Design and evaluation of an integrated change lifecycle model to explore multiple dimensions of successful information technology enabled public services initiatives

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.

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Acknowledgements

When I began the research journey at Henley, I was asked to select a nautical metaphor that best described my expected process. In anticipation of a solitary venture with a singular focus, I selected the sea kayak. In reality, a more suitable metaphor was that of captain and deck hand for an international, ocean-faring, fishing trawler. The first contributors to this excursion were my referees: Dr. Paul Boothe and Dr. George Cronk, Jr., who expressed confidence in my capacity to successfully navigate doctorate level requirements.

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> "It is not the critic who counts; not the man who points out how the strong man stumbles, or where the doer of deeds could have done them better. The credit belongs to the man who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; who errs, who comes short again and again, because there is no effort without error and shortcoming; but who does actually strive to do the deeds; who knows great enthusiasms, the great devotions; who spends himself in a worthy cause; who at the best knows in the end the triumph of high achievement, and who at the worst, if he fails, at least fails while daring greatly, so that his place shall never be with those cold and timid souls who neither know victory nor defeat." (Theodore Roosevelt, 1910)

Abstract

Investing in information technology (IT) to enable change in organizations is an abundantly researched subject. Academic literature and practitioner publications have emphasized critical success factors and reasons for failure in change initiatives. Recent studies in the private sector highlight major challenges with these undertakings that diminish shareholder value. There is also mounting evidence that government agencies have had similar experiences, resulting in the loss of public trust and confidence.

Many prior investigations have recommended improvements to one aspect of change, such as project management diligence or overcoming organizational resistance to change. Other investigations contend that success is inhibited by inadequate understanding of the multi-dimensional nature of change and by the application of prescriptive models that are incomplete.

In response to these shortcomings, this thesis iteratively designs and develops a theoretical model that integrates multiple dimensions, which originate as the *process, content,* and *context* of change. The resulting model offers an extensive set of factors, conditions, and practices within all three dimensions that should be considered during the *lifecycle* of IT-enabled change. The thesis evaluates this *integrated change lifecycle model (ICLM)* empirically by exploring how two public sector organizations have managed the contribution of IT to produce positive results and benefits.

Empirical evaluation of the ICLM focuses on the question, "*How are successful IT-enabled public services change initiatives governed, managed, and performed?"* The evaluation uses two cases: (1) a new service delivery channel initiative, and (2) an operational process improvement initiative. Both are located in a transportation program area of a U.S. state government. *Thematic analysis* of multi-faceted stakeholder interviews, survey results, and change initiative documentation was employed to determine findings for each change dimension and each change lifecycle stage.

This multi-dimensional ICLM contributes to the theoretical body of knowledge in the fields of (1) public services management; (2) organizational change and development; and (3) information systems and technology. The ICLM offers an extensive elaboration of *solution content domains*, *project performance processes*, and *organizational change environment aspects* across five lifecycle stages: (1) *public policy and strategy formulation; (2) public service improvement definition; (3) change solution delivery; (4) project results determination;* and (5) *public benefits realization*.

The methodology employed to produce and evaluate the ICLM corresponds to the *design science research* (DSR) paradigm and is consistent with DSR guidelines for contributing to research knowledge. The objective of the research is to develop a technology-oriented solution to an important and relevant management and organizational problem. The research has produced, via multiple iterations, an advanced artifact in the form of the ICLM.

The viability and utility of the ICLM has been evaluated and rigorously demonstrated via two in-depth case studies. The ICLM, and its evaluation findings and implications have been presented to technology-oriented and management-oriented academics and practitioners in research colloquia, conferences, and leadership sessions.

Participating program and system managers accept that the multi-dimensional ICLM could benefit their agency in two ways: (1) as a diagnostic tool to assess existing change initiatives; and (2) as a strategic tool to plan and organize new initiatives. Of particular interest is the finding that no individual manager was tasked to orchestrate solutions to meet the requirements of all change dimensions. Instead, each initiative organization employed a collaborative approach with well-defined accountabilities for each change dimension.

The ICLM could help system owners to understand the complex responsibilities of the *information system integrator* role to ensure fit for purpose and integrative compatibility of technical components from all sources. The ICLM also defines a *public services integrator* role for government change initiatives to ensure that the IT components fit with redesigned laws, rules, regulations, policies, processes, preferred practices, and duties.

The findings confirm the value to management practice and theory of a unifying model that integrates the three change dimensions within a prescribed change lifecycle. Based on these results, it is recommended that the ICLM be evaluated in other public sector program areas as well as in private sector business environments to further its contribution to management, organizational change, and information systems theory, and to increase its value to researchers and practitioners.

