the schedule, identify the schedule of risk. And when I say schedule, I mean integrated master schedule; that was a big one. Training, logistics, deployment.*

*So I started writing the majority of the test plan for, and they come to find out [logistics] was doing the same thing, system engineering, was doing the same thing with their system engineering documentation.*

The *stakeholder* category experienced seven critical incidents for two reasons. The first is that senior executives directed specific actions by the project. For example, a senior executive mandated that the source selection be completed by a specific date (Incident 7). The stakeholder category accounted for six critical incidents, of which three interventions were successful, and three failed. The second reason arose from the functional's desire for a perfect system (Incident 3). This incident did not have an intervention and remained a constant theme throughout the project. These incidents demonstrate the impact of senior and functional stakeholders on critical incidents, interventions, and project outcomes.

*Incident 6: [Department executive] established a sunset date for [the legacy system]. That sunset date meant that no additional contracts could be awarded in that system after that specific date.*

*Intervention 6: None*

The six *human resources* category events are associated with the project manager and project office personnel. Three incidents occurred because of the lack of project management skills, and one happened because a good project manager left, resulting in a poor new project manager. Of these four incidents, one did not have interventions, one failed, and two were successful. The remaining two critical incidents arose because of the previous human resource-related incidents with the project manager, which were issues with morale and turnover. However, the project office failed to intervene effectively, and distress persisted. Human resources critical incidents represent the third largest category of critical incidents in System D.

*Incident 27: Everybody's morale was down. [...] Here towards the end, I was like, even me of all people was like, screw this [curse word].*

*Intervention 27: There was a climate survey that went out. It was poor. Very poor.*

*(Researcher Question) Was anything done after that climate survey?*

*Participant: That's the whole point. Right? This is why I don't like to fill out climate surveys because nothing is ever done.*

The following three critical incident categories experienced less than three critical incidents each. They include *acquisition* (3), *financial* (2), and *technical* (1). The three acquisition critical incidents arose from being directed to comply with bureaucratic processes that didn't support the project. The two financial critical incidents were associated with funding cuts, and the technical critical incident was due to the insufficiency of the commercial software product. Every critical incident in these categories had an intervention. However, the acquisition category was the only one with successful interventions.

*Incident 16: The number one driving friction, you know, throughout the time that I was there was the fact that the software couldn't meet the requirements, [...] couldn't meet all the requirements of the standardized business processes that the functional had established through BPR.*

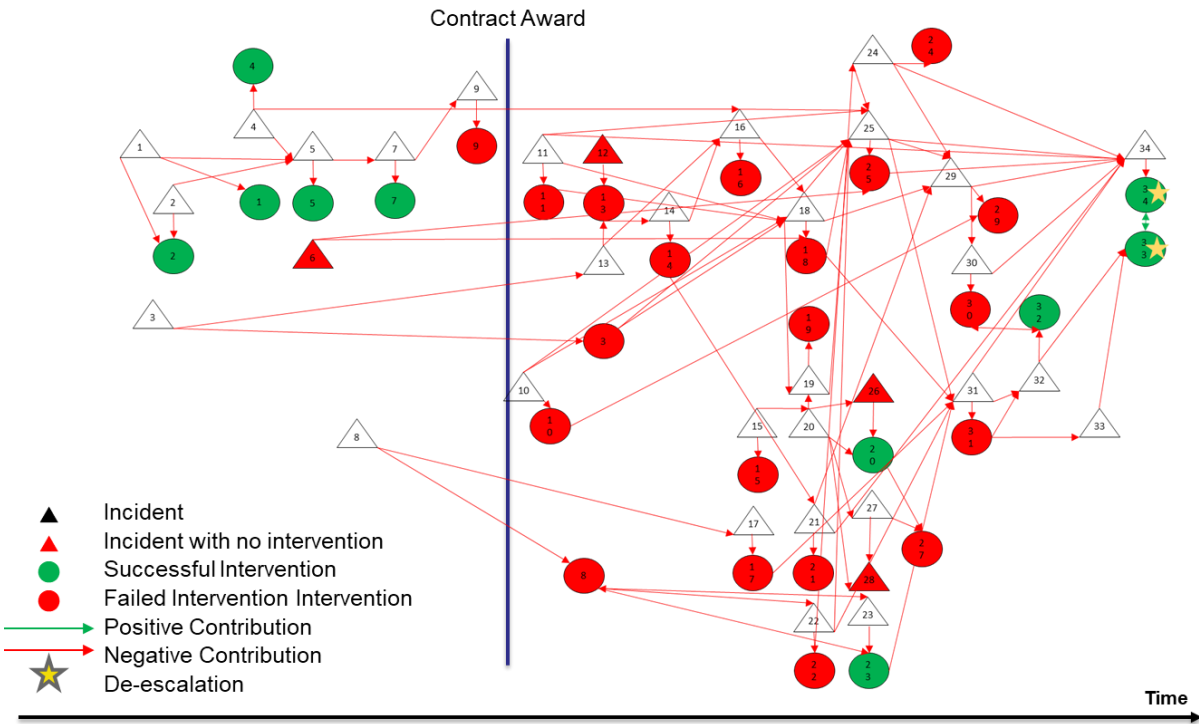
*Intervention 16: It led to just a tremendous amount of this desire by the functional for this tremendous amount of configuration that, at the end of the day, the product just couldn't support or enable the amount of configuration that was required to mimic the standardized processes that the [agency] had adopted versus the [agency] adopting the standardized processes that existed in the product.*

The six categories of events identified in System D represent the complex nature of critical incidents and interventions. Specifically, they demonstrate the importance of the critical incidents' structures, context, temporal nature, and interventions.

#### **4.3.1.4.3 Temporal Analysis**

We identified 89 relationships between 34 critical incidents and 30 interventions (Figure 4-8). In contrast to the previous cases, only one of the four critical incidents without interventions (Incident 28) contributed to future critical incidents. Two of the four (Incidents 6 & 12) contributed to failing interventions, and one (Incident 26) contributed to a successful intervention. In particular, Incident 26 occurred when an Acquisition Executive had a substantial prolonged dispute with the project manager, which contributed to the project manager's removal (Intervention 20). Additionally, there are three examples of incident convergence, where multiple critical incidents contribute to a single critical incident. These incidents include the project delaying the preliminary design review (Incident 18), the contractor being unable to meet the system requirements (Incident 25), and the contractor failing an operational test (Incident 34),

contributing to contract termination (Intervention 34) and project failure. In System D, all the events are related to each, but some have more impact than others.



**Figure 4-8 System D Event Chain Timeline**

System D experienced examples of critical incident convergence and divergence. Critical incident convergence occurs on five occasions (Incidents 5, 18, 25, 29 & 34), where three or more previous critical incidents contributed to a future critical incident. Each of the five critical incidents was associated with an event failure. For example, in Incident 5, a senior executive halted the project because she did not have confidence in the project’s strategy. Furthermore, prior to contract termination, the contractor failed an operational test (Incident 34). The critical incident divergence occurred on three occasions (Incidents 1, 11 & 24). Each of the divergent critical incidents impacted three or more future critical incidents. Convergent and divergent

critical incidents demonstrate the asymmetric impact of critical incidents. Some critical incidents contribute to the emergence of multiple future critical incidents, while others result from numerous past critical incidents.

#### ***4.3.1.4.4 Structures and Context***

This section explicates structures and context to “identify and analytically resolve the structural components that are causally relevant” (Wynn and Williams 2012). The social and organizational structures include the relationships between actors and procedures organized into a contextual environment of critical incidents and interventions. Below we discuss the presence of these structures in System D.

Three social structures were present throughout System D’s events: Government-Industry Relationship, Executive-Project Involvement, and Functional-Project Expectations. The government-industry relationship was negative throughout the project. This structure was present in nineteen events, all experiencing failed interventions except three. The three successful interventions were related to de-escalation or preparing for de-escalation (Incidents 32, 33, & 34). Additionally, fifteen events associated with negative government-industry structures were contractor-based critical incidents. This is generally expected that a negative relationship with a contractor emerges from contractor-critical incidents and contributes to contractor-critical incidents.

The second social structure is executive-project involvement. This structure has been observed eighteen times, and it has yielded positive results four of those times. Thus, executives positively impacted the project in the two de-escalation interventions and when removing two project managers. In thirteen of the remaining events, the negative involvement of an executive contributed to the critical incident. The majority of the thirteen negative events were in the

stakeholder category. Overall, executives negatively impacted System D by contributing to the emergence of critical incidents without assisting in interventions.

The final social structure is the functional-project expectations structure. This structure was first seen at the project's start when the functional stakeholders expressed the desire for a perfect system (Incident 3). System D experienced the structure negatively in thirteen events and positively in eleven events. Of the eleven positive events, the project had five successful interventions. While in the thirteen negative events, the project only intervened successfully once. This doesn't suggest a positive relationship between the positive involvement of functional stakeholders and intervention success. Still, it makes the case that project managers should examine intervention outcomes along with structures and contexts.

System D's thirty-four events experienced both organizational structures: rigid or flexible structures, and the second is the supportive nature of the structure. Flexible structures were identified in five events, and rigid structures in twenty-nine events. Similarly, supportive structures were present in seven events, and unsupportive structures in twenty-two events. Surprisingly, rigid and unsupportive structures account for twenty events, with half being contractor related. Nine events were rigid but supportive. These were associated with de-escalation, stakeholders, and human resource critical incidents. Only two events had both flexible and supportive organizational structures, with two successful interventions. Lastly, flexible and unsupportive structures accounted for two events with failed outcomes. The large number of rigid and unsupportive structures related to critical incidents and failed intervention indicates a deeper relationship between the interaction of the two structures. Moreover, these two structures and failed interventions demonstrate the difficulty of intervening in contractor-based critical incidents.

System D operated within two contexts: formal hierarchy and path dependencies. The contextual environment represents the settings in which the structures might interact to produce events (Sayer 1992). Formal hierarchy characterized ten of the thirteen events. The main critical incident categories associated with formal hierarchy are stakeholder, financial, and acquisition. Similarly, formal hierarchy is mainly associated with acquisition and stakeholder interventions. Moreover, the formal hierarchy context experience three successful interventions, seven failed interventions, and one critical incident without an intervention (Incident 6). This critical incident was caused by an executive order “arbitrarily” mandating a sunset date for a legacy system. The path dependency context was observed in twenty-six events. Therefore, only eight critical incidents arose from previous critical incidents. The two contexts appeared in eight events resulting in two successful and six unsuccessful interventions. The contextual analysis presented in this section reveals the adverse effects of a formal hierarchy in critical incidents related to acquisition, financial management, and stakeholder engagement. Furthermore, the analysis suggests that such a hierarchical structure may not affect interventions when considering the influence of historical events.

#### ***4.3.1.4.5 Insights into System D***

System D is a failed project. The project manager terminated the contractor just before our interviews, and the project transitioned to a government-owned contract management solution. The analysis in the previous section provides the critical incidents and interventions contributing to project failure. Through that analysis, we identified five insights. First, similar to System B, there appears to be a relationship between the number of critical incidents, the percentage of failed interventions, and project failure. System D encountered a total of thirty-four critical incidents, of which only twenty were effectively resolved through interventions. Consistent with

extant literature, this indicates that significant issues related to the project were either left unaddressed or inadequately handled, resulting in project failure (Baghizadeh et al. 2020; Lyytinen and Robey 1999; Mähring and Keil 2008; Nelson 2007; Pan et al. 2008). Moreover, System D's analysis demonstrates the future impacts of not intervening or employing failed interventions. This suggests that it's better to intervene than do nothing but that interventions can have consequences that should be managed.

The second insight relates to organizational structures and contractor-based critical incidents. Within System D, all fifteen critical incidents associated with the contractor had rigid structures attributable to the fixed-price contract. The contracting constraint hindered the project office's ability to intervene effectively. Furthermore, among the limited interventions made, only three were successful and involved preventative measures to de-escalate potential issues rather than resolving active incidents. In the context of System D, this suggests that contract termination was the only feasible recourse available to the project manager to address poor contract performance.

The third insight addresses senior executives' positive and negative impacts on projects. In System D, senior executives impacted the project on eighteen occurrences. Five of the eighteen were positive, dealing with internal project managers twice and the contractor three times. Also, senior executives assisted in an intervention when they perceived the project manager needed to be removed or the project needed to be terminated. In contrast, most executive impacts were negative by contributing to critical incidents. The project experienced this thirteen times prior to contract termination. The insight shows the need to manage stakeholders in a way that allows them to support the project as a whole and assist in interventions and limit their impact on critical incidents.

The fourth insight suggests that critical incident convergence may lead to de-escalation later in the project. In particular, System D experienced three sequential critical incidents with incident convergence (Incident 25, 29, & 34), with the last critical incident leading to contract termination. Escalation of commitment is “continued commitment in the face of negative information” (Keil and Robey 1999, p. 65), and de-escalation is to re-direct or terminate the project (Keil and Robey 1999; Montealegre and Keil 2000). Then System D’s analysis suggests that the negative information eventually becomes undeniable. Consequently, there is an inflection point because the project has experienced a convergence of critical incidents and must de-escalate.

The fifth and final insight for System D is that rigid structures characterized all the events that were also associated with a negative government-industry relationship. This occurred in nineteen of the thirty-four events, with fifteen being within the contractor critical incident category. This suggests that rigid contracting structures negatively impact government-industry relationships, which is crucial for a successful intervention.

We conducted a within-analysis of four systems and 92 events. We analyzed each case's incidents across nine categories, five structures, and two contexts. Additionally, we conducted a temporal analysis demonstrating the interrelated nature of critical incidents and interventions. In the following section, we conduct a cross-case analysis to analyze all events across the nine event categories, the impacts of structures and contexts on interventions, and common critical incidents and interventions.

#### **4.3.2 Cross-Case Analysis**

Across the four projects, we identified 92 critical incidents and 77 interventions (**Error! Reference source not found.**, Table 4-24). In this section, we compare the critical incidents and

interventions from the four cases and extend the insights provided in the previous sections. Specifically, we compare critical incidents and interventions in successful and failed projects, identify common critical incidents and interventions, and provide factors related to critical incident emergence and intervention outcomes. Finally, we discuss generative mechanisms and overarching insights across the four projects.

#### 4.3.2.1 Critical Incidents

In this section, we analyze and provide findings from our cross-case analysis on common critical incidents and factors associated with the emergence of critical incidents. Of the 92 critical incidents, the categories with the most are contractor and acquisition, with 21 and 15 incidents, respectively. The contractor and acquisition categories account for 42% of all critical incidents. The two smallest critical incident categories are technical and requirements, accounting only for 18%. The low number related to the technical aspects of a project and requirements is consistent with previous literature. Additionally, the high number of contractor and acquisition critical incidents demonstrate the importance of organizational symbiosis. If not properly established, the contractor and government interaction will lead to negative outcomes. Overall, this suggests that the complexity generally associated with ISD projects manifests itself in managing personnel, resources, and the contractor, rather than the technology.

**Table 4-20 Total Critical Incidents by Category**

	<i>Total</i>			
	<i>Incident</i>	<i>Intervention</i>		
		<i>Success</i>	<i>Failure</i>	<i>N/A</i>
<b>Acquisition</b>	15	6	6	3
<b>Financial</b>	13	5	7	1
<b>Human resources</b>	13	5	4	4
<b>Stakeholders</b>	13	5	6	2
<b>Requirements</b>	8	6	1	1
<b>Technical</b>	9	7	2	0

<b>Contractor</b>	21	4	13	4
<b>Total</b>	92	38	39	15

Our study finds that successful and failed projects statistically differ in the number and types of critical incidents experienced in various categories ( $\chi^2(6) = 26.037, p = .0002$ ) (see Table 4-21). The two successful projects, System A and C, had thirty-two critical incidents, and the two failed projects, System B and D, had sixty critical incidents. The difference in the number of critical incidents for failed projects may be due to the size of the projects. However, we find that is not the case. Many critical incidents occurred because the project office failed to intervene appropriately in past critical incidents. Moreover, there is a difference between successful and failed project's critical incidents categories. The most significant difference between critical incidents in successful and failed project categories are contractor, human resources, requirements, and technical. Human resource and contractor critical incidents are significantly higher in failed projects than in successful projects. Specifically, failed projects had 21 critical incidents associated with the contractor, and successful projects had zero. Conversely, successful projects had more critical incidents in requirements and technical categories. Therefore, from our cases, failed projects seem to deal more with personnel and contractor issues and less with requirements and technical issues than successful projects.

**Table 4-21 Critical Incident Categories and Project Outcomes**

	<i>Successful Projects</i>	<i>Failed Projects</i>
	<i>Incidents</i>	
<b>Acquisition</b>	6	9
<b>Financial</b>	6	7
<b>Human resources</b>	3	10
<b>Stakeholders</b>	4	9

<b>Requirements</b>	6	2
<b>Technical</b>	7	2
<b>Contractor</b>	0	21
<b>Total</b>	<b>32</b>	<b>60</b>

#### 4.3.2.1.1 Common Critical Incidents

Across the four projects, we identified twelve critical incidents that occurred in two or more projects (Table 4-22). Funding/mandated budget and functional involvement incidents occurred in all four projects. Moreover, there are zero contractor critical incidents associated only with successful projects. However, three critical incidents are specifically related to the two failed projects. They are critical incidents dealing with insufficient COTS products, incidents using agile development, and government-contractor animosity. In Systems B and D, the government had issues with the contractors' commercial software products. The critical incidents associated with the commercial software led to further critical incidents associated with configuring or customizing the systems through agile development, eventually leading to animosity and contract performance incidents.

**Table 4-22 Common Critical Incidents**

Incident	Project			
	Success		Failed	
	A	C	B	D
Pressure to Execute Quickly	✓	✓		✓
Funding/Mandated Budget	✓	✓	✓	✓
Requirements	✓	✓	✓	
Functional Involvement	✓	✓	✓	✓
Insufficient COTS Product			✓	✓
Project Manager (Skill and Turnover)	✓		✓	✓

Contractor Performance		✓	✓	✓
De-escalation	*	✓	✓	✓
Incidents using Agile			✓	✓
Project Office Morale		✓	✓	✓
Government - Contractor Animosity			✓	✓
Competing/Combined Project	✓			✓

\* System A's de-escalation did not contribute to a critical incident.

✓ Failed Interventions ✓ Successful intervention

The remaining nine of the twelve common critical incidents across the projects suggest specific critical incidents are not solely associated with successful or failed projects. The common critical incidents in successful and failed projects point to how project managers intervene in critical incidents and the structures and contexts related to the emergence of critical incidents. Apart from the financial critical incidents, Systems A and C intervened successfully, while Systems B and D either failed to intervene or implemented failed interventions. Therefore, managers should avoid specific critical incidents through risk management practices and focus on intervening successfully.

#### 4.3.2.1.2 Factors of Critical Incident Emergence

Our within-case analysis identified 21 factors for critical incident emergence across the seven critical incident categories (Table 4-23). The 21 factors generally align with the 75 individual early warning signs, critical success, and failure factors identified in the literature review. The three critical incident factors that do not precisely align with previous literature are executives trying to cancel the project, competing platforms, and contract termination. However, these three factors can be generally categorized as the “external environment” (Lyytinen 1987) and “poor vendor selection decision” (Schmidt et al. 2001; Wallace et al. 2004; Yeo 2002) failure factors. The finding that critical incident factors are similar to ISD early warning signs,

critical success factors, and failure factors demonstrates that these factors are not merely static characteristics of failing or successful projects but critical incidents that require interventions.

**Table 4-23 Critical Incident Factors**

<b>Critical Incident Category</b>	<b>Factors</b>	<b>Successful Projects</b>	<b>Failed Projects</b>
Financial	Insufficient funding at the required time	✓	✓
	Budget cuts (threats)	✓	✓
Acquisition	Competing platform	✓	✓
	Organizational directives	✓	✓
	Contract termination	✓	✓
	Inexecutable contract		✓
Human Resources	Project manager skill		✓
	Relational animosity		✓
	Project morale/turnover	✓	✓
Stakeholders	Functional expectations	✓	✓
	Executive directing actions	✓	✓
	Executives trying to cancel the project	✓	
Requirements	Inability to change requirements		✓
	Desire for more capability	✓	✓
	Immature requirements	✓	
Technical	Inter-organizational cooperation	✓	
	COTS product did not meet customer's needs		✓
	Technology gap	✓	
Contractor	Contractor personnel skills	✓	✓
	Poor contractor performance	✓	✓
	Dishonest contractor executive		✓

In addition to identifying the 21 critical incident factors, we analyzed how critical incident factors were related to successful and failed projects. Eleven of the factors occurred in both successful and failed projects. Four are in successful projects, and six are in failed projects. The four factors in the successful projects experienced successful interventions. However, the six specific factors in failed projects experienced failed interventions. They are project manager skills, relational animosity, inability to change requirements, COTS product not meeting customers' needs, and dishonest contractor executive. This supports the idea that when a critical failure factor is not intervened upon successfully, it can result in project failure. Moreover, our analysis suggests that the development of an early warning sign, failure factor, or loss of a critical success factor does not guarantee a project outcome, but it is the outcome of the intervention that leads to project success or failure.

Lastly, through the within-case analysis, we identified the structures and contexts related to the emergence of critical incidents (Appendix E – Truth Table). Three social structures and two contexts emerged as factors for critical incidents. Structures are “the relational conditions underlying behavior” (Porpora 2015). Regarding critical incidents, the three negative social structures represent (government-industry relationship, executive-project involvement, and functional-project expectations) the poor relationships between actors that exist for a critical incident to emerge. The negative government-industry relationship occurred in 31 events, mainly in the failed projects. The two negative occurrences of this structure in successful projects were before de-escalation when the government terminated the initial contract. Similarly, negative executive-project involvement and negative functional-project expectations contributing to a critical incident were seen in 36 and 28 events across all four projects, respectively. The 36

events with negative-executive involvement contributed to acquisition, financial, human resources, and stakeholder critical incidents. In comparison, negative functional-project expectations contributed to every critical incident category except financial. However, the negative structure is seen most notably in contractor-based critical incidents. Underlying social structures contributed negatively to the four cases, yet a negative government-contractor relationship seems to be present primarily in failing projects.

Moreover, the formal hierarchy and path dependency contexts were present in 34 and 63 critical incidents, respectively. Executives without acquisition authority and past critical incidents impacted the project. Formal hierarchy plays a role in critical incident emergence through creating the critical incident, but its primary function is in the type of intervention. Interventions in the context of formal hierarchies tend to mitigate the impacts of non-acquisition executives or change their minds. We see this primarily in financial incidents, where the project restructures its acquisition approach or reframes the project.

In contrast, path dependencies are seen in two-thirds of the critical incidents. Specifically, path dependencies impact the emergence of future critical incidents from past critical incidents and interventions. The event chains from the temporal analysis demonstrate the critical incidents that emerge from a prior critical incident, multiple prior critical incidents, and failed and successful interventions. Moreover, we see how critical incidents link to form negative event chains and how a single critical incident contributes to multiple future critical incidents. In all four cases, critical incidents contribute to future critical incidents and critical incident divergence and convergence. Successful projects only experienced less than two convergent or divergent paths each. In contrast, failed projects have numerous negative event chains with divergent and convergent paths. Additionally, failed project's negative event chains converge into a critical

incident. That is, multiple critical incidents accumulated into a single critical incident. In Systems B and D, divergent negative chains formed early in the project and converged just before de-escalation. This suggests that when divergent negative event chains converge, the critical incident becomes more critical to the point where de-escalation is the only option. Formal hierarchy, path dependency as contextual environments, and social structures are factors for critical incident emergence.

In this section, we identified 21 factors, three social structures, and two contextual environments contributing to the emergence of critical incidents. As stated previously, the factors demonstrate that project success and failure are not just based on the project's characteristics at a single point; rather, project success and failure are a path filled with critical incidents and interventions. Moreover, we identify that the breakdown of the government-contractor relationship has a significant impact on the project (Kappelman et al. 2006; Nikander and Eloranta 2001), as well as negative relationships among top management and stakeholders (McManus and Wood-Harper 2007; Nawi et al. 2011; Schmidt et al. 2001; Yeo 2002). All exist within a formal hierarchy and historical path, contributing to future critical incidents.

#### **4.3.2.2 Interventions**

This section analyzes and provides findings from our cross-case analysis of interventions. We identify interventions associated with successful and failed projects, common interventions, and factors associated with intervention success and failure. From 92 critical incidents, there are 77 interventions, of which 38 are successful and 39 failed (Table 4-24). The categories with the most interventions are acquisition and stakeholders. These categories are intuitive because, for the most part, project managers control the acquisition processes utilized in the four cases. Therefore, they implement interventions under their control. These include but are not limited to,

acquisition strategies, software development strategies, and government contracting. Moreover, when critical incidents are external to the project, stakeholders can provide the needed authority and influence to help alleviate the distress. Overall, the acquisition and stakeholder categories accounted for 56% of all interventions and were successful 63% of the time. However, successful projects in our study experience different intervention outcomes than failed ones.