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List of Abbreviations

AASHTO - American Association of State Highway Transportation Officials

AAMVA - American Association of Motor Vehicle Administrators

ADKAR – Awareness, Desire, Knowledge, Ability, Reinforcement (PROSCI)

BPI – Business Process Improvement

BPM - Business Process Management

BPR - Business Process Reengineering or Redesign

BSM – Business Systems Management

CF - Conceptual Framework

CIO – Chief Information Officer

CIS – DMV Customer Information System

COI – ODOT Community of Interests Council

COTS – Commercial off-the-Shelf (Software)

CSG – DMV Customer Services Group

DAS - Oregon Department of Administrative Services

DBMS – Database Management System

DEQ - Oregon Department of Environmental Quality

DMV - Oregon Driver and Motor Vehicle Services

DOJ – Oregon Department of Justice

DSR - Design Science Research

ECM – Electronic Content Management

ES – Executive Sponsor

FAQ – Frequently Asked Question

FHWA – Federal Highway Administration (US)

FSG – DMV Field Services Group

GAO – Government Accountability Office (US)

GIS - Geographic Information System

ICLM – Integrated Change Lifecycle Model

ICT – Information and Communications Technology

IRMD – DAS Information Resource Management Division

IS - Information Systems discipline

ISB – ODOT Information Systems Branch

IT- Information Technology

ITSG – DMV Information Technology Services Group

JAD – Joint Application Development

MIT – Massachusetts Institute of Technology

NAO - National Audits Office (UK)

ODC - Organizational Development and Change discipline

ODOT - Oregon Department of Transportation

OE – Opportunity Evaluation

OECD - Organization for Economic Co-operation and Development

OTC – Oregon Transportation Commission

PGSG – DMV Program Services Group

PM – Project Manager

PMBOK - Project Management Body of Knowledge

PMI – Project Management Institute

PMI – Right of Way Property Management Information System

POP – Oregon Policy Options Package

PSM – Public Services Management

PSG – DMV Processing Services

QA – Quality Assurance

RAD – Rapid Application Development

RAIN – Right of Way Acquisition Information Network

RITS - Right of Way Information Tracking System

ROI – Return on Investment

RUP – Rational Unified Process

RW – Right of Way Section or Program

RWDMS – Right of Way Data Management System

RWLT – Right of Way Leadership Team

SC – Steering Committee

SDLC – System Delivery (or Development) Lifecycle

SME – Subject Matter Expert

STIP – Oregon State-wide Transportation Improvement Program

TAD – ODOT Transportation Applications Development Section

TQM – Total Quality Management

VPN – Virtual Private Network

VRS – DMV Vehicle Registration System

1. Introduction

The purpose of this research is to design, develop, and evaluate an integrated change lifecycle model (ICLM) that can be applied to gain a more complete understanding of those organizational and managerial characteristics - factors, conditions, and practices - that are prevalent during successful information technology (IT) enabled public services change initiatives. This thesis explores these characteristics throughout the lifecycle of planned change from idea conception through to the delivery of a solution that achieves targeted results and facilitates benefit realization.

This Chapter provides an introduction to key concepts, the research objectives, scope of study, overview of methods, findings of theoretical and practical significance, and the structure of remainder of thesis. The Chapter begins with background information that sets the stage for this important organizational and managerial problem to be investigated. It frames a statement of purpose for the research, which explains how this problem will be addressed. Next, is the research question that covers the purpose and the answers to which will illuminate potential solutions to the problem. This Chapter includes a discussion of the research approach, the researcher's perspective, and underlying assumptions.

1.1 Problem Definition and Significance

Application of information and communications technology (ICT or IT)[1] to enable business or organizational change is a widespread and extensively researched phenomenon that has received public attention and academic scrutiny for at least thirty years. Yet, despite frequent calls for improvements to a plethora of organizational, managerial, and technical processes, initiatives that are planned and organized to deliver change continue to achieve, at best, mixed results (Standish Group, 2009). Flyvbjerg & Budzier (2011) reached a bleak conclusion from their global study of IT change initiatives. Their research found that an abnormally large proportion of these initiatives incur massive cost overages, which place entire organizations, not just projects, at risk of failure. The gravity of this issue in the corporate sector is underscored by attention it can receive at the board level. Leadership IQ research (Murphy, 2009) reports that *the* most common factor in board decisions to dismiss

[1] Information technology (IT) and information and communications technology (ICT) are often used as synonyms. This research uses the term *information technology* with a meaning that includes communications technology.

a Chief Executive Officer is an inability to successfully lead business change.

Government agencies have had similar experiences. Well-publicized IT-enabled change failures or major shortcomings have plagued, for example, the UK National Health Service (NHS) with its centralized patient record initiative; Canada's Province of Ontario, as noted in its Special Taskforce report on large-scale IT projects (Province of Ontario, 2005); and the U.S. State of Oregon DMV Licensing and Titling Project (Field, 1997). A subject that has recently received front-page news attention in Canada is the failure of the Federal Government's Phoenix Pay System initiative (Office of Auditor General of Canada, 2017).

The National Audit Office (UK) (2006) perhaps captures the essence of the public sector IT-enabled change challenge, noting (p.10),

> "The successful delivery of IT-enabled business change is essential for improving major public services, but experience in the public sector in Britain also shows that achieving such change is particularly complex and challenging in terms of the scale of the changes required, cross-government co-ordination needed, and technical issues around joining new and old systems."

This problem is exacerbated by conditions within the broader government context throughout Europe and North America where expectations for public sector responsibilities have been raised while budgets and staffing levels have been reduced. It is generally agreed that improvements in controllable organizational conditions and managerial practices for initiatives with major IT investments could contribute to more effective and efficient public service systems stewardship of public funds.

Economic use of public funds is an important and significant issue for society. According to the Organisation for Economic Co-operation and Development (2007), public expenditures represent a sizable proportion of the Gross Domestic Product of developed nations in Europe and North America, ranging from 34 percent in the United States to more than 44 percent in Greece.

As for the scope of IT investments, in 2009 the U.S. federal government spent an estimated $76 billion on information technology (Rosacker & Rosacker, 2010). The federal Government Accountability Office (GAO) reports on the progress and status of these initiatives. In a report (Powner, 2008) to a Subcommittee of the U.S. Senate (2008), the GAO

found that, "…approximately 413 IT projects – totalling at least $25.2 billion in expenditures for fiscal year 2008 – as being poorly planned, poorly performing, or both."

The GAO report continues,

> "…more needs to be done…to address recommendations GAO has previously made to improve the planning, management, and oversight of [these] projects so that potentially billions in taxpayer dollars are not wasted…Mature and effective management of IT investments can vastly improve government performance and accountability, while poor management can result in wasteful spending and lost opportunities for improving delivery of services to the public."

But what does "mature and effective management of IT investments", actually mean given complexity inherent in public services change? This thesis shines light on this issue.

1.2 Contribution of Prior Knowledge

A multitude of studies attempt to attribute the failure or poor performance of IT-enabled change initiatives in the public sector to a variety of specific causes. Some attribute the lack of success to weakness in project management. Others focus on technical deficiencies such as the incompatibility of system components. And many attribute shortcomings to inattention to change leadership and employee resistance to change. Recent research (Fernandez & Rainey, 2006) has attempted to discern whether the public sector environment creates conditions that interact differently with these other factors.

What complicates an evaluation of successful change is that frequently no consensus exists among stakeholders or participants as to whether a change initiative has succeeded or failed. Change initiative success may be based on achievement of mission-related outcomes or may be defined by an individual or group with their own goals, interests, and expectations.

Some researchers contend a reason for lack of success is that leaders and practitioners of change have not developed the necessary understanding of the complex, multidimensional nature of what occurs within the organization that *receives* the technology, and what *they* must do to facilitate success. In this broader context, Armenakis & Bedeian (1999), in their review of the 1990s change literature, conclude, "analyses of organizational change have generally tended to be limited in scope, focusing on one set of considerations or another (p.155)". Beer & Nohria (2000) assert that an integrated theory or framework for understanding organizational change does not exist.

The challenges in achieving change objectives leads to this research aim: could success as indicated by results achieved by an IT-enabled change initiative be associated with the presence, absence, or effectiveness of specific factors, organizational conditions, or managerial practices?

1.3 Research Purpose and Objectives

1.3.1 Purpose of Research

Given this background, the purpose of this research is three-fold:

(1) To design and develop an artifact – a model - that integrates the change dimensions of process, solution content and organizational change environment within a planned change lifecycle.

(2) To demonstrate and evaluate this artifact empirically to determine whether it can be an effective tool for understanding successful IT-enabled change.

(3) To elaborate characteristics of this artifact to provide a rich description of factors, organizational conditions, and managerial practices, which are prevalent in the governance, management, and performance of successful public service change initiatives.

1.3.2 Research Objectives

To expand the knowledge and tools available to address the problem of change initiative failure, this research should produce:

(1) An integrated model that elaborates multiple dimensions of change across the entire lifecycle of prescribed change.

(2) A description of how the model can support organizational and managerial solutions to overcome the problem of high failure rates in IT-enabled change initiatives.

(3) Identification of factors, organizational conditions, and managerial practices that are associated with successful change initiatives in the public sector.

(4) An improved understanding of what constitutes success in an IT-enabled change initiative from the various perspectives of key change initiative roles and stakeholders.

1.4 Overview of Research Approach

1.4.1 Research Question

To discover and understand factors, conditions, and practices present in successful IT-enabled public services change, the following research question is advanced:

> ***How are successful information technology-enabled public services change initiatives governed, managed and performed?***

This exploration is distinct from the type of investigation that would be required for an explanatory research question, which might attempt to establish cause and effect relationships, with a question such as, "What are determinants of successful information technology-enabled public services change?" To answer the latter question, a researcher would need evidence of both failed and successful IT-enabled change initiatives and a sample of cases sufficient in variability to provide data for a comparative analysis of factors that would have been identified in prior research.

The *design science research (DSR)* paradigm was adopted to link the problem domain, the solution artifact, and the case studies. Section 3.2 discusses the philosophical underpinnings of design science research and assumptions applicable to studies of management, organization, information systems, and technology. Section 3.3 details the *design science methodology* (DSM) phases, which apply qualitative research techniques and two case studies to demonstrate and evaluate iterations of an integrated change model.

1.4.2 Alignment with Design Science Methodology

Features of the DSM that align with the current research include:

(1) The model was designed, developed, demonstrated, evaluated, and communicated using an iterative approach.