**Table 4-24 Total Interventions by Category**

	<i>Interventions</i>		
	<i>Success</i>	<i>Failure</i>	<i>Total</i>
<b>Acquisition</b>	14	10	24
<b>Financial</b>	1	0	1
<b>Human resources</b>	4	5	9
<b>Stakeholders</b>	13	6	19
<b>Requirements</b>	1	0	1
<b>Reframing</b>	0	5	5
<b>Technical</b>	2	1	3
<b>Internal support</b>	3	7	10
<b>Contractor</b>	0	5	5
<b>Total</b>	<b>38</b>	<b>39</b>	<b>77</b>

Our study finds that successful and failed projects statistically differ in the number and types of interventions experienced in various categories ( $\chi^2(8) = 17.28, p = .027$ ). In successful projects, critical incidents tend to occur less frequently and are managed more effectively than in failed projects (Table 4-25). Successful projects had 87% positive intervention outcomes, while failed projects only had 25%. Moreover, the two successful projects relied more heavily on stakeholders for interventions than failed projects. 40% of interventions in successful projects were stakeholder interventions, whereas failed projects only had stakeholder interventions 15% of the time. Our events demonstrate that successful projects turn to outside help for interventions, while failed projects use internal intervention strategies, such as

acquisition, human resources, or internal support. For instance, System A and D experience competing platform critical incidents (Incidents A4 and D17) with different outcomes. System A intervened successfully by utilizing stakeholders to advocate for the project, but System D adjusted its acquisition approach to accelerate its deployment timeline with a minimal viable product. System A’s intervention was successful, while System D’s failed. As described in the previous section (Table 4-21), twelve incidents occurred across two or more projects. However, the successful projects intervened successfully, and failed projects intervened unsuccessfully. This suggests a positive relationship between intervention outcomes and project outcomes.

**Table 4-25 Interventions by Project Outcomes**

	<i>Successful Projects</i>		<i>Failed Projects</i>	
	<i>Intervention</i>			
	<i>Success</i>	<i>Failure</i>	<i>Success</i>	<i>Failure</i>
<b>Acquisition</b>	6	0	8	10
<b>Financial</b>	1	0	0	0
<b>Human resources</b>	4	0	0	5
<b>Stakeholders</b>	11	1	1	6
<b>Requirements</b>	1	0	0	0
<b>Reframing</b>	0	2	0	3
<b>Technical</b>	2	0	0	1
<b>Internal support</b>	1	1	3	5
<b>Contractor</b>	0	0	0	5
<b>Total</b>	26	4	12	35

**4.3.2.2.1 Common Interventions**

The table below (Table 4-26) depicts common interventions across the four projects. The red check mark denotes failed interventions, and the black check marks are successful interventions. All four projects intervened through governance, stakeholder engagement, and de-escalation. The intervention employed only by failed projects is software configuration. In particular, this intervention is related to critical incidents associated with insufficient COTS

products. Additionally, the intervention to develop a low-cost estimate is associated with the common critical incident of a mandated budget. This intervention was implemented in three projects. However, in System C, the intervention failed before de-escalation and contributed to contract termination. Therefore, this suggests that mandated project budgets, a project failure factor, are partially related to de-escalation and impact projects negatively in the long run.

**Table 4-26 Common Interventions**

Intervention	Project			
	Successful		Failed	
	A	C	B	D
Governance	✓	✓	✓	✓
Stakeholder Engagement	✓	✓	✓	✓
Developed Low-Cost Estimate		*✓	✓	✓
Software Configuration			✓	✓
De-escalation	✓	✓	✓	✓

✓ Failed Intervention, ✓ Successful intervention  
 \* Before de-escalation

De-escalation occurred as an intervention across all four projects. System A de-escalated before the contract award, and the other three after the contract award. System A was also the only project that did not incur a critical incident from de-escalation. This is because the project was redirected early in the project life and had the support of its project champion. Systems B, C, and D de-escalated after the contract award. The de-escalation successfully removed the project's distress from the contractor, but in System C, it created significant future distress due to losing their funding. The outcome of System D's de-escalation is still unknown. The system de-escalated a few months before the interviews. The interventions presented previously suggest that de-escalation is viable and should be considered. However, de-escalating earlier in the project with the project champion's support will limit the consequences compared to de-escalating later in the project.

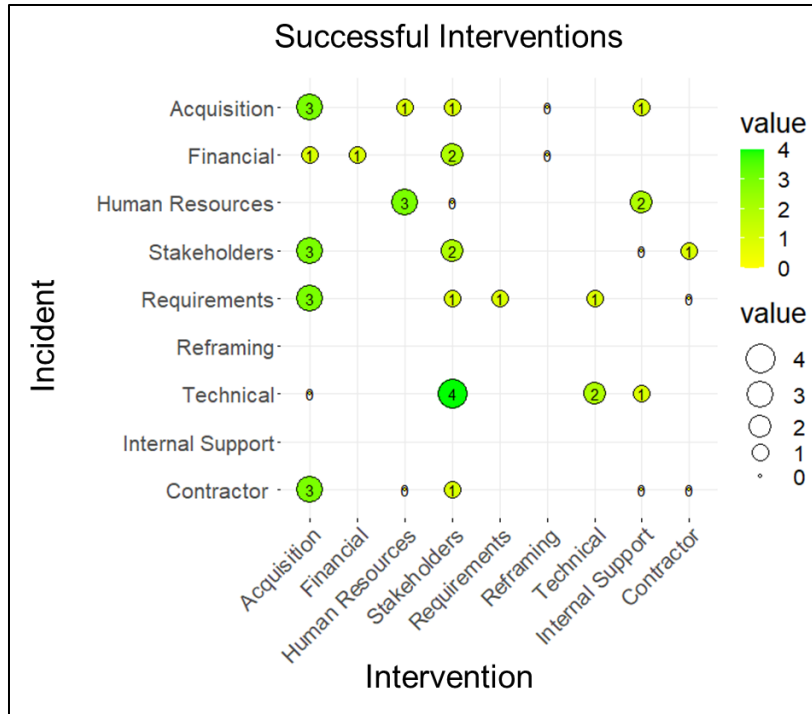
Lastly, governance and stakeholder interventions were present in all four projects. However, the two successful projects successfully intervened, while the two failed projects did not. This is due to the social and organizational structures described previously. The two successful projects were able to leverage positive social structures and use rigid structures to their advantage. In contrast, the failed projects experienced negative social structures and failed to leverage organizational processes. The interaction of the two structures led to failed interventions in both the governance and stakeholder interventions. This suggests that the effectiveness of an intervention is not solely dependent on the type of intervention used but rather on how well it is implemented.

#### ***4.3.2.2 Characteristics of Intervention Outcomes***

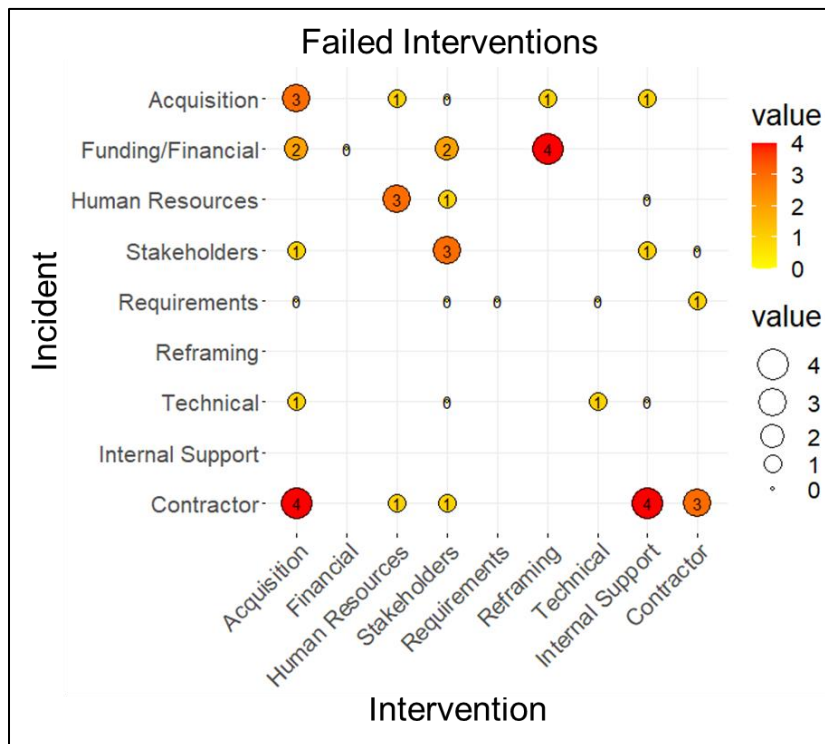
Based on our analysis, we identified several characteristics of successful and failed interventions. Our sample includes 38 successful interventions, 39 failed interventions, and 15 critical incidents without an intervention. The “no intervention” is described in the failed intervention section of our study. This decision is based on the popular William James quote, “No decision is, in itself, a decision.” Therefore, no intervention is a type of intervention that will be further discussed. This section explicates the types and characteristics of successful and failed interventions and their underlying structures.

Figure 4-9 and Figure 4-10 visually represent intervention success and failure by event categories. The color and size of the bubble signify the number of successful or failed interventions. We identified 36 critical incident-intervention combinations. Nine categories exist with 100% success rates, six with 50%, and sixteen with 0% success rates. Notably, reframing interventions across all critical incident categories failed. The largest critical incident category with a reframing intervention is financial. This suggests reframing interventions attempt to

change executive and stakeholder perception of the project but does not address the underlying issues that cause financial critical incidents. Lastly, three successful interventions under contractor critical incidents are de-escalation. The remaining thirteen interventions in the contractor critical incident category failed. Four failed interventions were internal support, where the government attempted to supplement the contractor's shortcomings. However, the intervention was a "band-aid" style fix, covering up the contractor's deficiencies. Other significant aspects of this graph are further discussed in the following sections.



**Figure 4-9 Critical Incidents and Interventions Success**



**Figure 4-10 Critical Incidents and Intervention Failure**

#### 4.3.2.2.2.1 *Characteristics of Successful Interventions*

Intervention success is defined as a “purposeful action that achieves its intent by appropriately resolving the current stressors” (Ward and Elvin 1999). By analyzing 38 successful interventions across the four projects, we identified two types of successful interventions: those that resolve distress in the short term and those that resolve distress in the long term. Long-term intervention success is the most difficult successful intervention because the intervention resolves the critical incident so that the critical incident or interventions do not contribute negatively to future critical incidents. Long-term intervention success occurred only in the successful projects, with seven interventions in System A and six in System C.<sup>1</sup> These thirteen successful long-term interventions were in no particular critical incident or intervention category but exhibited mostly positive social and supportive organizational structures. Every other intervention but one (Intervention A9) experienced at least one positive social structure. This suggests that successful interventions, in the long run, rely on positive social structures and supportive organizational structures.

The remaining 25 successful interventions only resolved distress in the short term, meaning that the critical incidents associated with successful interventions contributed to future critical incidents. Fifteen successful short-term interventions were in the acquisition, human resources, and internal support categories. These four intervention categories include activities that the project manager directly controls. For example, project managers can provide internal support to address skill gaps with contractors or functional representatives. Moreover, project managers can adjust their acquisition, contracting strategies, or timelines to intervene. However,

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<sup>1</sup> System D experienced two successful interventions that did not contribute to future critical incidents. However, they occurred just prior to the interviews. Therefore the consequences are unknown.

we find that these types of internal project interventions may resolve short-term distress but do not resolve the root cause of the critical incident.

In addition to successful intervention types, we identified the social and organizational structures that characterized intervention success. In general, positive social structures characterize intervention success. When the project office maintains positive relationships with the functional stakeholders, executive stakeholders, and the contractor, they are more likely to experience intervention success. 33 of the 38 successful interventions experience at least one positive social structure. Interestingly, the five successful interventions with only negative social structures were acquisition interventions in which the project officer successfully intervenes internally, without the support of external stakeholders or the contractor. This suggests that a project office can successfully intervene internally with negative social structures but will have a higher probability of success if positive structures are maintained.

Lastly, successful interventions can be characterized as containing supportive organizational structures. Only two of the thirty-eight successful interventions (Interventions A4 and A5) were characterized as unsupportive. However, in the two events, the unsupportive nature of the organizational processes was counteracted by agency executives and functional stakeholders willing to advocate for the project as an intervention. Therefore, project managers could leverage the organizational processes to their advantage to intervene successfully. When project managers could not, they leveraged positive social structures to overcome organizational challenges.

In summary, we identified two successful interventions: short-term and long-term. Social and organizational structures' positive and negative impacts can determine short-term and long-term successful interventions.

#### 4.3.2.2.2 *Characteristics of Failed Interventions*

We define intervention failure as a “purposeful action that does not achieve its intent by appropriately resolving the current stressors” (Ward and Elvin 1999). As previously discussed, this includes critical incidents in which the project office did not intervene. Over all four cases, we identified 39 failed interventions and 15 critical incidents without interventions. Successful projects accounted for four intervention failures, and failed projects accounted for the remaining thirty-five. In the context of formal hierarchy, the four failed interventions in the successful project can be characterized by having negative executive-project involvement and unsupportive rigid organizational structures. In particular, two of the four failed interventions occurred because the project manager attempted to change non-acquisition executives' perceptions of the project (Interventions A13 and A17) through marketing capability and strategy changes. While in the remaining two, the project manager failed to mitigate the impacts of executives' decisions by implementing governance (Intervention C1) and internal support (Intervention C5). Negative social structures contributed to the failed interventions because the project managers could not counteract the executives' negative impact on the project. All four attempted to use organizational processes to intervene. Yet, project reframing, governance, and internal support processes were insufficiently supportive and too rigid to overcome the executive’s impact on the project.

Moreover, the cross-case analysis identified 15 occurrences of critical incidents with “no” interventions. This describes a critical incident with no intervention, occurring in all critical incidents categories except the technical category. More importantly, “no” interventions can be described as having all negative social and organizational structures. In all fifteen occurrences, these project office experiences negative relationships with contractors, executives, or functional stakeholders and have rigid and unsupportive organizational structures. Lastly, six of 15 of these

intervention types occurred under the context of a formal hierarchy, while the remaining interventions have path dependencies. When the structures and context interact, the project manager appears constrained in their ability to intervene. When participants were asked about not intervening, they defensively responded, “What did you want me to do” or “There was nothing I could do.” Therefore, when critical incidents occur under rigid and unsupportive structures, with negative social structures, project managers perceive that they cannot intervene.

The remaining interventions failed for two reasons: intervention attempts that failed because the proposed action could not be enacted and interventions that were enacted but failed to alleviate distress. The first intervention type occurred when a project manager implemented an intervention, and the intervention itself was unsuccessful. For example, System B’s project manager could not “define release payments” (Incident B12), so the government would have to pay the contractor even if they did not deliver capability. To intervene, the project manager attempted to change the contract to clearly define the release payment. However, the contractor would not agree to change the contract. Therefore, the release payments continued to be undefined. This occurred in seven of the thirty-nine failed interventions. The seven failed intervention attempts are similar to “no” interventions in that all negative social and organizational structures characterize them. In these seven interventions, project managers were constrained in their ability to intervene appropriately and chose to intervene in what they perceived as the only way possible.

The second type of failed intervention is one where the intervention was implemented to plan but failed to alleviate the distress. We can characterize these failed interventions as “wrong corrective action” (Mähring and Keil 2008; Pan et al. 2008). The 32 examples of the wrong intervention applied can be characterized mainly as negative social and organizational structures,

but we find seven instances of positive social and organizational structures. For example, the positive government-industry social structures (Intervention C5) failed because of rigid and unsupportive organizational structures. The contractor tried to help the government but could not because the fixed-price contract would not allow it. This is similar to all the positive social structure events, where executive or functional stakeholders assist the project office but are constrained by organizational structures.

The 25 remaining failed interventions occurred under all negative social structures but varied in organizational structures and contexts. In these events, the contractor, executives, and functional stakeholders caused the critical incident but did not assist in the interventions. Moreover, three of the interventions were characterized as having flexible but unsupportive structures, and four of the interventions had supportive but rigid structures. The seven failed interventions under negative social structures suggest that flexible or supportive processes are insufficient to prevent failed interventions. Projects that experience negative social structures require both flexible and supportive organizational structures to employ successful interventions.

In addition to negative social and organizational structures, we identified three categories of interventions that did not provide positive outcomes. First, reframing critical incidents occurred five times (Incidents A13, A17, B22, B25, and B26). Four of the five interventions were implemented to address critical financial incidents, and one was due to a contract termination that led to financial incidents. Moreover, each of these events had negative executive-project involvement. In these cases, the project manager failed to change the executive's perception of the project through internal project changes, and the distress was not resolved. Similarly, under the critical contract incident category, the project failed whenever they provided internal support or let the contractor address the critical incident. This demonstrates that

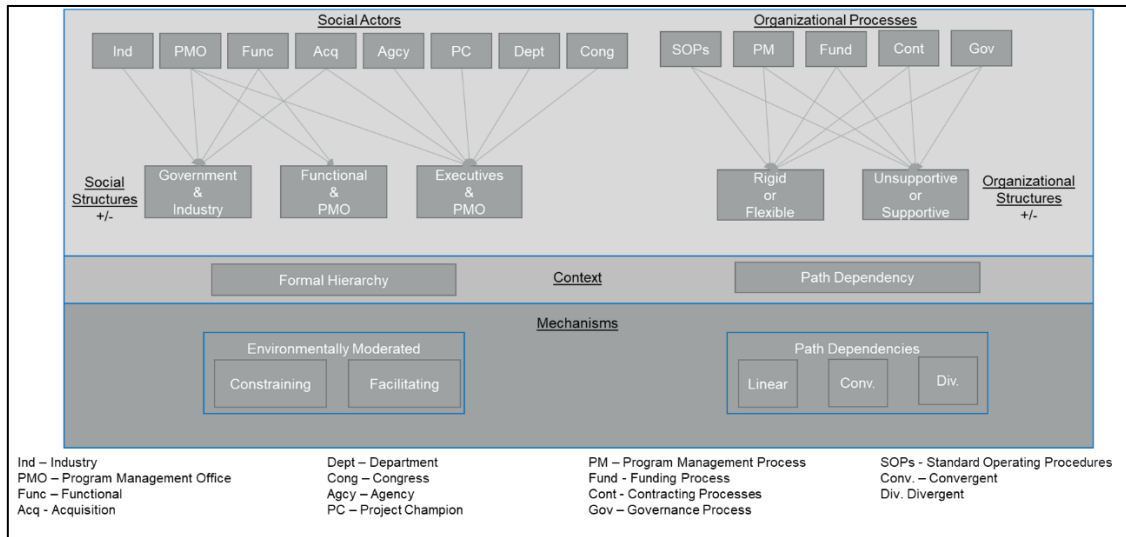
the distress is not resolved when the government provides internal support to the contractor to overcome the contractor issues. Moreover, when a critical incident occurred due to a contractor issue, the government unsuccessfully used the contractor to intervene three times. The intervention failed to alleviate distress, revealing the complex nature of intervening with contractor-based critical incidents.

In this section, we identified the characteristics of successful and failed interventions. Successful interventions occur in both the short term and the long term. However, successful short-term interventions do not prevent the critical incident from contributing to future critical incidents. At the same time, failed interventions occurred due to the lack of an intervention, a failed attempt at an intervention, and an intervention that failed to resolve the distress. Additionally, we explicated how positive and negative social and organizational structures contribute to intervention outcomes and the categories that experienced only failed interventions.

#### **4.3.2.3 Generative Mechanisms**

Generative mechanisms explain phenomena; they are central to the critical realist methodology (Bygstad et al. 2016). Mechanisms are the causal powers that emerge from structures to explain a specific outcome (Wynn and Williams 2020). Since mechanisms exist in the “real,” they cannot be accessed directly (Bhaskar 2013). Thus, we rely on retroduction as a mode of inference to expose causal mechanisms using the underlying structures and the context in which it operates (Mingers et al. 2017; Williams and Karahanna 2013; Wynn and Williams 2020). Retroduction is a creative process of seeking out what “must be” to explain an event (Wynn and Williams 2012; Wynn and Williams 2020). We applied retroductive reasoning to discover causal mechanisms from the interaction of social and organizational structures and their contextual environment that explain critical incidents and their interventions. Two generative

mechanisms were retroduced: environmentally moderated and path dependency. Figure 4-11 is an overview of the retroductive findings. It depicts the interactions between the social actors and organizational processes to create social and organizational structures. The social and organizational structures then interact with the context to form generative mechanisms that when triggered, contribute to a critical incident or intervention outcome.



**Figure 4-11 Retroductive Findings**

#### 4.3.2.3.1 Environmentally Moderated

The first generative mechanism identified was an environmentally constrained mechanism. *Environmentally moderated* refers to the idea that managers exercise choices within the constraints “imposed by their institution environment” or “external groups” to address influences from external pressures (Greening and Gray 1994, pp. 469, 471). In our context, the environmental moderated mechanism represents the extent to which the project office’s ability to intervene and take action is influenced by various structures in the broader social, organizational, and environmental contexts. This mechanism can either facilitate or constrain the project office's ability to act effectively. The environmentally moderated mechanism is positive if the interaction of the structures contributes to the ability of the project management office to intervene.

However, the mechanism is negative if the interactions of the structures and contexts contribute to the critical incident or hinder the interventions. Through retroduction, we identified two environmentally constrained aspects: internally and externally moderated.

Internally moderated characterized the interactions between the government's internal social and organizational structures and contexts (Greening and Gray 1994). A negative internally moderated mechanism emerges when negative relationships with organizational executives and functional stakeholders interact with rigid or unsupportive structures. Moreover, internally moderated mechanisms are further exacerbated under the context of a formal hierarchy or path dependency. In contrast, the positive moderated mechanism is triggered when positive internal relationships exist within the organization and interact with flexible or supportive structures. The mechanism does not exist only with the summation of positive or negative structures but occurs as a net value. Structural components counteract each other to contribute to net positive or negative effects. For example, department-level executives in System A threatened to cancel the project due to a competing platform, but agency executives facilitated an intervention to remove the threat. Therefore, this instance is considered a net positive internally moderated mechanism. The negative internally moderated mechanism is triggered in all four projects. However, only the two successful projects experienced this negative internally moderated mechanism. The negative version of the mechanism contributes primarily to twenty-three intervention failures. In contrast, the positive mechanism contributes to fourteen intervention successes. This emphasizes the importance of positive relationships with stakeholders (Yeo 2002) and the need for flexible and supportive organizational structures that assist the project manager's ability to intervene.

Externally moderated characterizes the interactions between the government-industry relationship social structure and the rigidity of organizational structures. The interactions between vendor relationships and contract instruments are considered “ingredients for success” (Saunders et al. 1997). Moreover, issues arise between the government and the vendor based on contractual impacts of control, trust, and bargaining power (Heiskanen et al. 2008). In our study, both positive and negative externally moderated mechanisms emerged. The negative externally moderated mechanism emerges when a negative relationship with the contractor and a rigid contracting structure limits or inhibits the ability of the project manager to intervene. This is because, in fixed-priced contracts, the clients are incentivized to demand more of the contractor, while the contractor is incentivized to limit the amount of work (Heiskanen et al. 2008). In order to intervene in specific critical incidents, the government requires the ability to change the contract when needed. In our examples, under fixed-price contracts, the contractor was unwilling to change the conditions of the contract to intervene without significant consideration. For example, when asked to change the contract requirements one participant exclaimed that the contractor responded, “one year and a million dollars.”

In contrast, the successful projects had cost-plus contracts. When critical incidents arose, they were able to leverage the ability to change the conditions of the contract, serving as the “gatekeeper” (Heiskanen et al. 2008). The rigid contracting structure was triggered in eighteen events, with all the interventions failings. In comparison, the eleven positive instances of this mechanism experienced all positive interventions. Lastly, we identified seven negatives instance of the mechanism with successful interventions. However, all seven interventions were associated with contract termination. This demonstrates the importance of good government-industry relationships and flexible contracting mechanisms when intervening in critical incidents.

#### 4.3.2.3.2 *Path Dependencies*

The second generative mechanism identified was a path dependency mechanism. *Path dependencies* describe the extent to which prior incidents and interventions positively or negatively impact future events. Path dependence refers to the idea that “history matters” and the path of the organization (or project) is shaped by prior events (Teece et al. 1997). In our context, prior events include previous critical incidents or interventions that contribute positively or negatively to future critical incidents and interventions along a *path trajectory*. Path trajectory is a pattern or sequence of events in which a path develops over time (Singh et al. 2015). Our study did not find a sequence of positive event chains. Therefore, we focus on the impacts of negative event sequences. Our temporal analysis identified three path trajectories that explain the emergence of critical incidents: linear, divergent, and convergent.

The linear trajectory explains that critical incidents may emerge over a linear path, with one critical incident contributing to the following critical incident until either the project is deployed or terminated. The linear trajectory emerges from both failed or successful short-term interventions, where distress in the project is not resolved and persists in contributing to a future critical incident. The linear trajectory triggered in all four projects. However, it is most clearly depicted in Systems A (Figure 4-5) and B (Figure 4-6), where a single linear trajectory is seen throughout the project's development. This suggests that specific critical incidents emerge from a single unresolved distress in past critical incidents.

Divergent and convergent trajectories emerge as a single critical incident either contributes to multiple future critical incidents or multiple critical incidents contribute to a single critical incident. In divergent trajectories, a critical incident's intervention does not appropriately resolve all the underlying issues, and the distress manifests itself in multiple critical incidents.

The impacts of divergent paths are more significant than the linear path because more critical incidents now require interventions. Divergent trajectories emerged in Systems B, C, and D, contributing to an exponential number of critical incidents. Moreover, divergent trajectories may lead to convergent trajectories. As paths diverge from a single critical incident, they create numerous linear paths that can converge to a single critical incident. A convergent critical incident emerges from multiple critical incidents where a stressor was not resolved, then combined to form a significant critical incident. Convergent trajectories are found in all four projects and lead to either a failed intervention or de-escalation. The path dependency mechanism emerges from three path trajectories and explains the emergence of critical incidents and specific intervention outcomes.

Through retroduction, we identified two overarching generative mechanisms with multiple sub-mechanisms. Our mechanisms are consistent with previous project failure and success and IS outsourcing literature. Moreover, our generative mechanisms explain the emergence of critical incidents and factors of intervention outcomes.

#### 4.3.2.4 Insights into Critical Incidents and Interventions

We identified seven insights from our analyses (Table 4-27). The following sections discuss these insights and how they were observed in our four cases.

**Table 4-27 Cross-Case Insights**

<b>Insights</b>	<b>System A</b>	<b>System B</b>	<b>System C</b>	<b>System D</b>
Critical incidents, interventions, and project outcomes	✓	✓	✓	✓
Dual impact of project champions and senior stakeholders	✓	✓	✓	✓
Persistent nature of funding incidents	✓	✓	✓	✓

De-escalation as a critical incident		✓	✓	*
De-escalation recovery	✓	✓		
Relationships and intervention outcomes	✓	✓	✓	✓
Contract structure and intervention outcomes	✓	✓	✓	✓

\*de-escalation occurred just before the interviews. So, the consequences are unknown.

#### **4.3.2.4.1 Critical Incidents, Interventions, and Project Outcomes**

Across the four projects, there appears to be a relationship between the number of critical incidents, failed interventions, and project failure. The successful projects account for a third of all the critical incidents (32 of 92) but only account for four of the failed interventions (see Table 4-1). In contrast, failed projects account for twice as many critical incidents and 96% of the failed interventions. Consistent with extant literature, System B and D's significant issues related to the project were either left unaddressed or inadequately handled, resulting in project failure (Baghizadeh et al. 2020; Lyytinen and Robey 1999; Mähring and Keil 2008; Nelson 2007; Pan et al. 2008). In our cases, the inverse is true, successful projects experience considerably fewer critical incidents, and of those critical incidents, the majority of them were addressed appropriately. In contrast, successful projects had fewer critical incidents and fewer failed interventions than failed projects in our four cases. This demonstrates that all projects experience critical incidents. However, how those projects intervene to limit the current and future impact of the critical incident contributes to project success or failure.

#### **4.3.2.4.2 The Dual Impact of Stakeholders and Project Champions**

The four projects experienced the dual impact of either a project champion or senior stakeholders. The critical success factor literature asserts that top management support, including a project champion, is essential to software project success (Petter et al. 2013; Petter et al. 2012;

Somers and Nelson 2001), and similar claims that the lack of top support is a key factor in project failure (McManus and Wood-Harper 2007; Schmidt et al. 2001; Schmitt and Kozar 1978; Yeo 2002). However, in the four cases, we see positive and negative impacts of project champions and senior stakeholders. The successful projects had senior-level project champions who contributed positively, demonstrating that they are essential as an intervention tool to support organizational cooperation, funding, and performance. In System C, the project champion intervened against other senior top managers attempting to cancel the project. However, in System A, the project champions contributed negatively to a project by directing the project to take certain risks. In the failed projects, System D had a project champion in a functional executive that existed at a lower level within the government. The project champion exerted the same negative pressures and influence as the senior-level project champion. However, they could not assist in interventions as the senior-level project champions did. The lower-level project champion did not possess the same power as the senior-level project champion to exert influence over other executives. Overall, the senior project champion was critical to the intervention's success, even though they created significant distress. The literature suggests project champions are universally beneficial, but they have social and symbolic capital that they can wield positively and negatively based on their organizational level.

#### ***4.3.2.4.3 Persistent Funding Critical Incidents***

Financial incidents occurred in all four projects. Previous literature suggests that limited resources and mandated or underfunded budgets are critical factors in failed projects (Benschop et al. 2020; Conboy 2010; Jones 2006; Kawamura and Takano 2014; Keil et al. 1998; Nelson 2008; Pan et al. 2008; Verner et al. 2008). Our research demonstrates the impact of financial incidents as critical incidents and interventions. Systems A and C are not failed projects, but we

still see how financial resources plagued the projects throughout their development. Specifically, in System C, the only financial critical incident (Incident C8) led to three other future non-financial critical incidents. This is more pervasive in System A, where financial incidents formed a negative event chain lasting the project's development. The two successful projects intervened successfully in most cases, but it put the project's future at risk. In the failed projects, financial critical incidents and interventions occurred at the project's inception. The critical incidents were not intervened successfully and afflicted the project until they were terminated and beyond. Specifically, in System B, the government reduced their prototype funding, directly contributing to choosing a vendor with a poor product, leading to project failure. Financial critical incidents are difficult to intervene in successfully and in the long term. This is mainly due to the rigidity of the government funding processes and formal hierarchies. Therefore, projects with critical financial incidents should seek to resolve the underlying financial issues as early as possible to avoid future financial incidents.

#### ***4.3.2.4.4 De-escalation of Commitment***

All four cases experienced de-escalation, and we identified two insights. Escalation of commitment is defined as “continued commitment in the face of negative information about prior resource allocations coupled with uncertainty surrounding the likelihood of goal attainment” (Keil and Robey 1999, p. 65). De-escalation is the intervention associated with the escalated commitment of failing projects to “redirect or terminate” a project (Keil and Robey 1999; Mähring and Keil 2008). De-escalation is deemed as the appropriate intervention in light of negative information. However, there may be future negative impacts from de-escalation. First, de-escalation exists in the literature as an intervention (Keil and Robey 1999; Mähring and Keil 2008), but in our cases, it is also a critical incident with significant consequences. Systems

B and C de-escalated commitment by terminating the contract and were “punished.” In both these cases, executives viewed the de-escalation as a project failure and thought the project should be terminated. In System B, multiple senior executives actively attempted to terminate the project post-de-escalation. While in System C, agency and congressional stakeholders removed the project’s funding. System C intervened through a senior project champion. However, System B did not have a senior project champion and could not recoup funding. For that reason, project managers need to be aware of the consequences of de-escalation and manage the associated risk, mainly as the need does not evaporate when a project is de-escalated.

The second insight is that projects can recover from de-escalation. The two successful projects were de-escalated successfully early on in the project. While the two failed projects de-escalated later in the project after high sunk costs. Timing of the de-escalation does not prove that projects can recover from de-escalation. However, both projects identified early issues in the project and then leveraged senior stakeholders and project champions to limit consequences. Whereas in the failed projects, they waited to de-escalate until the vendor practically gave up. This was due to the rigidity of the firm-priced contract. The contractor could not adjust and accommodate any new direction in Systems B, C, and D. Therefore, the only real option was to de-escalate by terminating the contract. Systems B and D chose to do this late in the project's development, and System B suffered the consequences. However, Systems A and C de-escalated early and recovered. This demonstrates that it is possible to recover from a de-escalation of commitment when you have the support of executives. It also suggests that the only option within rigid structures is to de-escalate and terminate the contract. Structures and norms that support making a major mid-course correction for a failing project can create future success. It

might make sense to drop the term de-escalation because it has a pejorative connotation and adopts the strategy-speak term ‘pivoting,’ which seems to have a positive course correction.

#### ***4.3.2.4.5 Relationship and Intervention Outcomes***

Social tensions existed within the four ISD projects. However, there is an essential connection between positive relationships within the project office, contractor, functional stakeholders, and executives and intervention outcomes. In every one of our cases’ successful interventions, there is at least one positive social structure. This is true even in the face of rigid organizational processes and path dependencies. The opposite is true as well. All the failed interventions experienced negative social structures. The single social structure with the most significant impact is the government-industry relationship. The only time this negative structure was present with a positive intervention was when the government de-escalated. All other examples are failed interventions. Our analysis underscores previous research providing stakeholder management as a factor for project failure (Keil et al. 1998; McManus and Wood-Harper 2007; Nelson 2007; Sauser et al. 2009; Schmitt and Kozar 1978; Verner et al. 2008) and critical success factors (Biehl 2007; Holland and Light 1999; Umble et al. 2003). However, our research goes beyond stakeholder support for the project outcomes and into support for interventions. Our research demonstrates that positive relationships with executives and stakeholders can help overcome critical incidents with other executives, rigid or unsupportive organizational structures, and past critical incidents. Successful projects depend on the willingness of the major stakeholders, including the contractor, to cooperate and exercise strong social connections to assist in specific project areas.

#### ***4.3.2.4.6 Contract Structure and Intervention Outcomes***

There is significant research on IS outsourcing and the impacts of fixed-priced contracts versus time and materials (Schermann et al. 2016). Moreover, previous research finds that “relational flexibility” is a factor in IS outsourcing performance (Gopal and Koka 2012; Schermann et al. 2016). Additionally, a formal contract sets expectations for “interpretation, renegotiation, and adjustments in project parameters,” and the risk associated with the contract are allocated differently between the vendor and client (Gopal and Koka 2012, p. 555). Fixed price contracts place the risk on the vendor, while times and materials or cost-plus contracts place the risk on the client (Mani et al. 2013; Schermann et al. 2016). However, we find that, specifically in our cases, fixed-price contracts contribute to critical incidents, failed interventions, and project failure. The two failing projects were fixed-priced contracts, and System C had a fixed-priced contract before de-escalation, then transitioned to a cost-plus contract. We find that fixed-priced contracts constrain the government’s ability to intervene appropriately. Numerous times throughout the interview process, interviewees stated that they could not intervene because of the fixed-price contract. One interviewee stated that whenever he tried to change a requirement in the contract, the contractor would respond with "one year and one million dollars." Making the required changes untenable. Moreover, as mentioned previously, with a fixed-price contract, the only real leverage the government has, is to end the contract, but you can’t terminate the need for the system. This was observed in the three cases. Fixed-price contracts constrain the government, resulting in no interventions or failed interventions to address critical incidents. Conventional risk analysis is wrong because it addresses the wrong risk. It should be concerned with the risk of a project not meeting the client’s needs rather than the financial risk faced by each party. The ultimate goal is to satisfy

system requirements, which should be the focus of risk analysis, not the risk associated with the financial relationship.

In this chapter, we analyzed our data by explicating events, structures, and contexts. Additionally, through retroduction, we conducted a within and cross-case analysis identifying the factors that account for the emergence of critical incidents and the factors that explain successful and failed interventions. Lastly, we addressed seven insights developed through the analysis process.

## **5 Theoretical Synthesis**

Our analysis identified that the relationships between critical incidents, interventions, and project outcomes are highly intricate and shaped by various social, organizational, and contextual factors. Based on our findings, we propose a series of propositions that aim to justify the relationships between our key constructs. This section synthesizes the findings into project outcomes, critical incidents emergence, and intervention outcomes.

### ***5.1 Critical Incident, Interventions, and Project Outcomes***

Project success and failure are defined as the ability of a project to meet its objectives (Ewusi-Mensah and Przasnyski 1994; Schmitt and Kozar 1978). Numerous factors exist to characterize project failure or success in an attempt to explain the outcome. Our first two propositions draw from event systems theory (EST) and the IS project outcomes literature. EST is based on the open systems theory (Katz and Kahn 1978) and posits that a series of events determine organizational outcomes. The saliency of an event is based on its strength (Morgeson et al. 2015). Critical incidents and interventions define an event in the context of IS project outcomes. The failure factors or lack of CSFs represent the presence of a critical incident, and the intervention characterizes the project office's attempt to address a failure factor or gain a CSF. For example, top management support is considered an important CSF (Schmitt and Kozar 1978). Therefore, losing top management support is a critical incident, and the attempt to regain support is the intervention. If top management support is restored, the intervention succeeds, and the project retains a CSF. However, if the attempt to regain the support fails, the project is characterized by the failure factor "lack of top management support" (Schmitt and Kozar 1978).

When failure factors exist and CSFs do not exist, a project is more likely to fail (Dwivedi et al. 2013).

The prior literature and our four cases suggest that failure factors and CSFs occur in combinations, and the more factor that exists, the greater the likelihood of failure (Dwivedi et al. 2013). Critical incidents are the manifestation of failure factors or lack of CSFs. The larger number of critical incidents in the project suggests more failure factors or lack of CSFs present in a project. Therefore, fewer critical incidents occur and fewer failure factors present. In our research, the two successful projects, Systems A and C, experienced seventeen and fifteen critical incidents, respectively. In contrast, the two failed projects, System B and D, experienced twenty-six and thirty-four critical incidents. Overall, the failed projects experienced significantly more critical incidents, and failure factors, that linked into a series of events to explain the project's outcome (Morgeson et al. 2015). Therefore, we posit:

*Proposition 1: The number of critical incidents reduces the likelihood of project success.*

If the critical incident introduces the failure factor or lack of CSF, the intervention is how these factors are removed. Prior literature and our analysis find that IS projects fail either from the wrong corrective action (Mähring and Keil 2008), manager's mistakes (Nelson 2007), or past problems (Greiner 1998). The wrong corrective actions and mistakes, in the context of our research, are failed interventions. If applied interventions do not remove the distress or failure factor, then the problems that contributed to the critical incident persist or diverge, causing additional critical incidents. Therefore, the distress is unresolved, and the number of failure factors remains or potentially increases. In contrast, if interventions are successful, the current stressors are resolved, and the failure factor is removed or the CSF is restored. Systems A and C both only experienced two failed interventions, for a 88% and 85% intervention success rate.

However, Systems B and D, exhibited fifteen and twenty failed interventions, for a 12% and 15% success rate. Thus, this suggests that when critical incidents are not resolved through successful interventions, the distress persists in the form of failure factors leading to project failure.

*Proposition 2: The number of failed interventions reduces the likelihood of project success.*

## **5.2 Critical Incident Emergence**

Critical incidents emerge from numerous factors. In our analysis, we identified twenty-one factors of critical incidents emergence that is associated with CSFs, failure factors, and early warning signs. However, based on previous literature and our findings, critical incidents also emerge from previous critical incidents, failed interventions, and negative social and organizational structures. The path dependency literature (Singh et al., 2015; Teece et al., 1997) and EST Field (Morgeson et al., 2015) support our subsequent propositions. Path dependencies describe the extent to which prior incidents and interventions positively or negatively impact future events. Path dependence refers to the idea that "history matters" and the path of the organization (or project) is shaped by prior events (Teece et al. 1997). Combined with EST, the literature states that events can result from other events within an organizational system (Morgeson et al. 2015). Therefore, future critical incidents can emerge from past critical incidents. Moreover, critical incidents contribute to future critical incidents when distress is unresolved. Distress is not resolved in two ways: failed intervention and an unresolved critical incident.

A failed intervention is a purposeful action that does not achieve its intent by appropriately resolving the current stressors (Ward and Elvin 1999). From our findings, failed

interventions occur for various reasons by neglecting to address the underlying factors that caused the distress. When an intervention fails, the underlying factors of the critical incident remain and may result in future critical incidents. For example, the COTS solution provided to System D did not meet the requirements, so the project office decided to configure the product to meet the requirements. However, the COTS product could not be configured to the government's satisfaction, which resulted in a delayed preliminary design review. Ultimately, the government issued a stop-work order and canceled the contract. This demonstrates how the intervention failed to remove the stressor. Since the stressor was not removed, it persisted and contributed to multiple future critical incidents. Therefore, we posit:

*Proposition 3: A failed intervention increases the likelihood of a critical incident.*

In some instances, critical incidents occur, and project managers fail to act. In our study, we found fifteen instances of critical incidents without interventions. These unaddressed critical incidents contributed to future critical instances in the fifteen instances. Similar to the previous proposition, the future critical incident emerged because the underlying stressor of the previous critical incident was not resolved. Therefore, we posit:

*Proposition 4: An unresolved critical incident increases the likelihood of another critical incident.*

Social structures include individual and organizational actors, including their relationships, relevant to critical incidents and interventions (Wynn and Williams 2020). Furthermore, current literature suggests that lack of top management support and stakeholder management are failure factors (Keil et al. 1998; McManus and Wood-Harper 2007; Nelson 2007; Sauser et al. 2009; Schmitt and Kozar 1978; Verner et al. 2008) and the inverse is CSFs

(Biehl 2007; Holland and Light 1999; Umble et al. 2003). We find that critical incidents occur when a top manager or stakeholders remove their support and negatively impact the project through mandated timelines, budget cuts, trying to cancel the project, last-minute requirements, etc. Therefore, we posit that:

*Proposition 5: A negative social structure increases the likelihood of a critical incident.*

Organizational structures include rules and practices of the various organizations that interact with the social structures and contextual environment (Wynn and Williams 2020). From our analysis, these structures may include SOPs, project management, funding, contracting, and governance processes. However, these structures can be flexible or rigid. Flexible processes are adaptable to address the project management office's needs. In contrast, rigid structures constrain the project manager's ability to operate. Specifically, rigid structures include firm-fixed-price contracts, financial processes, certain governance practices, approval processes, etc. These processes contribute to critical incidents by not adjusting to the needs of the project office. For example, when a funding process is rigid, it cannot address the typical changing requirements and timelines of ISD projects. So, when terms of the project change, the project management office does not have the required funding to continue, thus creating a critical incident. Thus, when the project management office operates under rigid structures, it is more likely to experience a critical incident. Therefore, we posit that:

*Proposition 6: A rigid organizational structure increases the likelihood of a critical incident.*

### **5.3 *Intervention Outcomes***

Interventions are purposeful actions intended to resolve the stressors from critical incidents (Jaspersen et al. 2005; Ward and Elvin 1999). Failure or success of an intervention is determined by its ability to resolve the current stressors. Therefore, when an intervention succeeds, the current stressor is resolved, but when an intervention fails, the current stressor remains. In our study, social and organizational structures impact intervention outcomes. Similar to proposition 5, social structures contribute to emergent critical incidents because contractors, executives, and stakeholders create distress through their actions and decisions and impact the interventions. Based on resource dependency theory (RDT) and the theory of relational constraints, intervention outcomes are not only associated with the project manager's choice of intervention but are dependent upon external resources and social actors within the higher-level organization (Dawson et al. 2010; Greening and Gray 1994; Pfeffer and Salancik 2003). Vendors, executives, and stakeholders impact an intervention positively when they advocate for it, approve it, or enforce it. For example, System A experienced distress caused by a lack of cooperation from the agency's "data owners." To intervene, the project manager leveraged the agency's Chief Data Officer and project champion to issue an executive order forcing the low-level organizations to comply, demonstrating that positive social structures can contribute to intervention success.

In contrast, negative social structures limit or constrain the project manager's ability to intervene due to the external social environment (Greening and Gray 1994). The project manager may want to intervene in a certain way but cannot because they lack social capital. This is mainly seen in the negative government-industry relationship. If there is tension between the government and the vendor, the vendor is less likely to assist the customer and more likely to

focus on profit motives (Dawson et al. 2010). These tensions similarly exist internally with executives and stakeholders. Therefore, we posit:

*Proposition 7: A positive social structure increases the likelihood of intervention success, and a negative social structure increases the likelihood of intervention failure.*

The rigidity of organizational processes impacts the way project managers intervene. When managers operate under rigid structures, they must exercise their decision ability within the constraints "imposed by their institution's environment" (Greening and Gray 1994, pp. 469, 471). Rigid or flexible structures prevent or allow, respectively, project managers to intervene appropriately. Rigid structures do not adapt to the project's needs, forcing the project manager to use alternative means or workarounds to address critical incidents. For example, fixed-priced contracts limited Systems B and D's ability to intervene when faced with contract performance issues because the contract did not allow the government to adjust cost, schedule, and performance metrics. The only possible intervention mechanism in the contract was to either stop payment or end the contract. In contrast, flexible organizational structures allowed project managers to adapt organizational processes to their advantage, thus, permitting project managers to intervene appropriately. Therefore, we posit:

*Proposition 8: A rigid organizational structure increases the likelihood of intervention failure, and a flexible organizational structure increases the likelihood of intervention success.*

Supportive organizational structures describe the extent to which organizational processes assist or inhibit a project. Supportive processes are independent of rigid or flexible organizational structures. As stated in a previous example, the executive order process supported

the project manager when addressing the lack of cooperation from data owners in System A. Additionally, we found supportive organizational structures in human resources, where the project office could leverage the firing process to remove unskilled personnel. However, the project manager could not leverage the standard organizational processes to intervene successfully in other examples of contractor performance, budget cuts, requirements changes, etc. Therefore, we posit:

*Proposition 9: A supportive organizational structure increases the likelihood of intervention success, and an unsupportive organizational structure increases the likelihood of intervention failure.*

When project managers operate within rigid structures, they must intervene within environmental constraints (Greening & Gray, 1994) and are limited in how they can intervene. However, if the rigid organizational structure supports the project manager's intervention, it is more likely to succeed. We find interventions when operating in supportive and rigid organizational structures are more traditional, leveraging established organizational processes and norms without trying to implement workarounds. For example, in Systems B, C, and D, the project managers leveraged contract termination clauses within the fixed-priced contracts to successfully cancel the contracts. Moreover, we saw examples of critical technical incidents that utilized the rigid bureaucratic governance system to intervene successfully. When project managers leveraged rigid and supportive organizational structures, they could intervene appropriately within the traditional government processes. Therefore, we posit that:

*Proposition 10: A supportive organizational structure will moderate the relationship between rigid organizational structure and intervention failure such that it decreases the likelihood of intervention failure.*

Our analysis identified that the relationships between critical incidents, interventions, and project outcomes are complex and shaped by various social, organizational, and contextual factors. Based on our findings, we proposed ten propositions that justify the relationships between our key constructs, synthesizing our findings. Overall, we find that ISD project outcomes can be explained through the lens of a project's critical incidents and interventions. Additionally, social and organizational structures and path dependencies contribute to critical incident emergence and intervention outcomes.

## **6 Discussion and Conclusion**

This dissertation examines distressed ISD projects by identifying factors that explain the emergence of critical incidents and the success or failure of interventions. We researched the following questions:

RQ1: What factors explain the emergence of critical incidents in ISD projects that label them as distressed?

RQ2: What factors explain successful or failed interventions in distressed ISD projects?

This chapter reviews our study's significant findings and discusses future research, limitations, theoretical contributions, and implications for practice.

### **6.1 Summary of Findings**

Our examination of four ISD projects in the U.S. federal government has yielded numerous findings and insights into the structures and mechanisms impacting critical incidents and interventions. In this section, we summarize the findings from our previous analyses.

#### **6.1.1 Structures, Context, Generative Mechanisms**

Explication of structures and contexts seeks to "identify and analytically resolve the components of the structure that are causally relevant" (Wynn and Williams 2012). Social and organizational structures include the relationships between actors and procedures organized into a contextual environment of critical incidents and interventions in ISD projects. Our study identified the structures' characteristics and the contextual setting that could produce the events (Sayer 1992; Williams and Karahanna 2013). Overall, we identified eight social actors within three social structures. The social structures include government-industry relationships, executive-project involvement, and functional-project expectations. In the context of the four

cases, social structures exemplify the impact of positive or negative relationships on critical project events.

We also identified five organizational processes and two structures impacting critical incidents and interventions. The organizational structures describe the rigidity and supportive nature of the organizational processes. Rigid or flexible structures describe the extent to which an organizational process is adaptable to different circumstances. In comparison, supportive structures describe the extent to which organizational processes assist or inhibit the project. As previously discussed in our propositions, the rigidity or supportive nature of the organizational processes contributes to critical incident emergence and intervention outcomes.

The contextual environment represents the settings in which the structures interact to produce events (Sayer 1992). Our analysis identified two contexts (see Table 4-7): formal hierarchy and path dependencies. A formal hierarchy describes the extent to which senior managers exercise project control without proper acquisition authority. Path dependencies describe the extent to which prior incidents and interventions positively or negatively impact future events. (Teece et al. 1997). We find evidence from the four case studies that the interactions of the contextual environments and structures generate the two mechanisms.

Generative mechanisms explain phenomena and are central to the critical realist methodology (Bygstad et al. 2016). Mechanisms are the causal powers that emerge from structures to explain a specific outcome (Wynn and Williams 2020). Through retrodution, we identified two generative mechanisms: an environmentally moderated mechanism and a path dependency mechanism. The environmentally moderated mechanism refers to the idea that managers exercise choices within the constraints "imposed by their institutional environment" or "external groups" to address influences from external pressures (Greening and Gray 1994, pp.

469, 471). We find that the interaction between an institution's negative social and organizational structures can constrain a project office by creating a critical incident or limiting the project manager's ability to intervene. In contrast, positive social and organizational structures can facilitate interventions leading to intervention success by leveraging key relationships and relevant organizational processes. Lastly, we find that the environmentally moderated mechanism comprises positive and negative structures that yield a net value. Consequently, project managers can counteract negative structures with positive structures to increase the likelihood of intervention success.

The second generative mechanism identified was a path dependency mechanism. *Path dependencies* describe the extent to which prior incidents and interventions positively or negatively impact future events. Path dependence refers to the idea that "history matters" and the path of the organization (or project) is shaped by prior events (Teece et al. 1997). We identified three path dependencies: linear, divergent, and convergent. Linear paths consist of multiple critical incidents and exist throughout an entire project. Linear paths show that multiple critical incidents can emerge from a single unresolved stressor. Divergent paths exist when a single critical incident contributes to multiple critical incidents, suggesting that certain unresolved stressors multiply. In contrast, convergent paths exist when multiple critical incidents contribute to a single critical incident. In our cases, we find that divergent paths eventually converge and may lead to project de-escalation. The path dependency mechanism explains three different ways critical incidents emerge.