(2) The initial model design was derived from the Pettigrew (1987) change framework of content, context and process dimensions, with elaborations from Venkatraman (1994), Rummler & Brache (1995), and Balogun & Hope Hailey (2008).

(3) An initial empirical design was developed, demonstrated, and evaluated using a case study of the e-Government initiative for Oregon DMV Services. Results were described using a three-level hierarchy of factors, organizational conditions, and managerial practices.

(4) An advanced design was developed, demonstrated, and evaluated using the Right of Way Information Tracking System (RITS) initiative for Oregon Department of Transportation. Results were described using an expanded three-level hierarchy of factors, conditions and practices based on the change dimensions and lifecycle stages.

(5) Interim versions of the model and characteristics were presented at research colloquia and academic conferences, which led to improvements in the model design.

(6) Versions of the model and its characteristics were communicated to program and system managers from the case initiatives and related organizations.

1.4.3 Case Study Information Sources

Section 3.4 discusses types and sources of information needed for each case, explains common methods and protocols used to collect and manage the information, and techniques used to analyze, synthesize and interpret the findings. A main source is individual interviews with participants in a various roles that govern, manage, and perform each case initiative. The interview process involved instrument pilot testing, adjusting format and scope, and applying the final design to interviews with 35 persons via individual and small group settings. The interview protocol was adjusted as collection progressed, influenced by the different roles and responsibilities and the emerging characteristics of each case.

A second information source for each case is project management documentation and solution content deliverables. These documents comprise the official project record and chart the entire change lifecycle from conception through to conclusion. These detailed documents were used to identify new findings and to amplify and corroborate interviews.

A third source of information is reports that assess the quality and risks for each change initiative over its lifecycle. Oregon State policy requires periodic, independent, third-party quality assurance reviews and risk assessments on significant information technology projects that direct change to program or service delivery within State agencies.

The stages and change dimensions of the evolving model provided the basic structure to manage the information and to organize the findings, as demonstrated in Chapters 5 and 6. Characteristics of each change case and themes were determined from patterns identified in the various sources by applying *Thematic Analysis* techniques.

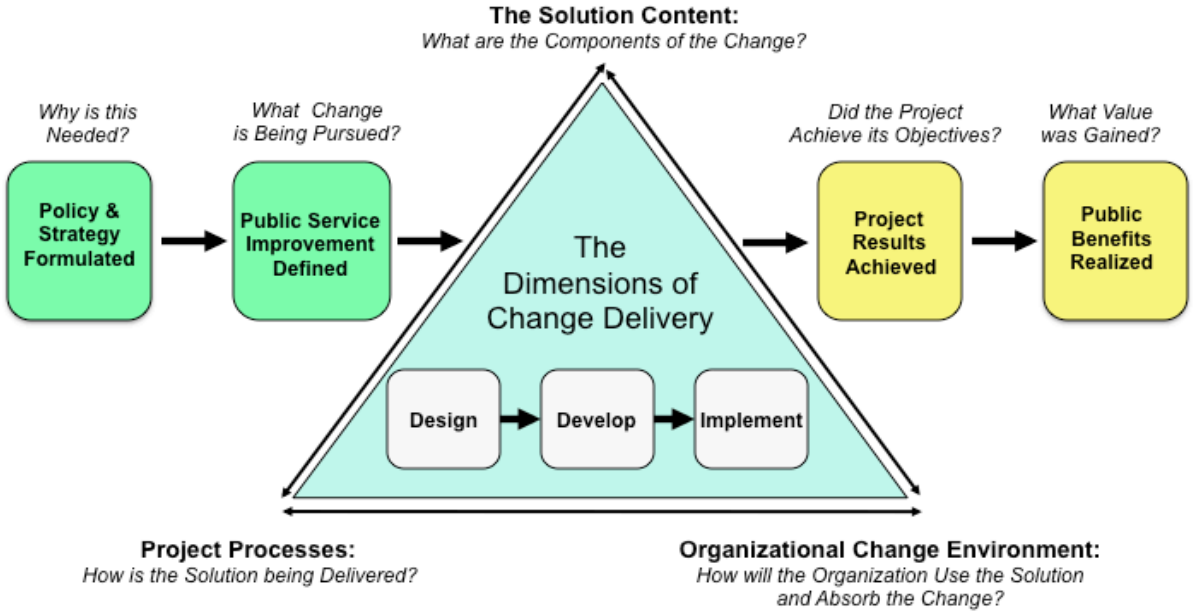
Section 3.5 outlines the criteria and tactics used to evaluate and demonstrate trustworthiness - *credibility*, *dependability,* and *transferability* - of results and methods.

1.5 Overview of Results

1.5.1 An Advanced Integrated Change Lifecycle Model

A major output from this research is an advanced iteration of an Integrated Change Lifecycle Model. Each stage of the ICLM represents a plateau of achievement in a public services change initiative. As illustrated in Figure 1.1, the first stage is the formulation of public policy and strategy that provides rationale and guidance to launch a change initiative and to forecast the required level of IT investment. The improvement definition stage is where an intention to change an existing public service system is expressed as improvement objectives within an accepted business case. The change delivery stage, comprising design, development, and implementation phases, is where three dimensions of change are managed explicitly: the solution content, project delivery processes, and preparations for the organizational environment for change. The results stage is where a new or redesigned process, service, or program is in operation and results are measured in relation to objectives. The final stage is where benefits are realized and the overall value is determined.