Overall, in our study, we explicated structures and contexts through the process of retrodution to identify generative mechanisms that explain critical incident emergence and intervention outcomes.

### **6.1.2 Project Outcomes**

Our study also finds that project success and failure can be explained by examining critical incidents and interventions. Project success is defined as the ability of a project to meet its objectives (Ewusi-Mensah and Przasnyski 1994; Schmitt and Kozar 1978). Numerous critical success and failure factors exist to characterize project outcomes. However, our research finds that critical incidents and intervention outcomes can explain project success and failure. We find that successful projects have statistically fewer critical incidents than failed projects and have higher intervention success rates. Moreover, we find that critical incidents align with previous literature on failure factors (FF) and critical success factors (CSF) (Dwivedi et al. 2013; Schmitt and Kozar 1978). This demonstrates that FFs or the loss of CSFs are critical incidents requiring interventions. If a project manager successfully intervenes, the FF is removed, or the CSF is restored, putting the project on the path to success. In comparison, if the intervention fails, the FF remains, and the likelihood of project failure increases. Therefore, distress manifests through critical incidents, but successful projects experience less distress and manage the distress more effectively than failed projects.

### **6.1.3 Critical Incident Emergence**

Critical incidents occur when events, demands, or stimuli create harmful project conditions (Cartwright and Cooper 1997). Our study identified seven critical incident categories and twelve common incidents. Additionally, we identified twenty-one early warning signs, FFs, and CSFs that explain critical incident emergence.

As previously described, critical incidents emerge for various reasons. Specifically, critical incidents emerge from negative social and rigid organizational structures. We find that critical incidents occur when a top manager or stakeholders remove their support, or negatively

impact the project through mandated timelines, budget cuts, trying to cancel the project, last-minute requirements, etc. Additionally, we find that rigid organizational structures limit the project manager's ability to operate, creating a critical incident. Mainly, rigid structures include firm-fixed-price contracts, financial processes, certain governance practices, and approval processes, which constrain project managers by not adjusting to the needs of the project office. Thus, creating a critical incident. Moreover, through the path dependency generative mechanism, we find that critical incidents emerge from failed interventions or unresolved critical incidents where the project manager fails to act. Failed interventions and unresolved critical incidents neglect to eliminate the underlying stressors. Therefore, the stressors continue to exist, contributing to future critical incidents.

In summary, critical incidents emerge from numerous factors associated with the seven critical incident categories. These factors align with previous literature on early warning signs, FFs, and CSFs. However, our research demonstrates these factors are not static overarching characteristics of a project but are critical incidents that must be addressed. Moreover, social and organizational structures explain the emergence of critical incidents. Negative relationships between the project office, contractor, and government stakeholders create critical incidents in projects. Additionally, rigid organizational processes contribute to critical incidents by constraining a project manager's ability to lead appropriately. This demonstrates the importance of understanding social actors and organizational processes' impacts on ISD projects.

#### **6.1.4 Intervention Outcomes**

Interventions are purposeful actions intended to resolve the stressors from critical incidents (Jaspersen et al. 2005; Ward and Elvin 1999). Failure or success of an intervention is determined by its ability to resolve the current stressors. In our research, we identified

interventions associated with successful and failed projects, common interventions, and characteristics of intervention outcomes.

As previously discussed, interventions occurred in nine different categories (see Table 4-25) that consisted of successful interventions, failed interventions, and unresolved critical incidents. Additionally, we identified three common intervention approaches across the four projects. All four projects employed governance, stakeholder engagement, and de-escalation of commitment interventions. However, the successful projects implemented the interventions successfully, and the failed projects implemented them poorly. This suggests that the effectiveness of an intervention is not solely dependent on the type of intervention but rather on how well it is implemented.

We also identified two types of successful interventions: interventions that resolved distress in the short term and those that resolved distress in the long term. A successful long-term intervention is the most difficult to implement because it must resolve a critical incident so that neither the originating incident nor associated interventions contribute negatively to future critical incidents. Successful short-term interventions removed the initial distress but did not address the underlying issues that caused the critical incident in the first place. Therefore, the underlying distress continued and contributed to a future critical incident. Moreover, successful short-term interventions are more likely to be internal project interventions, where the project manager can use intervention approaches under their control. However, we find that internal interventions are less likely to address the underlying causes of distress that would lead to long-term intervention success.

We identified three types of interventions that do not resolve current stressors (Ward and Elvin 1999). The first two types are failed interventions. Failed interventions exist for two

reasons: (1) the proposed action could not be enacted, and (2) interventions that were enacted but failed to alleviate distress. The first type of failed intervention occurs because the project manager could not implement the planned intervention. The second type of failed intervention aligns with previous research as a "wrong corrective action" (Mähring and Keil 2008; Pan et al. 2008). The intervention was implemented as planned but did not remove the distress. The last intervention type is a critical incident that does not have an intervention. We named this an "unresolved critical incident," where the project manager fails to act. We found that these events occurred not because the project manager didn't want to act but because they perceived they could not intervene. Overall, we find that failed interventions neglect to alleviate distress.

Lastly, we find that social and organizational structures within the context of a formal hierarchy impact intervention outcomes. Positive and negative social and organizational structures allow or prevent, respectively, a project manager's ability to intervene. As previously discussed, positive structures provide needed flexibility and support to a project manager to contribute to a successful intervention. In comparison, managers who operate under rigid structures must exercise their decision ability within organizational constraints (Greening and Gray 1994). These social and organizational constraints increase the likelihood of a failed intervention. The one exception is the combination of rigid and supportive organizational structures. We find that if project managers leverage supportive and rigid organizational processes, they are less likely to experience intervention failure. In our study, interventions that use supportive and rigid organizational processes exploit standard processes and norms. When project managers intervene within an organization's norms without trying to implement workarounds, the intervention is less likely to fail. Managing social and organizational structures is crucial for intervention success.

### 6.1.5 Other Insights

Through our analysis, we identified several insights into critical incidents and interventions (Table 6-1). The insight descriptions are found in the section 4.3.2.4. The first two insights relate to the importance of social relationships in ISD projects and how influential social actors can positively and negatively impact the project. Traditionally, the IS literature discusses the importance of project champions and managing stakeholders' expectations (McManus and Wood-Harper 2007; Schmidt et al. 2001; Schmitt and Kozar 1978; Yeo 2002). However, our study finds that project champions and stakeholders can contribute negatively by creating critical incidents. Similarly, the second insight addresses the importance of positive relationships within the project office, contractor, functional stakeholders, and executives for successful interventions. A positive relationship with the contractor is associated with the contract structure and intervention outcomes. There is significant research on IS outsourcing and the impacts of fixed-priced contracts versus time and materials (Schermann et al. 2016). Specifically, in our cases, we find that fixed-price contracts contribute to critical incidents, failed interventions, and project failure. Lastly, we find that de-escalation, or "pivot," in our cases, is an appropriate intervention in specific contexts. Pivoting led to successful projects when executed early in the project and under the project champion's support. However, it can also lead to future critical incidents involving loss of funding or threats of project termination. Our insights demonstrate the nuances of the environmental impacts on critical incidents, interventions, and project outcomes.

**Table 6-1 Other Insights**

<b>Insights</b>
A stakeholder or project champion can both positively and negatively impact the project.
Relationships between the project office, stakeholders, executives, and contractors impact critical incidents and intervention outcomes.

Fixed-price contracts increase the likelihood of critical incidents and failed interventions.
Funding critical incidents tend to persist throughout the project's development.
De-escalation of commitment can resolve current stressors but can also become a critical incident.

This section summarized our within-case and cross-case analysis findings and provided insights into critical incidents, interventions, and project outcomes.

**6.2 Future Research**

The current research focuses on critical incidents and interventions in U.S. federal government ISD projects. We acknowledge that similar research in other contexts (e.g., private sector organizations) could yield different results. We expect that the factors of critical incident emergence will continue to be associated with failure and critical success factors. However, the social and organizational structures impacting critical intervention emergence and intervention outcomes may differ. Further research using qualitative comparative analysis (QCA) to identify the contribution of factors to intervention success and failure might yield deeper insights into what combination of factors impacts intervention outcomes.

Our research uses a critical realist perspective to identify social and organizational structures and contexts to retroduce generative mechanisms that explain the phenomenon. Future research may analyze critical incidents and interventions from a positivist perspective, possibly using capital creation as a model (Watson 2019). Capital creation may provide a parsimonious way to synthesize the interactions of our structures and factors to explain critical incident emergence and intervention outcomes. Additionally, future research could build on our categorization of critical incidents and interventions by identifying optimal interventions for specific critical

incidents or providing guidance on implementing certain interventions. Next, using network analysis, future research can explore traditional network measures to explain critical incident emergence and intervention outcomes. Lastly, based on our insights, future research could examine the impacts of de-escalation of commitment as a critical incident and how different contract types impact the way project managers de-escalate an ISD project. Research on critical incidents and interventions in numerous contexts has the potential to change the way researchers and practitioners view ISD project outcomes.

### **6.3 *Limitations***

The current research was conducted in accordance with generally accepted guidelines for critical realist qualitative case-based research. However, there are several limitations associated with our study.

First, the primary researcher previously worked in the parent organization of the four case studies and was a key member in one of the cases during several critical incidents. As a previous leader, we took precautions to indicate that our research was independent of the organization and that the primary researcher possessed no authority. Due to the primary researcher's foreknowledge of several critical incidents and interventions, we ensured that events were corroborated by multiple sources, as much as practical, and confirmed all relationships between events with key informants within the projects. Additionally, the primary researcher met weekly with dissertation advisors to discuss the interviews, events, and findings. Given all the precautions, the primary researcher's inherent biases and past experiences may still have affected the study's outcome.

Second, the four cases represent IS projects within a single organization in the Federal Government and do not address strategic-level political issues. This allowed us to control for

several organizational factors and compare failure and success within the same context. Additionally, it allowed us to exclude certain congressional political issues outside the context of our research. We understand the context limits the generalizability of our findings. As with explanatory case-based research, the goal is to conduct a "real life" in-depth empirical inquiry focusing on activities and behaviors encompassing a certain phenomenon, not to obtain statistical generalizability (Ackroyd 2010; Yin 2003).

Third, the interviews with the participants were retrospective; in some instances, the critical incidents occurred more than five years before the interviews. Additionally, the number of participants was limited in some instances due to the project size and specific knowledge of events at the project level. Therefore, we triangulated the event descriptions with multiple interviewee descriptions, project management documents, and government and congressional reports to address the validity of our results. Lastly, The basic assumption of critical realism is that it does not claim that the proposed structures and mechanisms fully explain the emergence of critical incidents and outcomes of interventions. However, we contend that the structures and mechanisms explicated provide deep insights into the emergence and outcomes of critical incidents and interventions.

## ***6.4 Concluding Thoughts***

### **6.4.1 Theoretical Contribution**

We extend the IS literature in multiple ways. First, we contribute by examining critical incidents and interventions in ISD projects. Previous research examines factors contributing to IS project success or failure. Still, it neglects to discuss how critical incidents emerge and how a project manager intervenes to determine project success or failure. Our research provides a detailed analysis of ninety-two critical incidents and interventions across successful and failed

ISD projects. We provide a deeper understanding of ISD project outcomes by demonstrating that failure and success result from a series of critical incidents and interventions (Katz and Kahn 1978; Morgeson et al. 2015). Additionally, our study provides detailed descriptions of the critical incidents and the types of interventions, including their respective outcomes.

Second, this work shows that failure factors and lack of critical success factors are not static or permanent ISD project characteristics but critical incidents that occur at a particular point in a project's life. The twenty-one factors for critical incident emergence align with the previous failure factors and critical success factors literature. We do not suggest that the twenty-one factors for critical incident emergence are the only ones. Still, our analysis demonstrates that all the factors identified in the literature can become critical incidents in ISD projects. Moreover, we identify common critical incidents and interventions in failed and successful ISD projects, resolving the misconception that failure factors and CSFs are static or permanent (King and Burgess 2006) but rather dynamic and subject to change through the project. Failure factors or lack of CSFs may arise, but successful project offices intervene correctly to resolve the stressor.

Third, we contribute by identifying relevant social and organizational structures, contexts, and generative mechanisms that explain the emergence of critical incidents and intervention outcomes. Our study demonstrates the importance of leveraging relationships and organizational processes across numerous internal and external organizations. The IS literature discusses the importance of stakeholder management and project champions, but our research expands the discussion into relationship management across all social actors that impact the project. Previous literature discusses the importance of project champions and their positive impacts on a project (Petter et al. 2013; Petter et al. 2012; Somers and Nelson 2001). Our study finds that there is also a cost to project champion involvement, thus highlighting that the project champion may take

action that is sometimes detrimental. Moreover, we contribute to the IS outsourcing literature by finding the adverse impacts of fixed-price contracts. The IS literature traditionally posits that fixed-price contracts shift risks to the contractor and away from the customer (Mani et al. 2013; Schermann et al. 2016). However, we find fixed-price contracts constrain project managers relationally and contractually from intervening successfully.

Fourth, we contribute to the escalation of commitment literature by examining how successful and failed projects de-escalate commitment. Previous literature posits that de-escalation is an appropriate intervention for a failing project (Keil and Robey 1999; Mähring and Keil 2008). However, we provide deeper insights into the consequences of de-escalation. We contribute to the literature by identifying how de-escalation can instigate significant future critical incidents that negatively impact the project. We also provide evidence that the negative impacts of de-escalation can be mitigated if executed early in the project and with the support of senior stakeholders.

Overall, no known research provides the level of detail into critical incidents and interventions in ISD projects we present. While factors contributing to critical incident emergence and intervention outcomes still need further validation beyond this initial study, we believe this work provides a necessary foundation for future research.

#### **6.4.2 Implications for Managers**

This dissertation advances practice by detailing and explaining critical incidents and interventions in ISD projects. Our study identified ninety-two examples of critical incidents and interventions over four ISD projects in the U.S. Federal Government. The findings offer valuable insights for project managers and executives, enabling them to leverage this knowledge to enhance their understanding of ISD project outcomes and minimize the risk of future ISD project

failures. To that end, we provide several recommendations for IS project managers and executives.

First, IS project managers should manage and track critical incidents and interventions, including their potential impact on future events. Our analysis provides an example of categorizing critical incidents and interventions and visualizing events in causal chains to determine which events contributed to future critical incidents. Critical incident and intervention analysis can do more than explain project outcomes. It can assist IS managers in allocating resources to prevent the emergence of critical incidents or increase the likelihood of a successful intervention. Based on our path dependency mechanisms, if project managers can understand the impacts of past critical incidents and whether the stressor was ultimately resolved through an intervention, then they can prevent the future impacts of past issues.

Second, we recommend that IS project managers create a critical incident and intervention plan in conjunction with their risk management plans. It is common practice in the U.S. Federal Government for IS project managers to have a risk management plan. These plans focus on risk identification, analysis, mitigation, and monitoring. However, we suggest that as part of risk management, IS project managers develop processes to ensure they can intervene when a critical incident arises. The previous literature provides seventy-eight early warning signs, failure factors, and critical success factors. Therefore, IS project managers must identify the sub-set of those factors most likely to create a critical incident in their context and ensure their stakeholders and organizational processes support the proposed interventions. Warren Buffet famously said, "Someone's sitting in the shade today because someone planted a tree a long time ago." Similarly, IS project managers must create positive relationships among stakeholders and

executives and implement adaptable processes and contracts to intervene effectively before critical incidents arise.

Third, we recommend that IS project managers prioritize managing their interpersonal relationships with executives, stakeholders, and contractors. Our study finds that negative relationships among these social actors contribute to critical incidents and can limit a project manager's ability to intervene. If project managers understand what social actors may impact their project negatively, they can allocate social capital to gaining allies. Likewise, suppose project managers have a coherent picture of what social actors support the project. In that case, they can leverage the support when intervening, especially if one social actor can counteract the negative impact of another. Therefore, managing relationships is crucial to preventing critical incidents and intervening successfully.

Fourth, similar to the previous recommendations, we recommend that IS managers create flexibility within government-industry relationships and contracts. In our study, we found that project managers could not intervene the way they wanted to or not at all. This occurred for two reasons. First, due to the contractor's poor relationship with the government, the contractor didn't want to help. We saw this in two projects when the government asked the contractor for help, and they said "no." Second, the fixed-price contract didn't allow the government to intervene in specific categories of critical incidents. This was most pronounced with contractor performance critical incidents. The contractor was performing poorly, but because the contract was fixed-price, the government's only leverage was to terminate the contract. Therefore, we recommend that not only project managers place a high value on the government-contractor relationship but that they adopt flexible contract mechanisms. Such contract mechanisms are more likely to

facilitate healthy relationships between project managers and contractors and allow both parties to adapt to address critical incidents.

Fifth, we recommend using critical incident and intervention analysis, including analyzing social relationships and flexibility of organizational processes when deciding when or if to "pivot" away from the current contractor. By analyzing the critical incidents and interventions before pivoting, the project manager can better understand the project landscape and determine whether the contractor contributes to the critical incident or other factors. Additionally, by analyzing relationships, the project manager can focus on whose support is required to pivot and which social actors will attempt to punish the project by canceling it or cutting its budget. Lastly, through analysis of organizational structures, IS project managers should identify all the available contractual and organizational options before pivoting. Through these analyses, IS project managers will be better prepared to articulate how, why, and when they are ready to pivot.

From the analysis of this dissertation, we provided five recommendations for ISD project managers and executives to assist them in increasing the likelihood of project success. Critical incidents in ISD projects are highly complex and nuanced. Therefore, the goal of our research is not to provide solutions for every problem that causes an ISD project to fail but to help project managers think and analyze the current state of their project to equip them to solve their problems.

## **6.5 Conclusion**

Over the last 50 years, ISD projects have struggled and failed. Even with seven out of eight projects failing and 97% of IS projects not delivering a return on investment, organizations continue to invest in ISD projects expecting greater efficiencies (Wade and Shan 2020). For that

reason, it's imperative for organizations to examine the critical incidents and interventions within ISD projects to prevent them from failing. By analyzing critical incidents and interventions in ISD projects, this dissertation presents the pertinent factors and structures that can aid managers and executives in understanding ISD project outcomes and averting potential ISD project failures.

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## **Appendices**

### ***Appendix A – Semi-Structured Interview Guide***

#### **Background/Demographic**

1. What is your title? Department?
2. What is your current role and area of responsibility?
3. How long have/did you worked at the specific organization?
4. To what extent are you involved with decisions relating to the intervention?

#### **Distress/Stress Signals Emerge:**

1. What stressors lead to distress
2. How did you know the project was in distress? What status indicators are maintained, and what is the acceptable range for each? How is that established?
3. How did you identify any early warning signs that led you to believe the project was experiencing distress? What were those early warning signs? Were these captured and shared with others?

#### **Intervention Development:**

1. Describe how the project office responded. Did they ignore the signs or attempt to resolve the problem? How were they held accountable in either case? By what mechanism?
2. Was there a formal problem-solving technique used? If so, describe whether this was a "standard approach" or a use case specific. Was the solution development shared with others?
3. Describe how potential solutions were identified, received, and evaluated.

#### **Intervention Decision:**

1. Who made the decision to implement the intervention?
2. Was the decision in line with the senior stakeholders? How was the decision documented and associated actions captured?

#### **Intervention Implementation:**

1. Did the intervention get implemented as planned? Why or why not, and was the change in direction captured for future reference?
2. Was the intervention measured or tracked? By whom and reported to who?

#### **Implementation Refinement/Abandonment:**

1. Was the intervention evaluated?
2. How was it evaluated?
3. What criteria were used to either refine or abandon the intervention? Documentation and sharing?

#### **Short-Term Outcomes:**

1. Was the intervention a success or failure?
2. What determined if the intervention was a success or failure? Were the original criteria used to evaluate the intervention?

#### **Long Term Outcomes**

1. Was the project a success or failure?
2. What determined if the project was a success or failure?
3. Did the intervention lead to project success or failure? Was the project outcome reviewed, and were lessons learned from the experience captured? If so, by who and how was it shared? If not, why not?

**Appendix B – Failure Factors in IS literature.**

Modified from Dwivedi et al. (2013; Hughes et al. (2016)

<b>Failure Factors</b>	<b>Reference</b>
Project: Size and Value; Uniqueness; Density of Project; Life cycle; Urgency	(El Emam and Koru 2008; Ewusimensah and Przasnyski 1991; Nelson 2007)
Team (Covers Project team and Project manager Characteristics): Turnover; Staffing build-up; Knowledge; Motivation Levels	(Lyytinen and Robey 1999; Nelson 2008; Verner et al. 2008; Wallace et al. 2004)
Project Team: Technical background; Communication Skills; Commitment	(Ewusi-Mensah and Przasnyski 1994; McManus and Wood-Harper 2007; Myers 1994)
Absence of an influential champion and Change Agent	(Yeo 2002)
Improper definitions of roles and responsibilities	(McManus and Wood-Harper 2007; Schmidt et al. 2001; Schmitt and Kozar 1978)
User: User conflicts; User involvement and Commitment	(Schmidt et al. 2001; Wallace et al. 2004)
User Resistance: Lack of Felt Need; Uncertainty; Lack of Involvement in Change; Personal Characteristics	(Conboy 2010; Ewusi-Mensah and Przasnyski 1994; Ginzberg 1981; McManus and Wood-Harper 2007; Yeo 2002)
Conflict between user departments: Failure to manage end-user expectations	(Ahn and Skudlark 1997; Ewusi-Mensah and Przasnyski 1994; Ginzberg 1981; Lyytinen and Hirschheim 1987; Schmidt et al. 2001)
Goal: Goals are ambiguous, too narrow, and conflicting	(Lyytinen 1987)
Ambiguous business case and unclear vision; evaluation	(Pan et al. 2008; Peppard and Ward 2005; Sauer et al. 1997; Yeo 2002)
Resources (Economic): Staffing and Skill gap; Budget; Time and Money gap	(Benschop et al. 2020; Conboy 2010; Jones 2006; Kawamura and Takano 2014; Keil et al. 1998; Nelson 2008; Pan et al. 2008; Verner et al. 2008)
Unrealistic Time Frame	(Conway and Limayem 2011; Ewusi-Mensah and Przasnyski 1994; Yeo 2002)
Requirement: Conflicting system requirement; Difficulty in defining input and output	(Wallace et al. 2004)
Weak definitions of requirements and scope; incomplete specifications when the project started; Consultant/vendor underestimated the project scope and complexity	(El Emam and Koru 2008; Keil et al. 1998; Nawi et al. 2011; Pan et al. 2008; Verner et al. 2012; Yeo 2002)

Misunderstanding the user requirements; Lack of frozen requirements; Changing scope and objectives; Incomplete Requirements and Specifications; Changing Requirements and Specifications	(El Emam and Koru 2008; Kawamura and Takano 2014; Nelson 2007; Schmidt et al. 2001)
Planning and Control	(Kawamura and Takano 2014; Pan et al. 2008; Philip et al. 2009; Schmitt and Kozar 1978; Verner et al. 2012; Wallace et al. 2004)
Failure to apply essential PM practices; Lack of effective PM methodology; Lack of effective PM skills	(Keil et al. 1998; McManus and Wood-Harper 2007; Nelson 2007; Sausser et al. 2009; Schmitt and Kozar 1978; Verner et al. 2008)
Preoccupation with Technology in project planning; Technophilia	(Goldfinch 2007; Yeo 2002)
Reactive and not proactive in dealing with problems; Inadequate project risk analysis; Incorrect assumptions regarding risk analysis	(Keil et al. 1998; Pan et al. 2008; Verner et al. 2008; Yeo 2002)
Technology and Technological High risk restricts choices; Technology Gap; Inappropriate Technology; Ignorance of IT	(Keil et al. 1998; Lyytinen 1987)
Technology Focus over human relations	(Yeo 2002)
Technology Illiteracy; Chosen technology changes	(Nawi et al. 2011; Nelson 2007)
New Technology failure	(Schmidt et al. 2001)
External Environment: Economy Political; Social; Nature, Client Competitor	(Lyytinen 1987)
Changes in design specifications later in the project; Involves a high degree of customization	(Yeo 2002)
Organization/Organizational Environment	(Lyytinen 1987; Verner et al. 2008; Wallace et al. 2004)
Top management support; Project organizational structure; Functional managers' support	(McManus and Wood-Harper 2007; Nawi et al. 2011; Schmidt et al. 2001; Yeo 2002)
Management Development; Motivation; Culture and Feedback	(Conboy 2010)
Hostile Company Culture	(Yeo 2002)
Top-down management style	(Yeo 2002)
Managerial Influence; Poor stakeholder management	(Keil et al. 1998; McManus and Wood-Harper 2007; Nelson 2007; Sauer et al. 1997; Yeo 2002)
Learning: Educational Barriers; Organizational Intelligence; Disincentives for Learning	(Lyytinen and Robey 1999)
Managers ignore best practices and lessons learned	(Bartis and Mitev 2008; Nelson 2007)
Not managing change properly	(Irani et al. 2001; Markus 2004; Peppard and Ward 2005)

Conceptual Problem	(Lyytinen and Hirschheim 1987)
Complexity Problem	(Lyytinen and Hirschheim 1987; Wallace et al. 2004)
People Problem	(Lyytinen and Hirschheim 1987)
Factors Related to the Project Manager	(Davis et al. 1992; Dwivedi et al. 2013; Nawi et al. 2011; Nelson 2007; Philip et al. 2009; Verner et al. 2008)
Communication; Workforce management conflicts	(Irani et al. 2001; Yeo 2002)
Outsourcing; More than one supplier; Poor Selection decision	(Schmidt et al. 2001; Wallace et al. 2004; Yeo 2002)

**Appendix C - IS Success Literature**

Author(s)	D&M IS Success	CSF	Findings
Al-Mashari, et al. (2003)		x	Novel taxonomy of the critical success factors in enterprise resource planning (ERP) implementation process. Based on Setting up, Implementation, and Evaluation.
Biehl (2007)		x	CSFs: Top management support, BPM, cross-functional team cooperation/communication, Vision of the project/understanding goals, OCM, Training, Data accuracy, user attitude, IS Staff capability, and sufficient financial resources.
Delone and Mclean (1992)	x		<ol style="list-style-type: none"> <li>1. As these research studies show, the I/S researcher has a broad list of individual dependent variables from which to choose.</li> <li>2. Progress toward an MIS cumulative tradition dictates a significant reduction in the number of different dependent variable measures so that research results can be compared.</li> <li>3. Not enough MIS field study research attempts to measure the influence of the MIS effort on organizational performance.</li> <li>4. The six success categories and the many specific I/S measures within each category clearly indicate that MIS success is a multidimensional construct and should be measured as such.</li> </ol>

Delone and Mclean (2003)	x		<ol style="list-style-type: none"> <li>1. Original Model was validated</li> <li>2. updated model is useful for e-commerce</li> <li>3. service quality is an important dimension of success (Pitt et al. 1995)</li> <li>4. It is important to measure possible interactions between these dimensions</li> <li>5. IS success measures are contingent on the objectives and context of the investigation</li> <li>6. Attempt to made to reduce the number of measures used for IS Success</li> <li>7. System use is a critical dimension</li> <li>8. More field research should be conducted to incorporate net benefits.</li> </ol>
Doherty and King (2001)		x	Organizational issues are not perceived to have been successfully treated in the majority of information systems development projects. Senior IT executives must also ensure that the treatment of organizational issues is given adequate time, resources, and, perhaps most importantly, the highest level of priority.
Doherty et al. (2012)		x	<p>IS must transition from CSF to measuring benefits</p> <p>From identifying goals and objectives to detailed benefits planning</p> <p>From project management to the management of transformation</p> <p>From well-balanced project teams to coherent governance structures</p> <p>From user participation to stakeholder-enabled benefits realization</p> <p>From rigorous software testing to ongoing benefits review</p>
Fincham (2002)			<p>In both case studies, ‘success’ and ‘failure’ in systems development were articulated as signs that objectified these narratives and allowed actors to share in experiences. The cases thus provide examples of two distinct types of narrative change: (i) change within an existing narrative as it is rewritten by the actors involved, and (ii) change between narratives, or a switch from failure to success</p>
He and King (2008)		x	User participation is beneficial in ISD.

Holland et al. (1999)		x	standard project management CSFs, such as top management support and a clear business vision, factors specific to ERP implementation—such as legacy systems, ERP strategy, business process change, and software configuration—have a critical influence on the implementation process and outcome.
Jennkins et al. (2019)		x	Developed theoretical model of mutual understanding (MU) and project success  Emergent model describes relationships among project management mechanisms, cognitive activities (sensegiving, sensemaking), stakeholder groups, and MU within and across projects and how MU affects project success.
Jeyaraj (2020)	x		1. Constructs in DM1992 and DM2003 have been interchangeably used in empirical studies. 2. Studies have generally not examined all proposed relationships in DM1992 or DM2003 3. non-uniformity in the application of the DM models, 4. inconsistencies in the roles of ISS dimensions and the variability in findings involving relationships between ISS dimensions
Kim and Pan (2006)		x	Developed process model for CRM IS implementation based on critical success factors
King and Burgess, (2006)		x	Created a dynamic CSF model wherein individual CSFs are linked in causal chains.
Li (1997)		x	Classified CSFs into eight different dimensions.  Top five important factors, as perceived by the IS managers, are accuracy of output, reliability of output, the relationship between users and the Is staff, users' confidence in the system, and timeliness of output.  The five least important factors are the chargeback method, volume of output, competition between IS and non-IS units,

			features or computer language used, and job effects of computer-based support.
Milis and Mercken, (2002)		x	1. Scope/objectives/goals: defined and agreed upon. 2. Criteria for judging success: defined and agreed upon. 3. Business alignment.
Nandhakumar (1996)		x	Illustrate limitations of success factors better understanding of the relationship between key success factors and EIS development is required if success factors are to be of any guidance to the practitioners to develop effective information systems.
Petter et al. (2008)	x		Empirical support for Delone and Mclean Model
Petter et al. (2012)	x	x	History of IS Success Model and CSFs
Petter et al. (2013)	x		Identified 43 specific variables posited to influence the different dimensions of IS success, organized into five categories: task, user, social, project, and organizations. Identified 15 success factors that have consistently been found: Enjoyment, Trust, User Expectations, Extrinsic Motivation, IT Infrastructure, Task Compatibility, Task Difficulty, Attitudes Toward Technology, Organizational Role, User Involvement, Relationship with Developers, Domain Expert Knowledge, Management Support, Management Processes, and Organizational Competence.
Plant and Willcocks (2007)		x	Identified which stage in the software lifecycle CSFs are important.
Poon and Wagner (2001)		x	Companies either get all CSFs right or get almost all wrong Meta success factors are championship, availability of resources, and link to organization objectives.

Rademacher (1989)		x	Measured the "criticalness" of the top 18 CSFs
Rai et al. (2009)		x	Cultural differences, with the exception of power distance, both big and small, influence objective (cost overruns) and subjective (client satisfaction) measures of offshore IS project success.
Rai et al. (2002)	x		The fit estimates provide mixed signals concerning the goodness of fit of the DeLone and McLean structural model  Validated importance of using an integrated, multi-construct dependent measure of IS success that considers beliefs, attitudes, and behaviors, as opposed to using a unidimensional success measure or one that does not consider interdependencies between elements of IS success
Salmeron and Herrero (2005)		x	Technical elements are less critical than information and human factors, and adequate knowledge of the information requirements of users is the most important critical success factor related to executive information systems (EIS) It provides a method for ranking critical success factors and allows a consistent measure of results.
Segars and Grover (1998)		x	Identified over 50 SISP objectives were identified, narrowed down to 28, then three broad dimensions- alignment, analysis, cooperation, and planning capabilities. Developed and assesses construct measures -while each of these dimensions is distinct, success along one implies success along with the others. - constructs are independent in their prediction of SISP success
Singh et al. (2011)		x	Projects with greater internal cohesion (cohesion among the project members) are more successful.
Smithson and Hirschheim (1998)			IS evaluation is still an issue. Managers need to evaluate new IS, both before and after their introduction. Application of the evaluation framework can provide managers with useful insight into problem situations concerning IS outsourcing.

Somers and Nelson, (2001)		x	22 Success factors. ERP CSFs—Identified the top 10 CSFs
Umble, E., Haft, R., and Umble, M. (2003)		x	Clear understanding of strategic goals, a commitment by top management, excellent project management, organizational change management, great implementation team, data accuracy, extensive education, and training, focuses performance measure, 13 Step selection process, 11 steps for successful implementation
Urbach et al. (2009)	x		D&M success model was the most popular, then qualitative, empirical, assessing types of IS.
Wang et al. (2008)		x	The internal and external aspects must be aligned to implement an ERP system successfully.
Ward and Elvin (1999)		x	Developed a management framework that addresses the increasingly complex range of issues affecting IT-based change initiatives.
White and Leifer (1986)		x	Top Successful Design team characteristics are Technical Knowledge, Good Communications Skills, Analytical Skills, Knowing the Business, and Initiative and flexibility.
Xia and Lee (2005)		x	Developed a 15-item measurement of ISDP complexity Second, the measures developed in this study can be used to assess and manage the complexity of ISD projects in the early planning stages and during the implementation
Yap et al. (1992)		x	(1) IS success is positively associated with consultant effectiveness, level of vendor support, length of the small business's IS experience, the sufficiency of financial resources, level of CEO support, and level of user participation, and (2) CBIS success is not associated with the number of administrative applications nor the presence of a programmer/systems analyst.
Zmud, R. W. (1980)		x	Software development problems can be traced to the uncertainty inherent in such endeavors. The two most direct strategies for achieving more effective management of software development are to reduce the absolute amount of uncertainty within a project and to

			facilitate the information flow to decision-makers confronted with uncertainty
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## *Appendix D – Event Descriptions*

### **System A Event Descriptions**

#### **No Funding to Start Project (Event a1)**

##### **Description**

###### *Incident - No Resources to Start Project*

The top manager of the agency directed the project to start the project, but there were no resources allocated to the project.

###### *Intervention –Reallocation of resources*

To start the project, the executive office reallocated resources from other projects internally.

Then used, top managers from operations and funding domains petitioned for the reallocation of resources from agency internal projects.

###### *Outcome -Success*

The project office received \$7 million of reprogrammed funds to award the prototyping agreement.

###### *Distress*

"We didn't have any money to award this contract or agreement."

###### *Structures*

###### *Social*

- A top manager of the agency provided "top cover."

- The project office worked with senior leaders in operations and funding proponents to receive the required resources from Congress.
- Team of "basic volunteers"

*Organizational* – Funding, Internal budgeting, and reprogramming processes

*Environmental* – Culture of taking risks, bending the rules based on Senior leader demands.

## **Pressure to Execute Quickly (Event a2)**

### **Description**

#### ***Incident – Pressure to Execute Quickly***

[Top manager] puts pressure on the project to deliver capability. He desired to complete the project prior to his departure.

#### ***Intervention – Other Transaction Authority***

To execute quickly, the project office used Other Transaction Authority (OTA) instead of a traditional business system model. The OTA process allows vendors to have input into the system requirements. Additionally, the project office procured the data platform as "software as a service" to decrease the required documentation. Lastly, the project office partnered with the contracting agency to "remove a lot of fluff" and streamline the process.

#### ***Outcome – Success***

- Awarded prototype agreement in 14 weeks.

#### ***Distress***

The distress in this event was seen by the project office to execute every portion of the acquisition process quickly to finish the project prior to the [top manager] leaving. However, the project office has stated that this pressure improved them, forcing them to partner with organizations and streamline processes.

- "the biggest one was the, the pressure to deliver this capability, like, in, an extremely fast manner."

- “So, we actually, again, I think it made us better. Because we were able to streamline a lot of things that we probably wouldn't have had we not had 14 weeks to award of initial prototype contract.”

### *Structures*

#### *Social*

- Used a small creative team and worked "crazy hours" to award initial agreement.
- Partnered with the contract organization to streamline processes
- Top managers pressured the project office to execute quickly.

#### *Organizational –*

- Streamlined contracting processes were used to award the agreement quickly
- "Software as a service" was a novel process in this context.

*Environmental –* agency culture pressing projects to execute faster than possible.

## **Project Restart (Event a3)**

### **Description**

#### ***Incident – Expanded Requirements***

The initial requirement was for a readiness dashboard. During the original solicitation, the project champion visited a major oil company to tour its operations center. When he returned, he stated, "We got [the requirements] wrong" and wanted to go beyond readiness data to all organizational data. The project champion directed the project team to change the requirement drastically.

#### ***Intervention – Restarted Project***

To change the requirement from readiness data to all organization data, the project team has to "hit the reset button" and recomplete the solicitation. To maintain industry trust, the project office developed a new strategy to develop a "true partnership" with industry. This allowed industry to influence the requirement. Moreover, the project champion invited all the big consulting firms to meet with him to explain the problems he was trying to solve. Lastly, the project team held an industry day to meet with companies one-on-one to gain feedback on the requirements, acquisition approach and to hear about their proposed solution.

#### ***Outcome - Success***

The intervention was a success. The project team developed a partnership with industry that led to the development of requirements and a subsequent platform that "exceeded everyone's expectations."

## *Distress*

Before the project champion changed the requirement, the project office met with senior organizational leaders to present them with the results of the source selection. When the senior leaders saw the results of the source selection process, they walked out of the room, stating that the project office "missed the mark." This led to a series of meetings with the project champion to agree on the final high-level requirement, which was all organizational data. Moreover, the project champion was upset that the project office had "wasted time."

Lastly, due to the new requirement, the project office knew that the new direction would create significant changes to the solicitation requiring them to start over.

## *Structures*

### *Social*

- The project champion's partnership with industry allowed him to visit the oil companies' operation center and have all the big consultant companies' CEOs, COOs, or CIOs attend a meeting with him.
- The project champion used his power to halt a solicitation and start over.

*Organizational* – The government contracting rules forced the project office to halt the solicitation and start over.

*Contextual* – The project champion was due to rotate out of the position, which added pressure on the project office to complete the project.

## **Department's Competing Platform (Event a4)**

### **Description**

#### ***Incident – Competing Platform***

While the governmental agency was developing its data platform, the department built its own big data platform. During this time, the department issued a policy saying "thou shalt use" their platform. Even though the systems are both big-data platforms, they are used very differently. This creates confusion among top management personnel, leading them to threaten to cancel the project.

#### ***Intervention – Top Management Advocacy***

To address this incident, the agency has agreed with top management personnel at both the agency and departmental levels on how to proceed. This agreement was brokered by two top executives at the agency level. The agency Chief Data Officer used his relationship with the department's Chief Information Officer to push back on the department's directive. Additionally, he has convinced the department CIO about the benefits of the agency's platform. The department CIO was quoted in a new article stating he "loves what the agency is doing." Additionally, another operations-based executive in the agency is working with both platforms to provide "consistent data to both [agency] and [department] leaders."

#### ***Outcome – Success***

The intervention was a success. The agency implemented its data platform and "reports approved curated data to the [department's platform]." Additionally, the project office is "making process with our counterparts."

## ***Distress***

Project distress is decreasing; however, the "mere presence of [platform] and most folks misunderstanding of our capabilities versus their capabilities [...] is a problem on a regular basis that we find ourselves trying to explain to senior leaders on a regular basis." During this time, the project office constantly defended itself and argued why its platform differed from the departments. The interviews described this as always being in a fight.

## **Structures**

*Social-* agency CDO and operations executive used his relationship with the department to keep the agency's platform by advocating for the project.

*Organizational* – Intervention used data brokering as a way to meet the demands of both the agency and department.

Context – agency operates in a resource-constrained environment and has a culture of consolidating information systems

## **Selected Expensive Vendor (Event a5)**

### **Description**

#### ***Incident - Selected Expensive Vendor***

During the system's procurement, the acquisition strategy specifically said the agency was looking for the overall best capability and was not interested in the lowest price. The project office selected an expensive vendor characterized as "sticker shock" to top managers. Moreover, this is exacerbated by the difficulty of explaining "what good software costs."

#### ***Intervention – Stakeholder Management/ Advocacy***

Developed funding profile and provided documentation to identify the project objectives clearly. Additionally, they worked with stakeholders and top managers to communicate the value of the system

#### ***Outcome – Success***

The system was implemented but has adjusted the solution to meet changing funding profiles.

#### ***Distress***

Since the vendor was expensive, the project office was continually defending the project and was aware of the funding limitations of the agency.

- "Constantly in the back of our minds."
- The project office was aware of funding limitations prior to the selection
- "Knowing that you are going to have to justify the cost premium...gearing up."
- "Caused a lot of stress internally."

- "We didn't know where the [agency] was going to...or if they are going to push back, and we have to start from scratch again."
- "Felt responsible, like we had to get this done."

### *Structures*

#### *Social*

- Used stakeholders to communicate value to top managers
- The talented team felt the responsibility to "get this done."
- Leveraged industry partners to support staff

*Organizational* – Funding/budgeting process

*Environmental* – Lack of understanding of the cost of the technical solution to solve the problem.

## **Lack of Proper Data Skills (Event a6)**

### **Description**

#### ***Incident - Lack of Proper Data Skills***

Once the prototyping effort was near completion, and the project office was trying to attain data experts to help the vendor build data models, the project office found that the agency didn't have any personnel with experience working in more than one domain. E.g., personnel, logistics, finance, etc. Yet, the project required personnel with experience across all data domains for the vendor to build the data models.

#### ***Intervention – Hired Data Expert***

The project office used its primary executive's professional contacts to hire one of the best data scientists in the agency. The executive trusted this data scientist personally and professionally to solve the problem of hiring and training cross-domain data scientists. The hired data scientist had 20 years of experience in multiple data domains, and having the support of the senior executive created immediate trust in the team

The new data scientist:

- Translated data from potentially German acronyms to "human readable" terms
- "Sewed together a corpus of data in one place... knocking down barriers by providing access and understanding."
- Made data visible and accessible to encourage cross-domain usage, creating a cross-domain experience.

- Organized internal team members to be in charge of one specific domain, then worked with other domains to provide consistency with points of contact to answer questions from other domains.
- Developed staff meetings for all domains to help spread cross-domain knowledge.

Lastly, the agency created a software factory to train employees in cross-domain data applications.

### ***Outcome – Success***

The agency's employees are increasing in cross-domain proficiency and individual domains, augmenting their data with other functional area data. E.g., logistics personnel using personnel data to analyze and make decisions.

- "I think I've gone way up that learning curve; I can speak their language, and I can communicate with [stakeholder]. I can understand when they're trying to pull things over our eyes, right? I can call them things. So, I again, I think I'm even more uniquely qualified than then even I was before."
- "We've sort of been able to build that mindset and that skill set of people who know data across different domains."
- "It's building that skill set now of people, not just stove piped to one domain."

### ***Distress***

The project office was about to begin prototyping and required data expertise but didn't have data experts.

Data was not readable or understandable, preventing data experts from gaining cross-domain skills.

### ***Structures***

#### *Social* –

- The executive's professional relationship provided access to data expertise.
- The new data expert used his previous experience to engage with stakeholder organizations.

*Organizational* – agency hierarchy limits access to other data domains to create experience across stove-piped organizations.

*Environmental* – Culture in the agency prevents employees from admitting to a lack of expertise, preventing organizations from accepting support.

## **Data Owners Cooperation (Event a7)**

### **Description**

#### ***Incident – Data Owners Cooperation***

The project required all the agency's data to meet the project's requirements. However, data owners did not want to share/provide their data or use the platform.

"they were vehemently opposed to using the [agency platform]."

#### ***Intervention – Issued Executive Order***

Since the data owners would not cooperate with the project office, the project requested that their "champion" issue an executive order to force the data owners to cooperate. This forced the agency to develop a data strategy and governing body to monitor and hold data owners accountable for providing their data to the project office. Additionally, the executive order contributed to two senior managers serving as advocates for the project. Lastly, the executive order established functional data stewards to "allow for open dialogue and create consistent and constant feedback loops."

- Implemented executive order saying that the [project champion] wanted all agency data in the [platform]. "All means all." "Thou shall support this effort."
- Installed a "data board" to track
- Applied pressure on data owners, not wanting the [Top Manager] to know they were not giving their data.
- Senior leaders had to convince data owners to deliver their data

- "[Top Manager] thing. I know it's bad, but no one's going to fix it until they know I'm looking at it."
- Developed [agency] Analytics board and named functional data stewards
- Used [top managers] to be a "vocal advocate."
- Advertised project as a "data asset."
- "we've had to get [agency] chief data officer to come in over the top, but mostly it's been around access to data."
- Set up workshops for the functional data stewards and data owners with the vendors to allow for open dialogue, and create consistent and constant feedback loops

### ***Outcome – Success***

The project office currently has access to all agency data

### ***Distress***

Distress was seen in this incident because the people with authority to provide data were unwilling to share the data. If the project did not have data to manage or analyze, then the project would fail. This distress was compounded because of the pressure from the top manager to execute quickly and the high-level managers that would view the poor data quality.

"biggest stress of the whole project was in the very beginning. Because, again, we're the first project to ever go to every system across the [agency], no matter what domain, and say, give me your data. And they're like, Oh, we don't do that."

"challenge with [project] is the people that own the data, not sharing the data, right, that's really that's really the been the biggest one."

Data owners do not want to share their data because they are embarrassed by the data quality issues.

- Data owners did not want to lose the ability to adjust their data manually before senior leaders saw it
- “uncovered really bad data, really bad things about organizations more than common cyber threats.”
- “Memorandum of Understanding with Human Resources organizations saying we will give you the data, but they must approve the use of it to make decisions.”
- "pulling [data owners] kicking and screaming”
- "high turbulence, high-stress thing"

### ***Structures***

*Social* – Stakeholders were advocates for the project and added pressure on other senior leaders

*Organizational* – used the EXORD process to force data owners to share data, then held them accountable through the [agency] data board

*Environmental*- agency culture of hiding negative information

## **Defining Authoritative Data (Event a8)**

### **Description**

#### ***Incident – No Definition of Authoritative Data***

The project office was trying to identify what "all [agency] data" means. However, a list of authoritative data did not exist. Initially, the project office was told there were more than 1100 authoritative data sources based on a self-nomination system, but the list could not be produced. Additionally, there was no governing body to determine what data from each system was considered authoritative.

#### ***Intervention – Defined Authoritative Data***

The project office used an executive order to establish [agency] data board and identify data stewards to validate authoritative data.

- Data stewards are responsible for an entire functional area's data. E.g., logistics, finance, human resources

#### ***Outcome – Success***

The project office leverages the [agency] data board and data stewards to identify and define all authoritative data

#### ***Distress***

The project had a requirement to include all authoritative data but was unable to identify all authoritative data.

#### ***Structures***

*Social*

- Used top management to issue a directive to identify and define authoritative data
- Used top managers to monitor and pressure data owners and stewards to identify and define authoritative data.

*Organizational*- Executive order process to define governance structure and data stewards

*Environmental* – Need for formal orders and governance boards to organize data

## **Other Transaction Authority Approval (Event a9)**

### **Description**

#### ***Incident – OTA Approval***

The project office was required to get approval for their acquisition approach. However, the department or agency had never approved enterprise-level software as a service other than Microsoft Office. Moreover, the project office's acquisition strategy used Other Transaction Authority (OTA). The approval for the OTA was at the department level because it was over \$500 million. However, the agency authority wanted to sign off on the document and wanted the contract amount to be under \$500 million, so he forced them to change the contract to 4 years instead of 5 years.

#### ***Intervention – Parallel Processing***

The project office originally went around the agency-level authority to the department level. The project office then staffed both department and agency authority documents in parallel. Lastly, the project office utilized the agency acquisition attorney, with whom they had a previous relationship, to fast-track legal approval of documents to not slow the project

#### ***Outcome – Success***

OTA was awarded one day prior to the contract extension deadline.

#### ***Distress***

The agency authority was upset that the department-level authority signed the acquisition approach.

The project office was directed to use a shorter contract than what was approved at the department level.

The change in approach would extend the contracting beyond the negotiated timeline between the project office and the contractor.

The agency staff was not worried about the project timelines.

### ***Structures***

*Social* – The project office used their previous relationship with the senior agency lawyer to facilitate the approval of legal documents.

*Organizational* – Contract/dollar thresholds were implemented to create controls on large OTA processes.

*Environmental* – The project office had to navigate between the department and agency-level organizations on who would sign the approval for the OTA.

## **No Funding for Production (Event a10)**

### **Description**

#### ***Incident – No Funding for Production***

Once the prototyping period was complete, the project attempted to award the production contract. However, "the government did not have funding to support the production level contract." If the initial prototyping contract expired, the contractor would have to cease work and potentially dismiss employees.

#### ***Intervention –Prototype Contract Extension***

To intervene, the project and contracting offices extended the prototype contract until Congress approved the funding. This required the project office to negotiate with the contractor over the contract extension based on the work to be completed with limited funding. Moreover, the project office contacted the contractor as an "industry partner" to help alleviate the distress.

#### ***Outcome – Success***

The contract extension bridged the period required for the agency to secure funding. Once funding was allotted, the production contract was awarded.

#### ***Distress***

- "We spent countless, countless hours building PowerPoint briefs to justify why we needed additional funding during the prototyping period, and then countless PowerPoint briefs to convey what our cost estimate was for our production contracts moving forward; there was a lot of convincing that had to be done internal [agency], because essentially,

they were taking money from other projects and repurposing it to support this new [project]."

### *Structures*

#### *Social*

- Industry partnership was required to extend the prototyping contract and complete future work.
- Senior Leader involvement was required to reprogram funds from Congress.

#### *Organizational*

- OTA allowed project flexibility and open dialogue with vendors to negotiate the contract extension.
- The reprogramming process allowed the [agency] to reallocate funds internal to the agency.

#### *Environmental*

- agency culture to defend project to financial managers.

## **Authority to Operate (Event a11)**

### **Description**

#### ***Incident – No Authority to Operate***

The project office was not able to gain the authority to operate (ATO) on the agency's network when it was needed for the contractor to continue development. This was the first time the project and executive offices applied for an enterprise-level ATO and had a short deadline.

#### ***Intervention – Established Internal Responsibility***

The project office technical lead took responsibility for finding the failure points in the process between all the internal and external organizations. It started "putting pressure on those failure points by holding them accountable." The project office worked with the contractor to agree to a no-cost extension to keep the system turned on to help the project office build artifacts needed for the ATO. During this time, the acquisition team worked with the contractor to develop a performance work statement for production.

#### ***Outcome – Success***

The project office received the ATO prior to the deadline and awarded the production contract.

#### ***Distress***

The office was forced to use higher organizational staff to develop an enterprise-level ATO. The "[external staff] was not concerned about our timeline ...we were running up against a deadline" Additionally, the higher-level organization CIO acted more like a CTO and was not paying attention to this effort. The staff didn't want to help, and it became a "blaming game."