Figure 1.1: An Integrated Change Lifecycle Model for Public Services Initiatives



Elaboration of each stage and dimension into observable characteristics reveals the fundamental nature of a particular change initiative and validates the ICLM as a useful artifact. This elaboration occurred as the ICLM was demonstrated and evaluated empirically.

1.5.2 ICLM Congruence with Design Science Research Guidelines

As shown in Table 1.1, the approach, methods, and techniques used to develop the Integrated Change Lifecycle Model, and results obtained, are congruent with DSR guidelines for information systems and technology research, as outlined by Hevner *et al.* (2004).

Table 1.1: Integrated Change Lifecycle Model and Design Science Research Guidelines

Guideline	Description	Integrated Change Lifecycle Model
1. Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.	The Model (ICLM) provides a viable set of concepts, processes and methods for managing IT-enabled change.
2. Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.	Significant investments in IT-enabled change experience high failure rates and visible exposures.
3. Design Evaluation	Utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.	ICLM is evaluated in the contexts of two public sector change initiatives. Iterations of ICLM evaluated and design improved.
4. Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of design artifact, design foundations, and/or design methodologies.	Clear contributions of the ICLM as a tool to improve the planning and assessment of IT-enabled change initiatives.
5. Research Rigour	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.	Rigorous methods for data collection and validation (triangulation). Thematic analysis method used to synthesize findings from evaluation.
6. Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.	Initial iteration of ICLM based on Pettigrew (1987), Van de Ven & Poole (1996), Rummler & Brache (1995), Manwani (2008), Balogun & Hope Hailey (2008)
7. Communication of Research	Design-science research presented effectively both to technology-oriented as well as management-oriented audiences.	Presentations of artifact design at academic conferences and colloquiums and to public sector managers.

1.5.3 Knowledge Contribution from Integrated Change Lifecycle Model

This study enhances prior research in the field of IT-enabled change. The advanced Integrated Change Lifecycle Model (ICLM) as designed and developed herein contributes to the lifecycle theory of organizational development and change (Van de Ven & Poole, 1995). The ICLM applies to planned change in which a single change entity follows a sequence of prescribed development stages to produce a series of deliverables that are cumulative in knowledge acquisition and achieve a specific end state, while regulated by rules.

The ICLM is elaborated with numerous characteristics within the lifecycle stages of successful IT-enabled change in a public sector context. This expands the range of considerations proposed in prior IT-enabled change artifacts, such as those documented by Manwani (2008), Kotter (1996), Cooper & Zmud (1990), and Kettinger *et al. (1997).*

The ICLM extends the scope of the theoretical change dimensions of content, process, and organizational environment (from Pettigrew, 1987) to cover solution content and project delivery processes of IT-enabled change in a public sector context. The ICLM extends the use of the original three-dimensional framework to include solution design, development, and implementation.

The Integrated Change Lifecycle Model is relevant to practice as it can be used to facilitate a thorough examination of factors, organizational conditions, and managerial practices across all change dimensions in the design, development, and implementation of an IT-enabled solution. This should supply a stronger argument for what is needed to set up a new initiative and thereby increase the likelihood of success.

1.5.4 Transferability of Integrated Change Lifecycle Model

Transferability in management, organization, information systems and technology research is the degree to which a study has made it possible for practitioners to determine whether similar results could be found in their own organizational settings. This depends upon the original study providing information in suitable depth and sufficient detail to explain what is present or has occurred in that research setting. Decision-makers then would be in a position to consider whether an intervention could be implemented in a new, specific setting and whether the original study findings could be as effective in a new setting as they were in the original setting.

Chapter 8 discusses transferability of the ICLM to potential change initiatives within a range of government program contexts, starting within the vicinity of the case studies, and extending to other transportation jurisdictions, and then to other government program areas. The degree to which the ICLM is transferable for use by other public sector organizations would appear to depend upon the extent to which characteristics of the organizational environment are similar and the content of public services system solutions are comparable.

Transferability of the ICLM to the private sector would entail its use to plan, organize, and manage IT-enabled initiatives to improve business products, services, and processes. At the macro-level, the change stages and dimensions of the ICLM could be adapted to the private sector by redefining the purpose and name of each construct to reflect a commercial orientation. It is also recognized that many of the theories upon which the change stages and dimensions of the ICLM were developed apply to general business IT-enabled change. The degree to which the ICLM is transferable to private sector organizations at a detailed characteristic level would depend largely upon the content of the business system solution and characteristics of the organization itself.