The contractor gave the project office a deadline and said they would turn off the system if

## *Structures*

### *Social*

- Industry partnership: Used their relationship with the contractor to develop contracting and ATO intervention
- A project team member took overall responsibility for ATO and managed the process at higher levels.

### *Organizational*

- Contracting processes for the no-cost extension.
- ATO process

*Environmental* – Culture of managing organizational established timelines and not project requirements

## **Project Manager Leaves (Event a12)**

### **Description**

#### ***Incident – Project Manager Leaves***

The original project manager left the organizational mid-project between the prototyping and production phases. The project manager was:

- "motivational and empowering, like you want to work for him."
- "He was amazing, had great ideas, and is always thinking outside the box of how to push the lines contracting-wise."

#### ***Intervention – Created Project Continuity***

Since the project manager leaving was not a surprise, the office planned for it by hiring more technical support, implementing daily standups, and creating an organizational process to increase communication. Additionally, the new project manager empowered the deputy project manager and assessed how he could best help the project without "getting in the way."

The main component of the intervention was to establish continuity by keeping the Deputy Project Manager on the project. The deputy was on the project from the beginning and was knowledgeable in both the acquisition and technical-related issues.

#### ***Outcome- Success***

The new project manager came in at the "perfect time," and "we had the right people in the right roles at the right time" When the project manager left, the "battle rhythm continued. We were in lockstep." Additionally, the project office had cohesion and continuity. One interviewee stated, "They had a really good handoff."

### ***Distress***

The office knew the project manager was leaving, but there was a change in the office dynamics based on the new leader's leadership style. "Team morale was impacted initially but recovered."

In this event, the distress was perceived prior to the actual incident. After the project manager left, the distress continued only briefly.

- "There was a dynamic within the office a little bit."

### ***Structures***

*Social* - Team cohesion and continuity

*Organizational* – Personnel transitions periods in the organization

*Environmental* – Culture of constant turnover in the leaders of the agency.

## **Threat to Budget Cuts (Event a13)**

### **Description**

#### ***Incident – Threat to cut the budget***

Congress and top agency executives consistently threatened to cut the project office's budget because they thought it was too expensive for a "dashboard."

#### ***Intervention – Re-Branding***

To address these threats and "secure funding," the project office changed its name and attempted to re-brand itself as a data management platform to transform the agency's decisions.

Additionally, the project office wanted to change the perception of top executives by marketing that the tool was not just a senior leader tool but an "all [agency] tool."

#### ***Outcome - Failure***

The project office stated that they think the re-branding effort did not help their ability to secure funding, and their budget was cut in the most recent presidential budget.

#### ***Distress***

Distress in this incident was based on continuously defending the cost of the system and the process.

Defending the cost of the system.

- "Cost still becomes a huge sticking point between the [agency] and [contractor]."
- Hard to defend the "large price tag."

- "we've struggled is it's expensive." It's hard to monetize and provide an ROI for better, faster decisions.
- New people are introduced into the budgeting process, and "the conversation starts all over again."

Top Management not understanding the system or the process

- Congress still doesn't understand software as a service. "They still don't know what they are actually getting."
- "[agency] wants to be able to compare what they are buying to other things out there."

[Platform] was the first project of its kind. Big data project and software as a service.

### ***Structure***

*Social* – Project team members' desire to fight for project funding in the name of honor for your senior leader.

*Organizational* – The funding process is based on the top executive's perception of priorities and ability to justify the cost of the system against other priorities

*Contextual* – Government culture of fighting the hardest for funding.

## **Executive Turnover (Event a14)**

### **Description**

#### ***Incident – Executive Turnover***

The project's senior executive and project champion left the organization, as well as different senior staff members.

#### ***Intervention – New Project Champion***

The project office developed a new project champion by convincing a senior leader to be a pilot case. Additionally, the new project champion provided resources that mandated the platform's development for the new senior executives' visions.

The project office developed a straightforward narrative that could be used for multiple briefings. They focused on documenting previous briefings and decisions to each senior stakeholder to remind leaders of previous decisions. Moreover, they were proactive in "squashing repetitive questions."

#### ***Outcome- Success***

The new project champion gained senior and junior leader buy-in and automated monthly reviews saving approximately 500-man hours a month.

"We didn't need [senior leader] to push them because they want it themselves."

#### ***Distress***

The new senior executive had a different vision for the project and the use of data for decisions, changing the project objectives.

The project office had to constantly brief new leaders as they switched in and convince them to "get on board." However, in order to get to the senior leader, the office would have to brief numerous people in the organization up the organizational chart. "It was frustrating and time-consuming."

"We got to keep pounding; we can't take our foot off the gas."

### ***Structures***

#### *Social*

- Gaining a new project champion was not mandated but was pursued by the project office.
- Team persistence to "keep going."
- Keeping stakeholders and top managers informed.

*Organizational* - Shift between top-down mandate and bottom-up value

*Environmental* – Disconnect between senior and junior managers. Apart from senior leaders mandating the system, the office had to show value to lower-level managers.

## **Data Access (Event a15)**

### **Description**

#### ***Incident – No Cross-Domain Data Access***

The project office was unable to give cross-domain data access to individual domain users. For example, different data domain experts wanted to use human resource data to augment their analysis but were unable to because of a lack of access.

#### ***Intervention – Create Default Viewable***

The project office changed the data vernacular in the agency by using the terms default viewable and default discoverable. Default viewable is when users have default access to the data set.

Default discoverable is when users can see that the data set exists but need to request access to view data. The project office petitioned the data governance board and the Chief Data Officer to change the data access policy for the agency.

- Chief Data Officer/Chief Analytics Officer is the primary advocate for the project.
- The CDO influenced his counterparts to move the organization's culture to better access to data.

#### ***Outcome – Success***

The CDO made a "declaration in the meeting...I approve what was briefed, and if anyone has an exception or issue with that decision, speak now." The CDO waited 30 seconds and slapped the table, making the decision.

#### ***Distress***

Overly conservative default access policies prevented access to different data domains.

"This is the right thing to do, don't let the bureaucracy get us down."

***Structures***

*Social* – Senior Leader involvement: CDOs influenced counterparts to move the agency in a direction that favors default data views.

*Organizational* – The project office used the data governance board to address the incident

*Environmental* – The culture of overly conservative policies with data access prevented the use of cross-domain data.

## **Demand for New Requirements (Event a16)**

### **Description**

#### ***Incident - Demand for New Requirements***

The system experienced overwhelming success, and the project office could not keep up with the demand for new requirements. This created contractual issues and project issues. Contractually, the vendor could only perform a certain amount of work at a time based on the agreed-upon lines of effort. Moreover, the project office was unable to perform foundational data work.

- "We were having problems keeping up with how many people wanted it...it sold itself."

#### ***Intervention – Requirements Management Process***

The project office leveraged the [agency] Data Board and [agency] Analytics boards to manage and approve new requirements through lines of effort. Additionally, they trained operation researchers to use the system and carry the "message" to the rest of the force. Lastly, they established a community of interest to help data managers meet their requirements.

#### ***Outcome – Success***

Requirements are managed through the governing process, and the operations researchers meet their requirements and "carry the message."

#### ***Distress***

Distress is experienced as persistent struggling.

- "We were having problems keeping up with how many people wanted it."

- The project office is trying to gain "wins" by performing new work but is struggling to keep up with foundational programmatic data work

### *Structures*

#### *Social*

- Talented team to "train the trainer."
- Stakeholder involvement in providing trainers. "Constantly involved with stakeholders on building these things out."
- Industry partnership to "surge" resources when needed.

#### *Organizational*

- Contract flexibility to allow the contractor to "surge" resources
- Governing body to manage lines of effort

*Environmental* – Past project success at a "high-performing" organization led to more demand.

## **Budget Cuts in Program Objective Memorandum (POM) (Event a17)**

### **Description**

#### ***Incident – Budget Cuts***

The platform's budget was cut in the 2023-2024 POM.

- "we've already been told we're going to receive less funding."
- "tri-chair letter signed in the fall about maybe three weeks ago that said, we are cutting the funding from [Project A]."

#### ***Intervention – New Development Strategy***

To survive the budget cuts, the project office developed a new strategy to support reimbursable work, reduce costs, and work with the contractor to defend the project's ROI to top managers.

- "So, with the recent cuts, we've been, we've had to become very creative."
- Identified places where the agency could repurpose funds and save money.
- New development strategy to make work reimbursable by putting the project into sustainment. "No more 'free chicken'"
- Re-competed Contract, structure as a service.

To accomplish this, the project office developed a governance process within the executive order's data board to prioritize reimbursable work from different customers. Additionally, they highlighted the success stories of the new model.

- [Organization] piloted reimbursable model; [leader] toolkit – saved 500-man hours
- They worked with contracting organizations to identify unliquidated obligations so that they could be re-obligated and not lost.

### *Outcome – Failed*

The project operates after the new strategy but has not determined if it will survive the current budget cuts.

### *Distress*

Distress in this incident and intervention is due to the notion that the work is an unfunded requirement and created constant criticism from top managers. Since the project is not a priority, they continuously need to defend the value of the project.

- "constantly criticized for not having a requirements document."
- "distress point from the 2021 year has been we can't afford [contractor]."
- "fundings always a stress point."
- Final cost figures were a "sticker shock."
- "It was a big struggle to talk through that with those very high-up senior leaders to get them to understand."
- "We're going to get probably one of the first cuts based on, you know, what we are kind of while we're providing utility. We're not, you know, paying [employees]."
- "I'm living in a critical incident right now. They're going through the POM right now. And last week, I put all of the funding profiles and all the programs on one sheet of paper, and it looked like a murder scene. It's just blood everywhere."
- "it seemed like every time we talked to a new, a new stakeholder, if you will, we had to start from scratch again and tell that story."
- "the [agency] knows this is a needed capability. That's not the issue. It's the cost."

- "[agency] was always looking for more, so that was really a never-ending exercise, my entire tenure supporting the project office."
- The distress they're under today, I think, is self-inflicted by the [agency].

### *Structures*

#### *Social*

- The project office worked with Industry to develop ROI.
- Constantly trying to defend top managers of project value
- Team persistence in a "never-ending exercise"

*Organizational* – Budgeting Process, contracting process

*Environmental* – Fight to win budgeting culture



## **System B Event Descriptions**

### **Underfunded Project (Event b1)**

#### **DESCRIPTION**

##### ***Incident – Directed to be at a Lower Oversight Threshold***

The project budget was mandated and underfunded by approximately \$150 million to keep it lower oversight level.

##### ***Intervention – Developed a Realistic Cost Estimate***

An external organization built a project office estimate to demonstrate to stakeholders how much the project would cost.

##### ***Outcome – Failed***

The project remained underfunded and continued moving forward.

“We will make it happen.”

##### ***Distress***

##### ***Structures***

###### ***Social Structures***

- Project Management Office
- External Support
- Executive Office

###### ***Organizational Process***

- Budgeting/Funding (POE)

*Contextual*

## Critical Functional Stakeholder (Event b2)

### DESCRIPTION

#### *Incident – Critical Functional Stakeholder*

The functional stakeholders were extremely involved and “dictating” when systems would sunset and how they were developed.

“Customer was extremely needed, extremely involved, and wanted what they wanted, period, without any real recognition of what was involved in developing large complex systems.”

“What we want and when we want it,” without regard to funding and time.

“They always wanted everything front-loaded.”

“So [the priority] became everything.”

#### *Intervention – Demonstrating Success*

Build trust by gaining “quick wins” and “demonstrating something.”

#### *Outcome – Failure*

“I need to demonstrate something to get people excited about the program, which obviously didn’t happen [...] It just never got there.”

#### *Distress*

“I had to deliver everything.”

“These are the requirements. We need everything.”

“I didn’t feel like I had any power to change any requirement.”

“This is the party line. Deliver the requirements [...], Yes, Sir.”

## *Structures*

### *Social Structures*

- *Project Management Office*
- *Functional Stakeholders*

### *Organizational Process*

- *Requirement approval process*
- *Governance*

### *Contextual*

- *Government hierarchical system and power disparity.*

## Prototype Funding Cuts (Event b3)

### DESCRIPTION

#### *Incident – Prototype Funding Cut by 60%*

The project was supposed to receive \$5 million per prototype but then received \$2 million in funding.

#### *Intervention – Rescoped Prototype*

The project office re-scoped the prototype but explained to the contractor that is in their best interest to deliver as much as possible.

#### *Outcome – Failure*

The selected prototype didn't meet the requirements of the functional users.

#### *Distress*

“How do you deal with that.”

“It's all functionality you are going to lose.”

“Doom loop”

#### *Structures*

##### *Social Structures*

- Project Management Office
- Service

##### *Organizational Process*

- Budgeting/Funding

*Contextual*

## **The transition from Waterfall to Agile (Event b4)**

### **DESCRIPTION**

#### ***Incident – PM against Mandated Transition from Waterfall to Agile***

Initially, the project was planned to be developed using a waterfall methodology. In 2019, congress mandated that all software projects use an iterative development strategy. The project management office transitioned from waterfall to agile methodology.

The current PM at the time didn't believe in agile methodology. He was "very old school."

The project office "didn't have the right people."

Moreover, agile methodology verbiage was written in the contract at the last minute. "Worst [project work statement] ever."

#### ***Intervention – NA***

#### ***Outcome - NA***

#### ***Distress***

- "Failed as predicted."

#### ***Structures***

##### ***Social Structures***

- Congress
- Project Management Office

##### ***Organizational Process***

- Acquisition Strategy

*Contextual*

- Government culture of “old school,” not wanting to change.

## **Non-Responsive Contracting Office (Event b5)**

### **DESCRIPTION**

#### ***Incident – Non-Responsive Government Contracting Officer***

The contracting officer would not return phone calls and always be “too busy to talk.” Moreover, the contracting officer would say one thing, then change their mind.

#### ***Intervention – PM Engagement and Support***

The project manager and the team traveled to the contracting officer's location to sit down and rewrite the required documents.

#### ***Outcome – Failure***

The project manager did not get what he wanted, but the contract was signed.

“Did I get what I want? No. Did I get a contract signed? Yes.

#### ***Distress***

“Heartache”

“Heartbreaking”

#### ***Structures***

##### ***Social Structures***

- Project Manager
- Contracting Officer

##### ***Organizational Process***

- Contracting

*Contextual*

## **Inexecutable Contract (Event b6)**

### **DESCRIPTION**

#### *Incident – Inexecutable Contract*

“They were dead on arrival.” The contract had conflicting requirements. The functional stakeholder attempted to consolidate requirements but put the consolidated and expanded requirements into the contract. The first PM thought that “more was better”; therefore, things were put in the contract with the thought the vendor would find I and correct it.

#### *Intervention – NA*

#### *Outcome - NA*

#### *Distress*

- “They didn’t have a chance.”
- “Dead on arrival.”

#### *Structures*

##### *Social Structures*

- *Project Management Office*
- *Contractor*

##### *Organizational Process*

- *Contract Development*
- *Requirements Analysis*

##### *Contextual*

## **Rushed Source Selection Decision (Event b7)**

### **DESCRIPTION**

#### ***Incident – Rushed Source Selection Decision***

The source selection decision was a “rushed decision.” The project manager needed to obligate funds, “so time became an issue.” Therefore, they chose a vendor that “didn’t have a chance. There was no way in heck that they would meet the timeline.”

#### ***Intervention – NA***

#### ***Outcome - NA***

#### ***Distress***

The product was not technically acceptable, and the project management office knew it would fail from the beginning.

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Contractor
- Functional Stakeholders

##### ***Organizational Process***

- Source Selection
- Budget obligation

##### ***Contextual***

- Needing to obligate funds to meet departmental objectives.

## **COTS Product (Event b8)**

### **DESCRIPTION**

#### ***Incident – COTS Product Did Not Meet the Needs of the Users***

COTS products did not meet the needs of the functional stakeholders. “It turned out to not be very tailorable to what they needed.”

“Software didn’t meet the [organization] business practices.”

The selected prototype was not “what the users said they wanted to work with.”

#### ***Intervention – COTS Product Pivot***

The project management office attempted to get the contractor to pivot to another software.

The functional stakeholder wanted to customize the product.

#### ***Outcome – Failure***

The contractor refused to change COTS products.

#### ***Distress***

#### ***Structures***

##### ***Social Structures***

- Functional Stakeholder
- Project Management Office

##### ***Organizational Process***

- Business Process Reengineering

*Contextual*

## **Onboarding (Event b9)**

### **DESCRIPTION**

#### ***Incident – Contractor Onboarding Delay***

The contract had difficulty getting employees onboarded and accessing the government’s network and development cloud.

This was in the middle of COVID and was the first time anyone was developing in this government agency’s cloud.

The delay in onboarding creates a delay in the entire schedule.

It took “10 times longer than expected.”

#### ***Intervention – Government Assistance***

The project management office assisted the contractor in getting the required access to the system and locations.

#### ***Outcome – Failure***

The contractor had a three-month delay.

#### ***Distress***

“This is when the program fell apart.”

#### ***Structures***

##### ***Social Structures***

- *Contractor*

- *Project Management Office*

*Organizational Process*

- *Onboarding Contractor Personnel*

*Contextual*

## **Project Manager Retired (Event b10)**

### **DESCRIPTION**

#### ***Incident – PM “Checked out” Prior to Retirement***

The project manager retired, but prior to retirement, “he was already out the door.” He did not “take an active role in the project while he was transitioning into retirement.” He practically gave up.

“Completely hands off”

#### ***Intervention – Deputy as Acting PM***

The Deputy Project Manager stepped into the role of Acting Project Manager

#### ***Outcome – Failure***

The Deputy Project Manager was “inexperienced” and “relied heavily on the contractor” for metrics and updates.

#### ***Distress***

“They aren’t going to change it. I’m not going to continue fighting with them.”

“Thrown in the fire.”

#### ***Structures***

##### ***Social Structures***

- *Project Management Office*

##### ***Organizational Process***

- *Personnel Transition*

*Contextual*

## **Deputy Product Manager Became Acting Product Manager (Event b11)**

### **DESCRIPTION**

#### ***Incident – Inexperienced Acting PM***

After the Product Manager retired, the deputy product manager became the acting product manager. The deputy was “brand new to the role” and inexperienced. Therefore, the deputy relied heavily on the contractor’s word to know if things were going well.

#### ***Intervention – Increased Stakeholder Engagement***

The functional stakeholders became more “involved and engaged,” and the Acting product manager became more engaged with other elements to provide further oversight.

#### ***Outcome – Failure***

As the functional stakeholders became more engaged, they discovered the contractor was not meeting the contract's requirements.

#### ***Distress***

“Thrown in the fire.”

“Uncharted Territory”

“Learn as you go along.”

“Red Flags waived.”

#### ***Structures***

*Social Structures*

- Functional Stakeholder
- Project Management Office

*Organizational Process*

- Personnel Management (Turnover)

*Contextual*

## No Definition of Milestone Payments (Event b12)

### DESCRIPTION

#### *Incident – Unable to Define Point Release Payments*

The contract was written in a “nebulous way,” and the payments were not defined. Milestone payments were for point releases, but point releases were not defined. The contractor requested a point release payment two weeks after signing the contract. The agreements officer looked at the contract, and there was no definition to refute the contractor's request. The agreements officer asked, “Why am I giving you \$5.5 million?” The contractor replied, “That’s not my problem. That’s your problem.”

#### *Intervention – Attempt to change the Contract*

The agreements officer asked the government contracting officer and contractor to change the contract to define the milestone payments.

#### *Outcome – Failed*

The government contracting officer and contractor said, “No.”

#### *Distress*

“There was nothing that I could do.”

#### *Structures*

##### *Social Structures*

- *Project Management Office*
- *Government Contracting Office*

- *Contractor*

*Organizational Process*

- *Contracting Process*

*Contextual*

## Requirements Change Request (Event b13)

### DESCRIPTION

#### *Incident – Weekly Requirements Changes*

The project had scoping issues each week. For example, the government would submit a change request, and the contractor would ask for \$1 million and four months on schedule.

#### *Intervention - Attempted to Change the Contract*

The agreements officer asked the government contracting office and contractor to change the contract to create flexibility for requirement changes.

Additionally, the project management office asked the functional stakeholders to make tradeoffs to account for the changes in requirements.

#### *Outcome – Failed*

The government contracting officer and contractor said “no” to changing the contract.

The functional stakeholder said, “This isn’t something that we are going to change.”

#### *Distress*

“Change Request Hell”

#### *Structures*

##### *Social Structures*

- Project Management Office
- Contractor

- Government Contracting Office

*Organizational Process*

- Requirements Change
- Contract Modification

*Contextual*

## **Contractor Delivered Zero Features in Program Increment 1 (Event b14)**

### **DESCRIPTION**

#### ***Incident – Contractor Delivered Zero Features in PI 1***

The contractor said they would deliver 20 features in program increment 1, and they delivered 0.

The contractor was onboarding and developing infrastructure.

#### ***Intervention – NA***

#### ***Outcome - NA***

#### ***Distress***

“Program is at risk.”

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Contractor

##### ***Organizational Process***

- Software Development

##### ***Contextual***

## **Governance Process did not support Agile Methodology (Event b15)**

### **DESCRIPTION**

#### ***Incident – Governance only approved requirement changes every 3 months***

The governance process did not support agile methodology. If the functional stakeholders wanted to change a requirement, they would have to wait three months until the following requirements control board.

#### ***Intervention - NA***

The contracting officer representative talked with the executive office staff about how to deal with this. The staff said, “This is unacceptable.”

#### ***Outcome – NA***

#### ***Distress***

“Everybody was primed for, not really pushing to make it work.”

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Executive Office
- Functional Stakeholders

##### ***Organizational Process***

- Requirement Management

## COTS Product Updates (Event b16)

### DESCRIPTION

#### *Incident – Unresponsive COTS Development*

“Every time [the contractor] wanted to conduct any time of software updates. It had to go back to [foreign country] and go through export control.” The updates would take three to four months to be processed. Additionally, the COTS owner has numerous customers and would prioritize the project.

“We had a non-responsive developer to have input in a timely manner.”

#### *Intervention – NA*

#### *Outcome - NA*

#### *Distress*

#### *Structures*

##### *Social Structures*

- Project Management Office
- Contractor
- COTS Owner

##### *Organizational Process*

- *Software Development Prioritization*
- 

##### *Contextual*

**PI2: Contractor Delivered 3 of 20 Features (Event b17)**

**DESCRIPTION**

*Incident – Contractor Delivered 3/20 Features in PI2*

Contractor Delivered 3 of 20 features.

*Intervention – NA*

*Outcome - NA*

*Distress*

*Structures*

*Social Structures*

- *Contractor not performing*

*Organizational Process*

- *Software Development*

*Contextual*

## **Government and Contractor Animosity (Event b18)**

### **DESCRIPTION**

#### ***Incident – Government and Contractor Animosity***

After the government started withholding payments, there was animosity between the government and the contractor.

#### ***Intervention – NA***

#### ***Outcome - NA***

#### ***Distress***

- “Not the best opportunity for success.”
- “Everyone is throwing rocks at each other.”
- “This is terrible. This is awful.”

#### ***Structures***

##### ***Social Structures***

- Functional Stakeholder
- Project management office
- Contractor

##### ***Organizational Process***

- Government/contracting relationships

##### ***Contextual***

## **PI3: Contractor Delivered Zero of 29 Use Cases (Event b19)**

### **DESCRIPTION**

#### ***Incident – Contractor Delivered 0/29 Use Cases***

By program increment three, “the contractor had not delivered anything of value to the [organization].” The contractor did not analyze the business use cases. The contractor said they would deliver 29 business use cases but did not deliver any.

#### ***Intervention – Government Issues Letter of Concern***

The agreements officer wrote a letter of concern requesting a corrective action plan.

#### ***Outcome – Failure***

The contractor’s “corrective action plan didn’t state how they were going to fix things, but what the government was doing wrong.”

“In the end, no one was willing to move and try to fix it.”

#### ***Distress***

“Did not meet the functionals expectations.”

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Functional Stakeholders
- Contractor

*Organizational Process*

- *Contracting Process*

*Contextual*

## System Demonstration (Event b20)

### DESCRIPTION

#### *Incident – System Demonstration Failed*

The contractor had a demonstration with the project management office and functional stakeholders. The demonstration failed. The contractor was only going to deliver 17% of the required capability for the first release.

#### *Intervention (De-escalation) – Contract Termination*

Withheld payments, issued a stop work, and terminated the contract.

#### *Outcome – Success*

Contract was terminated

#### *Distress*

#### *Structures*

##### *Social Structures*

- *Functional Stakeholder*
- *Government Contracting Personnel*
- *Project Management Office*
- *Contractor*

##### *Organizational Process*

- *Product Demonstration*
- *Contract Termination*

## **Contractor Executive Dishonesty (Event b21)**

### **DESCRIPTION**

#### ***Incident – Contractor Executive Dishonest***

The Vice President of the contracting firm lied to the executive responsible for the project. The VP told the executive they would deliver all the out-of-the-box functionality. However, they didn't tell the executive it would take six months to deliver. Additionally, the VP told the government executive that the project was on track, but "the worker bees on the ground were telling [them] the truth. The leaders were lying."

#### ***Intervention – Corrective Action Plan/Termination***

The government executive gave the contractor 90 days to come back with a corrective action plan. The corrective action plan was not accepted, and the government terminated the contract.

#### ***Outcome – De-escalation***

The project was considered a failure

#### ***Distress***

"Loss of confidence"

#### ***Structures***

##### ***Social Structures***

- Executive
- Project Management Office
- Contractor

*Organizational Process*

- Government Contracting

*Contextual*

## **Contract Termination (Project Failure) (Event b22)**

### **DESCRIPTION**

#### ***Incident – Contract Termination***

Contract was terminated

#### ***Intervention – New Development Strategy***

Bridging Strategy to develop software modules using support contractors with Agile. This strategy is considered “software [development] as a service.”

#### ***Outcome – unknown***

The project is underfunded and is supposed to field in 2024

#### ***Distress***

#### ***Structures***

##### ***Social Structures***

- *Congress*
- *Service*
- *Project Management Office*
- *Contractor*

##### ***Organizational Process***

- *Contracting*
- *Software Development*

*Contextual*

- Bureaucracy
- “When it crashes in industry, it is all hands on deck to help the PM recover. In government, people come down and kick the PM in the nuts and take all his money.”

## Switched Funding Portfolios (Event b23)

### DESCRIPTION

#### *Incident – Project Changed Government Funding Portfolios*

The project was switched to a funding portfolio with \$100 million in unfunded research and development requirements. Therefore, the project had more difficulty receiving the required funding.

#### *Intervention - NA*

#### *Outcome - NA*

#### *Distress*

“Decision was stupid.”

#### *Structures*

##### *Social Structures*

- Service

##### *Organizational Process*

- Funding/Budgeting Priority

##### *Contextual*

- “[Mid-level bureaucrats] making funding decisions without institutional knowledge.”

## Funding Cut 2024 (Event b24)

### DESCRIPTION

#### *Incident – Funding Cut*

The project was cut by \$40 million.

#### *Intervention – Sought Executive Office Support*

The project management office worked with the executive office to restore the funding.

#### *Outcome – Failure*

Funding was not restored.

#### *Distress*

“Fighting for survival.”

#### *Structures*

##### *Social Structures*

- Project Management Office
- Contracting Office
- Service Budgeting Office

##### *Organizational Process*

- Funding/Budgeting

##### *Contextual*

## **Congressional Marks (Event b25)**

### **DESCRIPTION**

#### ***Incident – The budget was marked by Congress***

The project was marked \$39 million by Congress, delaying the project and creating \$65 million in unfunded requirements.

#### ***Intervention – Rescope Project Plan***

Extended schedule. The project office notified the executive officer of different courses of action to proceed, expecting the executive officer to try to get the money back.

#### ***Outcome – Failed***

The project office did not receive the required funds.

#### ***Distress***

#### ***Structures***

##### *Social Structures*

- *Congress*
- *Executive*
- *Project Management Office*

##### *Organizational Process*

- *Budgeting*

##### *Contextual*

## **Zero funding in 2025 (Event b26)**

### **DESCRIPTION**

#### ***Incident – Zero funding***

The project management office requested \$65 million in 2025; the budget line is zero.

#### ***Intervention - Rescope/Survival***

Extended schedule and restructured funding to “keep the lights on.”

#### ***Outcome – Failed***

The budget line has not been allocated

#### ***Distress***

#### ***Working to “Keep the lights on.”***

#### ***Structures***

##### *Social Structures*

- *Project Management Office*
- *Executive Office*
- *Service Budgeting Office*

##### *Organizational Process*

- *Funding/Budgeting*

##### *Contextual*

## **System C Event Descriptions**

### **Multiple Functional Stakeholders (Event c1)**

#### **DESCRIPTION**

##### ***Incident – Multiple Functional Stakeholder Communities Involved***

The functional stakeholders for Project C were not a traditional functional community. They were composed of multiple little stakeholder groups that did not know what they collectively needed. The project was a financial management effort, but the driver of the requirements came from a security organization. Moreover, this meant there was not a single requirements owner, which meant the financial community owned the system requirements, but the multiple security communities owned the data protection requirements.

##### ***Intervention – Created Governance Board***

The business office for the service stood up a working group as a governance board to manage the multiple stakeholders.

##### ***Outcome – Failure***

The working group allowed the project management office to “reach out to the right organizations.”

##### ***Distress***

Distress was realized when the project management office didn't have the necessary requirements, and additional requirements were added later in the project.

## *Structures*

### *Social Structures*

- Functional Stakeholder Communities
- Project Management Office

### *Organizational Process*

- Governance Process (Requirements)

### *Contextual*

## **False Assumption of System Complexity (Event c2)**

### **DESCRIPTION**

#### ***Incident – False Assumption about System Complexity***

The initial requirements for the project were built around the false assumption that the government had developed an unclassified version of the financial ERP that could be used on a classified network. Senior leaders would use the words “copy and paste” or “low code” to articulate the project's simplicity and set low expectations for cost and schedule. Moreover, the initial requirements were characterized as “salesmanship” to get funding, in which senior leaders mandated the funding level for the project based on the initial requirements. Lastly, the project office estimates for performance were “backed into” by cost and schedule constraints.

#### ***Intervention – N/A***

#### ***Outcome – N/A***

#### ***Distress***

The project did not realize distress until later in the project when the selected small business vendor could not perform the requirements (c15)

#### ***Structures***

##### ***Social Structures***

- Service Leaders
- Project Office

##### ***Organizational Process***

- Requirements Process
- Budgeting Process

*Contextual*

- The culture of Senior leaders not understanding the complexity of systems and mandating cost and schedule.

## **Initial Cost Estimate (Event c3)**

### **DESCRIPTION**

#### ***Incident – Mandated Initial Cost Estimate***

The initial cost estimate of the project was developed using the false assumption that the project would be a “copy and paste.” Additionally, the cost estimate was developed to align with the mandated budget and schedule. Due to the simplistic nature of the requirement and the low cost, it was determined that a small business could perform the requirements.

#### ***Intervention – NA***

#### ***Outcome - NA***

#### ***Distress***

- The project did not realize distress until the small business contractor could not perform the requirements at the projected cost.

#### ***Structures***

##### ***Social Structures***

- Project Office
- Service Leaders

##### ***Organizational Process***

- Budgeting Process

##### ***Contextual***

- Culture of project offices “backing into” cost estimates

## **Immature Requirements (Event c4)**

### **DESCRIPTION**

#### ***Incident – Immature Requirements***

The initial “requirements were not sufficient for a vendor to come on and do anything.” Once the contract was awarded, the government and SI realized that the original requirement was “naïve” and “due diligence was not performed prior to contract award.”

#### ***Intervention – Requirements Decomposition Workshops***

The project office, functional representatives, and the systems integrator began requirements decomposition workshops. Additionally, the outcome of the decomposition workshops was that additional requirements were not in the scope of the contract. The requirements were significantly more complex and not technically feasible within the ERP software. Moreover, the government initiated an enterprise-level working group incorporating the right organizations with actual users to determine the system requirement.

#### ***Outcome- Success***

The intervention was successful in that it relieved the distress by maturing the requirement, but it led to additional distress because the new requirements were out of scope for the contract and eventually would require a new systems integrator.

#### ***Distress***

Distress in this event was combined with multiple incidents when the project office realized the government did not understand what they needed, and once they figured it out, the SI could not provide it (c4).

## *Structures*

### *Social Structures*

- Project Office
- Functional Stakeholders
- Systems Integrator

### *Organizational Process*

- Governance Process (Requirement validation)

### *Contextual*

## **Small Business Systems Integrator (Event c5)**

### **DESCRIPTION**

#### ***Incident – Directed to use Small Business Integrator***

The executive office directed the project to use a small business systems integrator off a mandatory indefinite-delivery/indefinite-quantity (IDIQ) contract. It turned out that the small business systems integrator did not have the required personnel or skills to accomplish the contract terms. This was seen in numerous areas, but two referenced multiple times were the contractor's inability to hire qualified personnel and conduct/document blueprinting workshops.

#### ***Intervention – Additional Government Support***

Awarded the contract to a small business contractor and attempted to augment the business with government contractors.

#### ***Outcome – Failure***

The systems integrator continued to fail and was eventually terminated.

#### ***Distress***

“Challenge” “continued to be outside their expertise.”

#### ***Structures***

##### ***Social Structures***

- Executive Office
- Project Management Office
- Systems Integrator

*Organizational Process*

- Business Case/Analysis of Alternatives
- Contracting Process

*Contextual*

- Culture of trying to use small businesses to develop cheaper expertise.

## **Contractor Unable to Meet the Requirements (Event c6)**

### **DESCRIPTION**

#### ***Incident – Contractor Unable to Meet Requirements***

The contractor was unable to meet the new requirements from the decomposition workshops. Specifically, they “did not have the expertise to do significant development, and they didn’t have the resources.” Moreover, “across the board[...] the contractor failed to do what had to be done.” The government recognized contractor failure at multiple points during requirements decomposition, blueprinting, and business process designs.

#### ***Intervention – Contract Termination***

The government terminated the contract and went directly to a large vendor with experience implementing the baseline ERP.

#### ***Outcome – Success***

Terminating the contract allowed the government to pivot to a vendor that could successfully meet the project requirements.

#### ***Distress***

The contract office experience “a bit of burning rage” from stakeholders because of the money wasted on a contractor that could not perform the contract requirements.

#### ***Structures***

##### ***Social Structures***

- Project Office

- Systems Integrator
- Functional Stakeholders
- Contracting Office

*Organizational Process*

- Contracting Process (Termination and Sole Source)

*Contextual*

## **Contract Termination (Event c7)**

### **DESCRIPTION**

#### ***Incident – Contract Termination***

Due to the small business systems integrator failing to perform and the expansion of requirements, the contract was terminated. This caused “a burning rage” amongst the stakeholders because the project management office would have to start over, which would “take years.”

#### ***Intervention – Sole Source Contract***

The PMO developed a strategy to award a sole source contract to a systems integrator with specific experience and knowledge of the unclassified ERP. It could hire the required expertise to develop the project successfully.

#### ***Outcome – Success***

The new systems integrator was successful in delivering a product.

#### ***Distress***

The project management office experience “burning rage” from stakeholders

#### ***Structures***

##### ***Social Structures***

- New Systems Integrator
- Project Management Office
- Functional Stakeholders

*Organizational Process*

- Contracting Process

*Contextual*

## Unfunded Requirements (Event c8)

### DESCRIPTION

#### *Incident – Not Enough Funding to meet the requirements*

Due to the expansion of requirements, the project did not have enough funding to meet the requirements and schedule.

“We had to get some additional dollars in the out years, probably had about a two and a half year delay [...]. “

#### *Intervention – Gained Support of Senior Executive*

The project manager and various stakeholders continuously briefed government officials on the path forward and how they would not make the same mistakes again. Specifically, the portfolio manager gained the support of a senior government official for the project.

#### *Outcome – Success*

“We went out and got that funding.”

#### *Distress*

The project office could not award a contract to do development without increased funding.

#### *Structures*

##### *Social Structures*

- Project Office
- Senior Stakeholders

*Organizational Process*

- Budgeting Process

*Contextual*

- Government hierarchy for project support

## ERP and Data Protection (Event c9)

### DESCRIPTION

#### *Incident – Data Protection Gap*

Due to the new complex requirements for a classified system, the government required user access controls and data protections not native to the government's baseline ERP.

#### *Intervention – Developed Innovative Technical Solution*

The government worked with the systems integrator to identify a 3<sup>rd</sup> party solution that could eventually meet the system requirements. The government negotiated with the SI and 3<sup>rd</sup> party to restructure the contract to use the tool.

#### *Outcome – Success*

The government, SI, and the 3<sup>rd</sup> party vendor came to a negotiated agreement and implemented the tool successfully.

#### *Distress*

The classified requirements were antithetical to the open nature of ERPs. This project was the first large-scale ERP implemented on the classified network. Therefore, there was significant uncertainty about the feasibility of the solution

#### *Structures*

##### *Social Structures*

- Systems Integrator
- Contracting Office

- Project Management Office

*Organizational Process*

- PMO and SI negotiation
- Contracting Process

*Contextual*

## **Executives Trying to Terminate Project (Event c10)**

### **DESCRIPTION**

#### ***Incident – Executive Attempting to Cancel the Project***

The project was “in jeopardy of being canceled ... because there had been so many years and so much money wasted with nothing to show for it.” Specifically, two executives repeatedly tried to “kill” the project. They questioned whether there was a valid need for the project and if it was cost-effective. Moreover, one executive had “zero confidence” in the developer or the project manager.

#### ***Intervention – Developed Stakeholder Confidence***

The project management office “spent a lot of time on building, just getting stakeholders to have more confidence in the project.” They also decreased the project’s cost estimate and were the first ERP to operate in the cloud by working with the service and contractor experts.

#### ***Outcome – Success***

The project office received a signed memorandum from a senior government official stating the project office would continue.

#### ***Distress***

The project office had considerable turnover during this time because employees didn’t know if they would have a job in the near future.

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Executive Office
- Service
- Functional Stakeholders

*Organizational Process*

- Project approval/authorization process
- Budgeting Process

*Contextual*

- The acquisition community is responsible for defending the requirement

## **Project Management Office Turnover (Event c11)**

### **DESCRIPTION**

#### ***Incident – Project Management Office Turnover***

The project management office experienced turnover due to the executive and stakeholder leaders trying to kill the project. The small team that remained was “overworked” and “overloaded.” This period in the project was described as a “revolving door” of people coming in and leaving the project.

“People were leaving the project left and right because of all the issues from a leadership standpoint, some saying go, some saying stop. So it caused a whole lot of stress in the project.”

#### ***Intervention – Built Team Commitment***

This period was described as “sitting on the sidelines until we got a better answer if the project was going to continue.” The remaining small team decided to “stick in” and “see it through.”

#### ***Outcome – Success***

Even though there was no specific intervention, the team continued the work to get the project back on track, and it ultimately was successful.

#### ***Distress***

In the event, personnel distress is described as “overloaded” and “overworked.” The team could not control the external circumstances that created the incident.

#### ***Structures***

##### ***Social Structures***

- Project Management Office

*Organizational Process*

- Human Resource Process (Hiring)

*Contextual*

- Internal PMO culture of pushing through

## **Developing in the Cloud (Event c12)**

### **DESCRIPTION**

#### ***Incident – No Secure Cloud Environment***

The department did not currently have an accredited secure cloud environment. To maintain functional stakeholder support, the project management office's strategy was to develop in a secure cloud environment. The department and the cloud service provider were confident that they would be accredited, but not in time to begin the development of the system. Moreover, the contract with the systems integrator was not written for the contractor to develop the software in the cloud.

#### ***Intervention – Found Government Partner***

The PMO searched and found a government partner operating in a cloud environment that could host the system's development. Additionally, the PMO negotiated a contract change with the system integrator to begin development in the cloud.

#### ***Outcome – Success***

The PMO developed the system in the hosting partner's cloud environment and then transitioned it to the department's accredited secure cloud environment.

#### ***Distress***

“Blazing the trail” and “mixed answers.”

#### ***Structures***

#### ***Social Structures***

- Project Management Office
- Departments Hosting Organization
- System Integrator
- Government Hosting Partner
- Contracting Office

*Organizational Process*

- Cloud accreditation process
- Contracting Process

*Contextual*

## **Cross Domain Solution (Event c13)**

### **DESCRIPTION**

#### ***Incident – Cost of Cross-Domain Solution***

The project management office was required to use the department's cross-domain solution between classified and unclassified environments. This caused the cost of the project dramatically increases. Specifically, the life-cycle cost of the department's cross-domain solution was nearly as much as the project's development cost. Moreover, the project was not expecting this requirement and had not budgeted for it. Lastly, the department's hosting organization did not have a cross-domain solution between the secure cloud and on-prem environments, making it challenging to create the cross-domain solution.

#### ***Intervention – Created Trade-Space with Stakeholders***

The Project Management Office and stakeholders worked with the executive office to request more funds. They also conducted trade-offs cutting back on training and helpdesk support. Lastly, the PMO worked with the department's hosting organization to successfully demonstrate how the project was going to meet the government's requirements for a cross-domain solution.

#### ***Outcome – Success***

Between the trade-offs, receiving more funding, and working with the department's hosting office, the PMO implemented the cross-domain solution.

#### ***Distress***

Distress from this event was caused because “no one knew that [organization] was going to charge us that much money,” and the funding was not budgeted.

## *Structures*

### *Social Structures*

- Project Management Office
- Executive Office
- Department's Hosting Organization

### *Organizational Process*

- Budgeting Process

### *Contextual*

## **Last minute addition of required capability (Event c14)**

### **DESCRIPTION**

#### ***Incident – Last Minute Critical Requirement***

During the testing of the system, contracting officials that did not participate in the workshops told the project management office that they needed additional capability in a secure system because another project failed to deliver the needed capability. Moreover, the functional stakeholders and users said they would not accept the system without this capability or send any users to initial training. The governance board eventually approved the requirement.

#### ***Intervention – Implemented a government-owned solution***

The project management office worked with stakeholders and the PMO for the failed project to identify actual requirements. Additionally, they worked within the government to find a deployed system that could be configured to meet those requirements. This was critical because the system needed an approved authority to operate in a secure environment.

#### ***Outcome – Success***

The PMO developed and implemented the system for testing and initial deployment. The functional stakeholders and users accepted the system, but currently, there are no users.

#### ***Distress***

Distress in the PMO for this event is described as “being held hostage, “stalemate,” and “scrambling.”

#### ***Structures***

### *Social Structures*

- Project Management Office
- Functional Stakeholders (including users)
- Contracting Officials
- An external Project Management Office

### *Organizational Process*

- Contracting process
- Governance (Requirement approval)

### *Contextual*

## Operational Testing (Event c15)

### DESCRIPTION

#### *Incident – Initial Failure of Operational Test*

During operational testing, the testing organization determined that the system was “not effective, survivable, or suitable.” The testers asked for “back door” access to the system. Once granted access, the testers said the system was vulnerable, even though this was not a “normal circumstance.” Due to the determination, the system was delayed more than six months to adjudicate the “vulnerabilities.” Moreover,

#### *Intervention – Adjudication and Stakeholder Management*

The PMO worked with the testing organization to adjudicate all the items from the adversarial assessment. Additionally, the PMO worked with the executive office, functional stakeholders, and users to ensure the system was viable and suitable to protect classified data.

#### *Outcome – Success*

The PMO and the testing organization worked together to secure a passing score on the operational test.

#### *Distress*

This event was described as the “most challenging experience of my career,” a “hurdle,” and “a big headache.”

#### *Structures*

##### *Social Structures*

- Project Management Office
- Functional Stakeholders
- User Communities
- Testing Community

*Organizational Process*

- Testing and adjudication process

*Contextual*

## **System D Event Descriptions**

### **1<sup>st</sup> Project Manager Lacked Requisite Skills (Event 1)**

#### **DESCRIPTION**

##### ***Incident – 1<sup>st</sup> PM Lacked Requisite Skills***

The first project manager was ill-equipped because he was a traditional PM, not a software PM. He was “well in over his head.” The portfolio saw that “[he] did not have the ability to effectively manage this program.” When his ideas were “insufficient, ” he was “not flexible enough to listen to the people who had a lot more experience.” He had “been spinning for two or three years and hadn’t got a solicitation out.”

##### ***Intervention – External Support/Fired***

The portfolio manager brought in subject matter experts to help the project manager and ultimately removed the project manager.

##### ***Outcome – Success***

The executive officer had a lot of confidence in the next project manager, and he was able to get the project to move forward and release a solicitation.

##### ***Distress***

“Spinning”

##### ***Structures***

##### ***Social Structures***

- Project Management Office

- Executive Office

*Organizational Process*

- Hiring/Firing Processes

*Contextual*

## Directed to be at a Lower Oversight Threshold (Event d2)

### DESCRIPTION

#### *Incident – Directed to be at a Lower oversight threshold*

During the initial development of the project costs estimate, the project would be at the threshold for department-level oversight. The PMO was directed to remain under the service level threshold.

#### *Intervention – Developed an artificially low cost estimate*

The project leaders devised a strategy to keep the project cost low to maintain oversight at the service level.

#### *Outcome – Success*

The project was designated at the agency level.

#### *Distress*

This event was described as “the biggest hiccup” that negatively impacted the project.

#### *Structures*

##### *Social Structures*

- Project Management Office
- Executive Office

##### *Organizational Process*

- Budgeting Process (Cost Estimate)

*Contextual*

- Culture of limiting oversight due to time delays

## **Functional Wanted a Perfect System (Event d3)**

### **DESCRIPTION**

#### ***Incident – Functional’s Desire for Perfect System***

From the beginning, the functional stakeholder wanted a perfect system that met all their requirements immediately. Moreover, there was a mentality of scrutinizing everything, where “good enough wasn’t going to cut it.” The project was designed to replace the current capability into one system, but the functional stakeholders wanted a significant amount of configuration during development.

#### ***Intervention – Requirements Review Board***

The project management office and the functional stakeholder developed a requirements review board and configuration review board.

#### ***Outcome – Failure***

However, the functional community had a “significant amount of weight” on the boards and “wanted to make their users happy.”

#### ***Distress***

#### ***Structures***

##### ***Social Structures***

- *Project Management Office*
- *Functional Stakeholders*
- *Contractor*

*Organizational Process*

- *Governance (Requirements and Configuration Management)*

*Contextual*

- *Power and Politics*

## **Transition Acquisition Process (Event d4)**

### **DESCRIPTION**

#### ***Incident – Transition Government Acquisition Process***

The department initially directed the project to transition acquisition processes three times in five years. Each acquisition process required different types and levels of documentation and approvals. Moreover, each acquisition process had different directions on the level of detail necessary for requirements.

#### ***Intervention – External Support/Requirements Decomposition***

The government contracted external support from major technical universities and spent time and money developing business processes and requirements to meet the demands of the new acquisition process.

#### ***Outcome – Success***

The project was able to develop a requirements document that was approved and deemed suitable for the project to continue.

#### ***Distress***

“Whiplash”

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Department

*Organizational Process*

- Acquisition Process
- Requirements Analysis

*Contextual*

- Department issuing regulations

## **Service Executive Halted the Project (Event d5)**

### **DESCRIPTION**

#### ***Incident – Senior Executive Halted Project***

The service executive responsible for acquisition activities halted the project because they were not making “meaningful progress,” “not satisfied with the state of the requirements,” and disagreed with the initial project office estimate.

#### ***Intervention – Fixed Programmatic Issues***

The service executive directed a red team assessment. The red team assessment addressed the requirements, cost estimates, integrated master schedule, and business process model.

#### ***Outcome – Success***

The project office fixed the issues and was allowed to move forward.

#### ***Distress***

#### ***Structures***

##### ***Social Structures***

- Service
- External Support
- Project Management Office

##### ***Organizational Process***

- Approval process
- Budgeting (Cost Estimate)

- Business Process

*Contextual*

## System Sunset Dates (Event d6)

### DESCRIPTION

#### *Incident – Legacy System Sunset Dates*

The department executive responsible for acquisition wrote a memorandum for record mandating the deployment timeline of the system by creating a sunset date for the legacy system.

#### *Intervention - NA*

#### *Outcome - NA*

#### *Distress*

“Arbitrary fielding date”

#### *Structures*

##### *Social Structures*

- Department Executive

##### *Organizational Process*

- Official Directives

##### *Contextual*

- Department-level executive mandate

## **Pressure to Move Fast During Source Selection (Event d7)**

### **DESCRIPTION**

#### ***Incident – Pressure to Execute Source Selection by a certain date***

The senior functional stakeholder directed the project management office to conduct the source selection in 1/3 of the standard procurement timeline. The functional stakeholder was retiring and wanted the contract to be awarded before he retired.

#### ***Intervention – Created a Realistic Schedule***

The project management office conducted multiple rounds of analysis and risk assessments to create a realistic schedule.

#### ***Outcome – Success***

The source selection was conducted within the allotted time.

#### ***Distress***

“People felt pressure, a sense of urgency.”

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Functional Stakeholder

##### ***Organizational Process***

- Source Selection

*Contextual*

- Hierarchical decision-making mandating schedule

## **Congressional Mark Budget (Event d8)**

### **DESCRIPTION**

#### ***Incident – Congressional Marks***

Congress believed that the department should only have one of these particular types of projects. Therefore, the project was marked by Congress for “duplication of efforts or redundancy” each year. The mark would reduce funding to zero for the next fiscal year unless removed during committee. The results of these marks mean “instead of developing capability and deploying, you are continually reassessing, replanning, and adjusting.”

#### ***Intervention – Congressional Agile Pilot Project***

The project manager volunteered for a congressional pilot project that required the project to use agile development methodology and deploy an MVP within six months.

Additionally, all the services met with Congress to discuss why they needed separate projects.

#### ***Outcome – Failed***

The meetings and pilot project worked in the short run, but ultimately, the idea of a combined project kept coming up.

The congressional pilot project kept the project from funding cuts by other entities

#### ***Distress***

“Always on the chopping block.”

#### ***Structures***

*Social Structures*

- Congress
- Project Management Office

*Organizational Process*

- Funding/Budgeting

*Contextual*

## Source Selection Offeror Submits Draft Document (Event d9)

### DESCRIPTION

#### *Incident – Vendor Submits Draft Document During Source Selection*

The vendor with the best technical solution “submitted a draft management plan as part of their final documents and was deemed ‘unawardable.’”

#### *Intervention – Government Vendor exchanges*

The project manager did face-to-face interchanges with the vendor on the proposed revisions.