2. Literature Review

2.1 Introduction

The purpose of this research is to develop an integrated model that leads to a more complete understanding of those factors, conditions, and practices that are prevalent in successful information technology-enabled public services change initiatives. A fundamental task in conducting this review is an appreciation of historical and current literature in a somewhat ambiguous and confusing field of inquiry. Tranfield, Denyer & Smart (2003) define roles for the literature review, as:

> *"…enabling researchers to both map and assess the existing intellectual territory, and to specify a research question to develop the existing body of knowledge further".*

Any discussion of information technology-enabled change starts with recognition that it is a cross-discipline intellectual territory. Contributions to the existing body of knowledge on IT-enabled change represent a diverse portfolio of research drawn from: general systems theory; business process improvement, reengineering, redesign, innovation, and management; organizational transformation; information technology innovation; IT-enabled transformation; total quality management; project governance; project management; organizational change and development; and organizational change management.

Accordingly, this review considers results from a broadly based exploration of foundational theories, frameworks, concepts, and analytical techniques in these disciplines and fields of study, primarily from the academic literature, supplemented by some practice-based sources.

For the phenomenon of IT-enabled change in the public sector, this review covers both general management literature and public administration literature that are pertinent to delivery of public services and programs and associated process and organizational change.

The literature review describes the nature and significance of information technology-enabled business change. This review approach is inclusive by examining the descriptive literature produced under the specific heading of IT-enabled business change, as well as prescriptive knowledge on affiliated topics such as IT implementation, project management, organizational change, business process redesign, and socio-technology systems.

Next, is a synthesis of the body of knowledge concerning the three overarching dimensions viewed as common to all types of organizational change efforts, introduced by Pettigrew (1987), and subsequently applied by Armenakis and Bedeian (1999), Kuipers et al. (2014), Pettigrew and Whipp (1991), Pettigrew et al. (2001), and Ward and Elvin (1999). This supports application of these dimensions in the design and development of an integrated change model.

Subsection 2.3.1 summarizes the literature that focuses on the *content* or substance of the change being introduced, which includes strategies, structures, solutions and systems.

Subsection 2.3.2 summarizes the literature that focuses on the *processes* by which the change initiative or project is governed, managed and executed.

Subsection 2.3.3 summarizes the literature that focuses on *context* – factors and conditions present in internal and external environments of the organization within which the change occurs.

Section 2.4 discusses literature on some of the different ways that success can be evaluated in an IT-enabled change initiative.

Section 2.5 reviews references to IT-enabled change in government, the content of which is labelled as *public service delivery systems*, *IT-enabled public program change,* or *electronic (e-) government*. This review includes hindrances to change arising in the public sector that private sector organizations do not have to contend with. Recent literature reviews on organizational change in the public sector (Fernandez & Rainey, 2006; Kuipers *et al*., 2014) indicate that the government context is under-represented in the change literature.

Section 2.6 summarizes the literature review, including conclusions about the opportunity to build upon the limited body of knowledge about the content of public services change and the organizational environment within which change occurs in the public sector, particularly in those program areas that have mandates for the natural world.

This review should not be regarded as an exhaustive appraisal of all literature about IT-enabled business, organizational, and public services change, but rather as a representative overview of relevant topics.

2.2 The Nature and Significance of IT-Enabled Business Change

A discussion of business change enabled by information technology starts with the recognition that this research requires an interdisciplinary approach, combined with knowledge from functional activities of management practice (Knights & Willmott, 1997). The extensive body of knowledge finds contributions from general systems theory, economic theory, information systems theory, and organizational behaviour theory. It gains insights from developments in management practice including: business process improvement, reengineering, and management; business transformation; total quality management; innovation; change lifecycle management; organizational change management; benefits realization; project management; and project governance.

An appreciation of the IT-enabled business change literature finds many theories and concepts that express in similar, though slightly different, ways the means by which changes to processes, organizations and performance can be facilitated by information technology.

Table 2.1: Theories and Concepts Applicable to IT-Enabled Business Change

Theory or Concept	Key Proponent(s)	Other Sources
Business/general systems theory	Forrester (1957), von Bertalanffy (1968)	Kast & Rosenzweig (1972), Senge (1990), Rummler & Brache (1995), Checkland & Scholes (2003),
Business/organizational transformation	Scott Morton ed. (1991)	Pettigrew (1987), Venkatraman (1994), Kotter (1995), Ackerman (1997), McNulty & Ferlie (2004)
Business process reengineering	Hammer (1990)	Hammer & Champy (1993), Grover *et al*. (1995), Earl *et al.* (1995), Keen & Knapp (1996), Cao *et al*. (2001)
Business process management	Rummler & Brache (1995), Hammer (1996)	Kettinger & Grover (1995), Smith & Fingar (2003), Rosemann and de Bruin (2005)
Business process redesign/transformation	Davenport & Short (1990), Davenport (1993)	Earl (1994), Fiedler, Grover, and Teng (1994), Stoddard & Jarvenpaa (1995)
Business process improvement	Harrington (1991), Rummler & Brache (1995)	Davenport & Beers (1995), Garvin (1998)
Information technology-enabled business change/ transformation	Zuboff (1988), Earl (1992), Venkatraman (1994), Manwani (2008)	Nunamaker et al. *(1991) Fiedler et al. (1994)*, Markus & Benjamin (1997), Ward & Elvin (1999), Gibson (2003), Harmon (2007), Mitchell & Zmud (2006), Margherita & Petti (2010)
Information system/ technology innovation	Rogers (1983), Tornatzky & Fleischer (1990)	Damanpour (1991), Swanson (1994), Klein & Sorra (1996), Jeyaraj *et al.* (2006), Avgerou McGrath (2007)
Total quality management	Crosby (1979), Deming (1986), Juran (1988)	Flood (1993), Spector & Beer (1994), Hill & Collins (1996), Cao *et al*. (2000)
Socio-technical system	Leavitt (1964)	Mumford (1987), Kwon & Zmud (1987), Davis *et al.* (1992), Lyytinen (1999), Lyytinen & Newman (2008)
Technochange management	Markus (2004)	Boudreau & Robey (2005), Peppard & Ward (2005), Willcocks & Sauer (2005), Harison & Boonstra (2009)
Organizational change & development	Lewin (1947), Van de Ven & Poole (1995)	Pettigrew (1987), Van de Ven & Huber (1990), Kanter (1992), Kotter (1996), Armenakis & Bedeian (1999), Weick & Quinn (1999), Hope Hailey *et al.* (1999), Beer & Nohria (2000), Fernandez & Rainey (2006), Hiatt (2006), Wallace (2007a), Weiner (2009)

This Chapter continues with a discussion of each variant listed in Table 2.1. It provides a brief history of the development and use of the concept or theory, and explains some of the limitations within the context of a holistic approach to IT-enabled change. It is recognized that this review references a small sample of the body of knowledge documented in the academic literature and practitioner publications. To underscore this, Van de Ven & Poole (1995) in the widely cited, *Explaining Development and Change in Organizations*, found more than one million articles on development and change in ten different disciplines.

2.2.1 The Business as a System

At the core of many discussions of IT-enabled business change is the theory of the *business as a system*. As Kotter (1995) remarked (p.60), "change, by definition, requires creating a new system". Many writers have set forth key concepts of general systems theory (GST), notably von Bertalanffy (1950, 1968), Boulding (1956), and Forrester (1957, 1961, 1995). Others have applied GST to organization and management: Kast & Rosenzweig (1972); Senge (1990); Rummler & Brache (1995); and Checkland (1999). Originating with von Bertalanffy (1968), (p.4),

> "The field of systems theory began with the recognition that interrelationships exist because all elements and conditions of an ecosystem, or human society – essential factors in public problems, issues, policies, and programs – must always be considered and evaluated as interdependent components of a total system" (Fotheringham, 2008).

Research into how information technology could affect the design and performance of a business system began nearly three decades ago. MIT's *Management in the 1990s Research Program* (Scott Morton, 1991) evaluated the emerging contribution of information technology to the business as an integrated system. It proposed how, as a consequence, future organizations and systems might differ from those in existence at that time.

Rummler & Brache (1995) developed a comprehensive framework to analyze and design an organization as a system to improve performance. Their underlying theory is that an organization is a dynamic ecosystem, which is defined by its *processes*. People perform roles to design and execute these processes to collectively accomplish a business result. This theory emphasizes that process work is performed and problems arise within *the white space on the organizational chart*.

2.2.2 Business and Organizational Processes

Building on a theme of the business process as a core concept of organizational change, Keen & Knapp (1996) explore two distinct interpretations of business processes. The first is a process as a workflow, a series of activities aimed at producing something of value. Many prominent authors provide conceptions. The industrial engineering view (Hammer & Champy, 1993) is "…a business process as a collection of activities that takes one or more kind of inputs and creates an output that is value to the customer." In the same vein, Davenport (1993) states, "A process is a specific ordering of work activities across time and space, with a beginning, an end, and clearly identified inputs and outputs: a structure for action." An organizational theorist (Earl, 1994) defines a process as, "a lateral or horizontal organisational form that encapsulates the interdependence of tasks, roles, people, departments and functions required to provide a customer with a product or service." The second interpretative school (Keen & Knapp, 1996) views processes as coordination of action between people that yield firm-specific assets such as "dynamic organizational capability" or "core competence", which competitors cannot match.

Earl (1994) suggests that four types of organizational processes are emerging: (1) *core processes* that are central to business functioning and relate directly to external customers; (2) *support processes* that have internal customers and back-up core processes; (3) *business network processes* that extend beyond organisational boundaries to suppliers, customers and allies; and (4) *management processes*, which firms use to plan, organize and control resources.

Garvin (1998) proposes a unifying process framework that links organizational processes and managerial behaviour. Three categories of organizational processes are advanced: (1) *work processes*, akin to Keen & Knapp's (1996) categorization of business processes, but labelled as "operational processes" and "administrative processes"; (2) *behavioural processes*, the sequences of steps used to accomplish cognitive and interpersonal aspects of work (p.37); and (3) *change processes*, which alter the scale, character, and identity of an organization over time (p.41).

According to Garvin (1998), three broad categories dominate the literature on *managerial processes*: direction setting, negotiating and selling, and monitoring and control. Garvin combines organizational and managerial processes into an integrative framework. This provides managers with intervention points and paths, depending upon the type of process under study.