#### *Outcome – Failure*

The offeror “still had not addressed it.”

#### *Distress*

“There’s nothing we can do.”

#### *Structures*

##### *Social Structures*

- Offeror
- Project Manager
- Source Selection Team

##### *Organizational Process*

- Source Selection

##### *Contextual*

- *Culture of following the process, having faith in the process*

## **Additional Functional Staff Denied (Event d10)**

### **DESCRIPTION**

#### ***Incident – Required Functional Staff Denied***

The functional stakeholders on the project were understaffed. Staffing models recommended 12, and the team had three. The decision was made that to implement a COTS product. A system that doesn't need a sizeable functional team.

#### ***Intervention - PMO Augmented Functional Staff***

The project management office paid for contracting support to augment the functional team.

#### ***Outcome – Failure***

“In the end, there was never enough.”

#### ***Distress***

The project was unable to meet the BPR requirements and agile development.

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Functional Stakeholder
- Acquisition Executive

##### ***Organizational Process***

- The approval process for hiring

## **Inexperienced Contractor Personnel (Event d11)**

### **DESCRIPTION**

#### ***Incident – Inexperienced Contractor Personnel***

On the first day the contract was awarded, the contractor's management team did not understand how the department or service "did business." They "could not get it right." The contractor was not communicating with the right people. Moreover, they did not understand how to interpret the requirements of the system based on the organization the system was going to be implemented. The contractor did not have the subject matter experts to understand the approval process for acquisition documents and key milestones. Additionally, the contractor struggled to fully manage their development team and was hiring young people who didn't understand the system's or organization's functionality. They "were focusing on hiring people they could pay less, rather than hire [...] strong developers."

"[They] lacked a good understanding of that. And they grasped that even as we were closing out the terminated contract."

#### ***Intervention – Government Hired Additional Personnel***

The project office recommended that the contractor hire personnel with expertise in the government organization. The contractor hired one person but did not use that person correctly. Additionally, the project management office hired personnel to augment the contractor's team, but the government ended up doing the work.

#### ***Outcome - Failed***

The contractor never developed the required expertise, ultimately leading to the contract's termination.

### *Distress*

In this event, government employees feel distressed because they are executing the contractor's work.

### *Structures*

#### *Social Structures*

- Project Management Office
- Contractor

#### *Organizational Process*

- Contractor and PMO Communication
- Contractor Hiring
- Government's approval process for contract deliverables

#### *Contextual*

- There is a culture of the PMO expecting the contractor to know everything about the service.

## **Demonstrated COTS Software Disappeared (Event d12)**

### **DESCRIPTION**

#### ***Incident – Demonstrated COTS Software Disappeared***

During the source selection, the contractor team was required to demonstrate that the software met a subset of the government's requirements. After the contract award, the government team and contractor began requirements analysis and BPR. The product that was being analyzed was not the product that was demonstrated during the source selection. The government asked to see the demonstrated software, but the contractor said it "disappeared" and "does not exist."

#### ***Intervention- NA***

#### ***Outcome - NA***

#### ***Distress***

Distress in this instance was because there was nothing that could be done. The government thought they were buying a "live system," but it ended up having to help build it.

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Functional Stakeholders
- Contractor

##### ***Organizational Process***

- Contracting Process (Not being to do anything contractually)

## **The product Did Not Meet Self-Certified Requirements (Event d13)**

### **DESCRIPTION**

#### ***Incident - Product Did Not Meet Self-Certified Requirements***

During the source selection process, each vendor certified the number of requirements their product met “out of the box.” The winning vendor self certified that their product met 86% of the requirements “out of the box.” After the contract award, the government and contractor underwent a requirements analysis/ business process reengineering effort. It was determined that the solution only met 60% of the requirements “out of the box.”

#### ***Intervention – Started from “Scratch”***

The project management office continued with the project, but it was “starting from scratch.”

#### ***Outcome – Failed***

This was the beginning of all the issues and was not addressed to remove the stress

#### ***Distress***

The difference in actual requirements that were met required a significant amount of work that was not accounted for in cost and schedule.

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Contractor
- Functional Stakeholders

*Organizational Process*

- Requirements analysis

*Contextual*

## **Business Process Management Tool (Event d14)**

### **DESCRIPTION**

#### ***Incident – Vendor’s BPM Contract Ceiling***

The contractor proposed a specific BPM tool to implement the government desired configurations. However, the contractor quickly “hit the ceiling” and was “taking a bath, losing money.” The contractor was unwilling to do additional configurations using the BPM tool.

#### ***Intervention – Change Baseline Product***

Since the contractor would not use the BPM, they decided to add capability to the baseline COTS product.

#### ***Outcome – Failure***

The strategy ultimately caused delays in the project and led to multiple critical incidents in the future.

#### ***Distress***

“Caused a lot of confusion and angst.”

#### ***Structures***

##### ***Social Structures***

- Contractor
- Subcontractor
- Project Management Office

##### ***Organizational Process***

- *Contract Management*
- *System Design*

*Contextual*

## **2<sup>nd</sup> Project Manager Leaves (Event d15)**

### **DESCRIPTION**

#### ***Incident – 2<sup>nd</sup> Project Manager Leaves***

The second product manager was moved to start a new project without notice and “left a gap.” He was “always shaking hands and resolving big problems.” When the product manager left, the project office lost the ability to manage personalities.

“[Name] had a way of, you know, folks can be mad at each other, he would come into a room, and all of sudden he is schmoozing, and then [contractor name] would smile, and the government would smile, and tempers would just go away.”

#### ***Intervention – Replace with Acting Project Manager***

The deputy product manager and the chief engineer attempted to replace the product manager's responsibilities.

#### ***Outcome – Failure***

The deputy manager and chief engineer were focused on their main role inside the project management office and not filling the gap of the product manager

#### ***Distress***

The 2<sup>nd</sup> product manager served as a buffer between the government and contractor personnel. When he left, there was no one to ease the tension between the two.

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Contractor

*Organizational Process*

- Key Leader turnover

*Contextual*

## **COTS Product Did Not Meet Requirements (Event d16)**

### **DESCRIPTION**

#### ***Incident – COTS Product Did Not Meet Requirements***

The initial certification of requirements was 80% of the government's requirements. The assumption was to deploy the 80% and develop the 20% later. However, it became apparent that 20% of the requirements needed to be developed across all the different capability categories. Therefore, the COTS product was unusable and did not meet the requirements.

“Nothing was plug and play.”

“Nothing was ready to go with the COTS product.”

“The product was not as flexible as they proposed.”

“The software couldn't meet all the requirements of the standardized business process established through BPR.”

#### ***Intervention – COTS Configuration***

The government required the contractor to bring on more resources for additional configuration.

#### ***Outcome – Failure***

The product and the contractor “just couldn't support or enable the amount of configuration that was required.”

#### ***Distress***

Described as “friction.” “Realizing that maybe this product wasn't the right product for the solution.”

## *Structures*

### *Social Structures*

- Project Management Office
- Contractor
- Functional Stakeholder

### *Organizational Process*

- *Requirements*

### *Contextual*

## Combined Department Project (Event d17)

### DESCRIPTION

#### *Incident – Combined Department Project*

The department created a group to analyze portfolio investments and make recommendations.

The project received a significant amount of scrutiny. The group decided they thought the project should become a combined project across the departments instead of individual projects across the services.

#### *Intervention - MVP*

Due to the fear of becoming a combined project, the project management office accelerated the schedule to deploy an MVP

#### *Outcome – Failed*

The project ended up being combined after the system failed.

#### *Distress*

“We were under the gun.”

“We were put under a microscope.”

#### *Structures*

##### *Social Structures*

- Department
- Project Management Office

*Organizational Process*

- Department system consolidation
- Scheduling

*Contextual*

## Preliminary Design Review (Event d18)

### DESCRIPTION

#### *Incident – Delayed Preliminary Design Review*

The contractor was not ready for the preliminary design review because they didn't understand the PDR requirements.

#### *Intervention – Accepted PDR Due Outs*

The project office delayed the PDR by two months and approved the PDR. Moreover, they planned to do an MVP because of the delay.

#### *Outcome – Failed*

Even though the PDR was approved, a substantial amount of due outs were eventually forgotten once the next task order contract was signed.

“hindsight 2020, we should have [...] delayed PDR.”

#### *Distress*

#### *Structures*

##### *Social Structures*

- Project Management Office
- Contractor

##### *Organizational Process*

- Systems Engineering Technical Review

*Contextual*

- The project management office was optimistic that the contractor would succeed.
- The PMO was fighting to maintain schedule because of Night Courts.

## **Antagonistic Relationships (Event d19)**

### **DESCRIPTION**

#### ***Incident – Antagonistic Relationship***

There was animosity between the government and the contractor because “we hired you to do this job, and so now I’m having to do this job for you.” The animosity built up over time and manifested in passive-aggressive behavior and “finger-pointing.” Additionally, anytime the government or contractor would provide constructive criticism to the other, the other would “complain to their boss.” Due to the animosity, people would stop talking in meetings, and everyone was mad at each other.

“I don’t feel like we ever had a good relationship with [Contractor name].”

“It became very contentious.”

#### ***Intervention – Personnel Collocation and Team Building***

The project management office had a collocated office with the contractor and forced government employees to spend the majority of their time in the contractor's office. Secondly, the project management office had “right arm nights,” where the government and contractor would go out to a happy hour. Thirdly, the deputy project manager discussed how to talk with contractors.

#### ***Outcome – Failed***

There was animosity and antagonistic relationships between the government and the contractor until the contract was terminated.

#### ***Distress***

Overall frustration was that the project would not meet its goals because the government and contractor could not get along. It was described as blatant disrespect to the government.

### *Structures*

#### *Social Structures*

- Project Management Office
- Functional Stakeholders
- Contractor Personnel

#### *Organizational Process*

- Contract Management

#### *Contextual*

### **3<sup>rd</sup> Project Manager Skill (Event d20)**

#### **DESCRIPTION**

##### ***Incident – 3<sup>rd</sup> Project Manager Skill***

The 3<sup>rd</sup> Project Manager did not have the technical competence, work ethic, or leadership skills required for the position. He was described as being absent, coming in late, and leaving early. At times, no one knew where he was.

##### ***Intervention – External Support/Fired***

A blue team was implemented to overcome the product manager's shortcomings; however, they reported back to the executive about the poor leadership of the product manager. Next, the product manager was removed and replaced by an interim product manager.

##### ***Outcome – Success***

The project “significantly improved” when the new official product manager was hired.

##### ***Distress***

The product manager would walk around screaming, “Terminate.” Members of the team were frustrated.

##### ***Structures***

###### ***Social Structures***

- Project Manager
- Executive Officer

###### ***Organizational Process***

- HR practices

*Contextual*

- Leader-centric culture. The leader drives the culture of the organization.

## **Unresponsive COTS Developer (Event d21)**

### **DESCRIPTION**

#### ***Incident – Unresponsive COTS Developer***

The contractor/systems integrator in this project also owned the COTS software. Initially, this was positive because the government had direct access to the development team. However, after the contractor was awarded another government contract, this government agency was no longer the priority. The contractor's product development team would take approximately nine months to resolve defects in the baseline system.

#### ***Intervention – Leader Engagement***

The government project manager “continued to engage with [Contractor Name].”

#### ***Outcome – Failure***

“I felt like it was the only thing we could do, Even thinking about it now.”

The lead team for defects never improved, and they would “push back into their development cycle to make those changes in the core solution.”

#### ***Distress***

“Really slowed things down and caused a lot of confusion, a lot of angst.”

#### ***Structures***

##### ***Social Structures***

- Project Manager
- Contractor

*Organizational Process*

- Product Development

*Contextual*

## **Agile Pilot Project (Event d22)**

### **DESCRIPTION**

#### ***Incident – Congressional Agile Pilot Project***

The project chose to be a part of a congressional agile pilot project “thinking it would fence [their] money in [...] and secure funding.” However, the project mandated that the PMO deliver a minimal viable product within six months. Additionally, after eight months of doing scaled agile, the contractor could not keep up.

#### ***Intervention – Shifted iterative developed strategies***

The government attempted to deploy MVP.

The government and contractor shifted to a different agile methodology closer to a waterfall method.

#### ***Outcome – Failed***

The MVP deployed and failed.

The contractor continued to fall behind in TO2.

#### ***Distress***

#### ***Structures***

##### ***Social Structures***

- Congress
- Project Management Office
- Contractor

*Organizational Process*

- Agile Methodology

*Contextual*

- Taking risks to secure funding

## Threats from Service Executives to Cut Funding (Event d23)

### DESCRIPTION

#### *Incident – Service Executive Funding Cut Threats*

The service's chief executive made significant funding changes and cuts across the services portfolio. The project was constantly in fear of funding cuts.

#### *Intervention – Agile Pilot Project/MVP*

The congressional pilot project protected the project from additional funding cuts.

The PMO Attempted to deploy the MVP as soon as possible.

Developed an ambitious schedule

#### *Outcome – Success*

The project did not receive funding cuts.

#### *Distress*

#### *Structures*

##### *Social Structures*

- *Service Executive*
- *Project Management Office*

##### *Organizational Process*

- Agile Software Development
- Budgeting/Funding

- Scheduling

*Contextual*

## Schedule Management (Event d24)

### DESCRIPTION

#### *Incident – Contractor changed baseline schedule*

The contractor did not adhere to the integrated master schedule and would change the dates on the IMS without approval. This was done after the project was directed to a waterfall methodology. Additionally, because the contractor did not maintain an adequate IMS, the contractor would respond with, "I don't know, " when the government would ask when something would get done." They would "slip schedule" without regard to other key project dates.

#### *Intervention – Hired Expert Schedulers/Oversight*

The project management office hired two expert schedulers that helped create a resource-loaded IMS and metrics to provide oversight.

#### *Outcome – Failure*

Even though the project had an IMS, the contractor continued to fall behind and "negatively impact the critical path."

#### *Distress*

#### *Structures*

##### *Social Structures*

- Project Management Office
- Contractor

*Organizational Process*

- Schedule Management

*Contextual*

## **Contractor Performance (Event d25)**

### **DESCRIPTION**

#### ***Incident – The contractor could not meet the contract requirements***

After the second task order was awarded, the contractor could not perform the contract's requirements. The contractor was not delivering software in accordance with the designs that the government and the contractor agreed upon. Additionally, the contractor was behind, and the backlog continued to grow. The contractor only completed 40-65% of their planned progress each sprint. During a demonstration, the software did not match the agreed-upon designs.

#### ***Intervention – Stop work/Get well plan***

The government issues a stop work for the contractor to develop a “get well” plan. The government issued a “no cost extension.” Moreover, the government's executive officer mandated that the project office stop implementing agile development and transition to waterfall. Lastly, a blue team was brought in to help the team move forward.

#### ***Outcome – Failure***

The contractor continued to perform poorly, and the transition to waterfall “considerably slowed the project down.”

#### ***Distress***

#### ***Structures***

#### ***Social Structures***

- Project Management Office

- Executive Office
- Contractor

*Organizational Process*

- Contracting Process

*Contextual*

## **Fight between Executive and 3<sup>rd</sup> PM (Event d26)**

### **DESCRIPTION**

#### ***Incident - Fight between Executive and 3<sup>rd</sup> PM***

The executive in charge of the project did not care for the 3<sup>rd</sup> project manager, “causing a big riff.” There was no “mutual respect,” and the project team didn’t feel like that had any “cover.”

“[PM Name] got cross-wise with [Executive Name].” It impacted the entire project, where they always felt “under the microscope)

#### ***Intervention – NA***

#### ***Outcome - NA***

#### ***Distress***

- Not having support from the executive organization
- Feeling like you are always under a microscope

#### ***Structures***

##### ***Social Structures***

- *Project Manager*
- *Executive*
- *Project Team*

##### ***Organizational Process***

- Professional Relationships

## **Project Management Office Morale (Event d27)**

### **DESCRIPTION**

#### ***Incident – Low PMO Morale***

The project's office morale was low, and the employees were not "acting as a team." The deputy product manager left, and the sentiment was, "screw this [expletive]." People were "checked out."

#### ***Intervention – Climate Survey***

The project manager did a climate survey that said the morale was "poor, very poor."

#### ***Outcome – Failed***

Nothing was done to increase morale.

#### ***Distress***

Employees lost commitment to the project.

#### ***Structures***

##### ***Social Structures***

Project Management Office

##### ***Organizational Process***

- Morale Building

##### ***Contextual***

## **Project Management Office Turnover (Event d28)**

### **DESCRIPTION**

#### ***Incident – PMO Personnel Turnover***

The Product Manager, Assistant Product Manager, and Deputy Product Manager turned over within a year. Then another essential individual left the project because the new product manager would not listen to team members, and they thought, “There wasn’t a lot more that I could do for the project.” This loss “exacerbated” other issues in the project.

#### ***Intervention – NA***

#### ***Outcome - NA***

#### ***Distress***

People left the project because they wanted nothing to do with the team.

#### ***Structures***

##### ***Social Structures***

- Project Management Office

##### ***Organizational Process***

- Organizational Management

##### ***Contextual***

- Bad organizational culture

## Defects during System Test (Event d29)

### DESCRIPTION

#### *Incident – Significant Defects during System Test*

The functional users ran test scripts during the system test and found significant issues. The functional identified areas that the process didn't meet the requirement, "gaps in functionality," and "lots of defects." Moreover, the PMO found issues between the test scripts, design documents, and training documents.

#### *Intervention – Additional Government Oversight*

The PM issued a letter of concern, and the government provided more oversight and control over documentation. Moreover, the functional stakeholders brought in more experts to help with the test scripts and training.

#### *Outcome – Failed*

The project never adjudicated the defects found in the system test but was forced to move forward.

#### *Distress*

#### *Structures*

##### *Social Structures*

- Project Management Office
- Functional Stakeholders
- Executive Office

- Contractor

*Organizational Process*

- Contracting Process
- System Testing

*Contextual*

## **Downgrading Defects from System Test (Event d30)**

### **DESCRIPTION**

#### ***Incident – Downgrading Defects***

The contractor would continually request to downgrade defects from category one to category three and to be less stringent on critical and high defects. The government would continually “lower and shape our standards, so [the contractor] can get through the next gate of testing.”

#### ***Intervention - Risk-Based Governance***

The project management office and functional stakeholders developed a “risk-based approach.” This approach allowed the PMO and functional stakeholders to examine each testing event's exit and entrance criteria and determine if the risk level was appropriate to proceed.

#### ***Outcome – Failure***

The risk-based approach was “a step in the right direction,” but the functional “dove into insanity.” Ultimately, the defects were not fixed, and the contractor failed the operational test.

#### ***Distress***

Distress is described as “insanity.”

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Functional Stakeholder
- Contractor

*Organizational Process*

- Testing (adjudication)

*Contextual*

- Constantly having to show progress

## **Failed Minimal Viable Product (Event d31)**

### **DESCRIPTION**

#### ***Incident – Failed MVP Deployment***

The minimal viable solution failed 30 days after being deployed to 20 users. The organization said the system was not meeting their requirements. The users had to “swivel chair” between three or four systems to get through specific business processes. The system was described as “not usable.”

#### ***Intervention – Parallel Work/Stop Payment***

The project manager stopped paying the contractor. They recorded the feedback sessions from the MVP users and did a root cause analysis. Additionally, they began parallel work on the MVP and initial operational capability release.

#### ***Outcome – Failure***

The defects were never fixed before the operational test.

#### ***Distress***

The organization in which the MVS was deployed stopped using the system.

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Functional Stakeholders
- Users

- Contractor

*Organizational Process*

- Contracting Process (Stop Payment)

*Contextual*

## **Contractor Dishonesty about Defects (Event d32)**

### **DESCRIPTION**

#### ***Incident – Contractor Dishonesty about Defects***

The contractor was tracking defects from the MVP on different dashboards than the government and triaging the defects as lower categories, attempting to mislead the government by hiding the defect. Additionally, the contractor would close defects without the government reviewing the fix. Lastly, the contractor’s corporate leadership lies to service executives.

#### ***Intervention – Risk-Based Governance Board***

The project management office used the previously established risk-based assessment to provide a “spotlight” on the defects.

#### ***Outcome – Success***

The risk-based approach allowed the government to see the defects and authorize the closure of those defects.

#### ***Distress***

#### ***Structures***

##### ***Social Structures***

- Project Management Office
- Functional Stakeholders
- Contractor

##### ***Organizational Process***

- Defect Management

*Contextual*

## **Contractor Gave Up (Event d33)**

### **DESCRIPTION**

#### ***Incident – Contractor Gave up***

The contract reached the fixed price ceiling, and the contractor was losing a substantial amount of money. They did not think the contract was worth continuing, so they started to “drop people left and right” and bring in the “D Team.” The contract lost the minimal subject matter experts they had. Once the government decided not to deploy and started to develop a new schedule, the contractor asked, “Okay, well, when are we getting our [termination] letter.”

#### ***Intervention – Contract Termination***

The government terminated the contract.

#### ***Outcome - De-escalation***

#### ***Distress***

#### ***Structures***

##### *Social Structures*

- Project Management Office
- Contractor
- Government Contracting Office

##### *Organizational Process*

- Contract Termination

##### *Contextual*

## **Contractor Failed Operational Test (Event d34)**

### **DESCRIPTION**

#### ***Incident – Contractor Failed Operational Test***

The project failed the operational test. The testers were not able to run through the test scripts, only getting to run through 30-40% of the test cases. Of the test cases that were completed, only 30% passed. The testing agency said, “Pretty much this system sucks, and you should not deploy this to anybody in the community.” In addition to the system defects, the training and usability of the system were “horrible.”

#### ***Intervention – Contract Termination***

The PMO extended testing for two more weeks, but the system was unusable. Additionally, the executive office directed a “tiger team” to conduct a root-cause analysis of the system failure.

The contract was terminated.

#### ***Outcome – Success & Failure***

The root cause analysis confirmed that the main issues were system defects, inadequate training, and system usability. Based on the analysis performed by the tiger team, the Executive Officer and the functional sponsor agreed to terminate the contract.

#### ***Distress***

In this critical incident, the project experienced distress because the testing community could not continue with the test because of system defects. The project was delayed, and the contract ended up being terminated.

#### ***Structures***

### *Social Structures*

- Project Management Office
- Executive Office
- Functional Sponsor
- Testing Organization

### *Organizational Process*

- Operational Testing

### *Contextual*

Appendix E – Truth Table

			Incident Category						Intervention Category							Social Structures			Org Struc		Cont ext							
System	Event #	Incident Name	Acquisition	Financial	Human Resources	Stakeholders	Requirements	Technological	Contractor Issues	Acquisition	Financial	Human Resources	Stakeholders	Requirements	Reframing	Technological	Internal Support	Contractor	None	Govt Industry Relationship	Executive Project Involvement	Functional - Project Expectations	Rigid or Flexible Structures	(Un) Supportive Structures	Formal Hierarchy	Path Dependencies	Outcome	
A	1	No Resources to Start Project		1							1										1		-	1	1		1	1
A	2	Pressure to Execute Quickly				1					1										*		-	1	1			1
A	3	Expanded Requirement					1				1										1		1	1			1	
A	4	Competing Platform	1										1								*	1	1	-	-	1		1
A	5	Selected Expensive Vendor		1									1								*	1	1	-	-	1	1	1
A	6	Lack of Proper Data Skills			1							1										0	1	-	1	1		1
A	7	Lack of Data Owners Cooperation						1					1									1	1	-	1	1		1
A	8	No Definition of Authoritative Data						1					1									1	1	-	1	1		1
A	9	Other Transaction Authority Approval	1								1											-	1	1	1		1	1
A	10	No Funding for Production		1							1											-	1	-	1	1		1





C	6	Contractor Unable to Meet Requirements					1			1									-	1			-	1	1		1	1		
C	7	Contract Termination	1						1										1	1	1		-	1	1	1		1	1	
C	8	Not Enough Funding to meet the requirements		1							1										1	1		-	1	1	1	1	1	
C	9	Data Protection Gap					1						1						1	1	1		-	1	1	1		1	1	
C	0	Executive Attempting to Cancel the Project					1				1								1	1	1		-	1	1	1	1	1	1	
C	1	Project Management Office Turnover			1						1								1	1			-	1	1	1	1	1	1	
C	2	No Secure Cloud Environment						1						1					1	1	1		-	1	1	1		1	1	
C	3	Cost of Cross-Domain Solution						1			1								1	1	1		-	1	1	1	1	1	1	
C	4	Last Minute Critical Requirement					1							1					1	1	1		-	1	1	1	1	1	1	
C	5	Initial Failure of Operational Test						1			1								1	1	1		-	1	1	1	1	1	1	
D	1	1st PM Lacked Requisite Skills			1									1						1			-	1	1	1			1	
D	2	Directed to be at a Lower Oversight Threshold	1							1										1			-	1	1	1			1	
D	3	Functionals Desire for a Perfect System					1				1												-	1	1	1	1	1	0	
D	4	Transition Government Acquisition Process	1											1						1	1		-	1	1	1	1	1	1	
D	5	Senior Executive Halted Project					1				1									1	1		-	1	1	1	1		1	1
D	6	Legacy System Sunset Dates					1										1			1			-	1	1	1	1		N A	
D	7	Pressure to Execute Source Selection					1				1												-	1	1	1	1	1	1	
D	8	Congress Marked Budget		1							1									1			-	1	1	1	1	1	0	
D	9	Vendor Submit Draft document during Source Selection	1							1										1	1		-	1	1	1	1	1	0	