Integration of information technology into the business system has become an essential design factor through approaches and practices referenced as business process reengineering (BPR), business process improvement (BPI), business process (re) design, process innovation, and business process management (BPM). These terms are used interchangeably to represent the phenomenon of *business process change* (Kettinger & Grover, 1995). The basis of these practices is a *process-oriented* perspective, in contrast to the historical *function-oriented* theories associated with Fordism, Taylorism, and the industrial revolution (Hammer & Champy, 1993).

2.2.3 Business Process Reengineering

Hammer (1990; with Champy, 1993) brought to public attention the idea that radical, large-scale business process reengineering could revolutionize business and dramatically improve performance through benefits such as increased unit productivity, reduced process cycle time, improved quality, and increased customer satisfaction. Hammer and Champy (1993) highlight the process by which BPR content could be delivered and explain organizational factors and conditions affecting its adoption.

Although BPR became a widely used approach to manage change during the following decade, it frequently failed to meet expectations (Earl, 1994). This is attributed variously to ineffective communication, underestimating organizational resistance, change content that is not aligned with the capabilities of those involved, and weak recognition of organization structural and cultural aspects (Cooper & Markus, 1995; Hill & Collins, 1996; Valiris & Glykas, 1999). By 2001, BPR had virtually disappeared from business process practitioner lexicon and toolkits, as well as from the academic literature. Harmon (2007) claims a root cause is that most BPR programs and theorists underestimated the difficulties of integrating and changing enterprise business systems using information technologies that

were available at the time. Cao *et al.* (2004), in a critique of BPR literature, finds that many studies stressed the need for "a holistic view of the management of change within BPR implementations" (p.333). Field research (Grover et al., 1995) offers: "Change management stands out as the most severe source of difficulty in reengineering" (p.136). In their clarion call for future research, the authors suggest that application of different organizational change theories and intervention techniques should be a top priority.

2.2.4 Business Process Improvement

Whereas IT-enabled change through business process reengineering effectively lasted for only a decade, business process improvement has endured. Closely aligned with the total quality movement, business process improvement benefits from theory and techniques from operations research, which is interested in quantitative understanding and optimization of aspects of processes and their design.

Harrington (1991) introduces a role for IT as a tool to improve a business system. But, Harrington only explains basic automation of process tasks and does not explore how IT could innovate a business process, or ultimately change an entire business system and organization. Practices such as *Lean*, *Six Sigma* and *Lean Six Sigma* are usually associated with incremental or continuous improvement of business processes. More typically, however, information technology plays a more limited role in these types of improvements.

With the demise of the term "business process reengineering" due to widely publicized failures and employee distrust, "business process improvement" is now an accepted term for incremental change, while "business process redesign" is frequently associated with more substantive change.

2.2.5 Business Process Redesign

Recently, academics and practitioners have adopted *redesign* as a substitute for the "R" in BPR. It is also offered as a tool for organizational transformation, by marrying changes to business processes and organization structure with information technology (Stoddard & Jarvenpaa, 1995). Earl (1994) does not distinguish between BPR and process innovation, while analyzing the new and old of a collective underpinning and positing six characteristics to explain the phenomenon. These are: strategy-informed, planned transformation; process-

centric systems view of organization; IT as an enabler and constraint of redesign; holistic view of multiple, integrated change domains; managing organizational and social change variables; and use of refined systems analysis techniques, tools, and expertise. Earl concludes: (p.17) "Business process redesign is perhaps another case of sociotechnical systems thinking…Leavitt's (1964) model seems to describe the challenge well".

Mitchell & Zmud (1999) have a slightly different take. They state that, "Process design involves physical transformation and repatterning of assets and activities embedded in both targeted business units and supporting infrastructure" (p.425). When the blueprint of an intended work system to be transformed deviates significantly from existing practices, the authors regard the situation as *process innovation*. When the new work system design depends on IT, the process innovation is *IT-enabled* (following Davenport & Short, 1990).

2.2.6 Business Process Management

Smith & Fingar (2003) and van der Aalst *et al.* (2003) define business process management (BPM) as the methods, techniques and tools to support the discovery, analysis, design, enactment or deployment of business processes. At the programme or enterprise level BPM includes the executive, administrative and supervisory control over on-going human performance of processes to ensure that business objectives and customers' expectations are met (Harmon, 2007; Smith & Fingar, 2003). At the enterprise level, BPM is also used to refer to development and maintenance of a *business process architecture* (Harmon, 2007). More ambitious BPM approaches propose that management processes such as strategy formation, goal setting, planning and controlling be centred on the organization's core processes. e.g., Bandara, Indulska, Chong, and Sadiq (2007).

2.2.7 Total Quality Management

Total Quality Management (TQM) has a primary objective of improving quality in the production or service delivery process. Responsibility for establishing foundations of TQM is generally attributed to Crosby (1979), Deming (1986) and Juran (1988). TQM began to be widely practiced in Western industrial settings in the late 1980s in response to Japanese competition based on superior quality.

Principles of effective contemporary TQM practice include a cross-functional process orientation, a focus on quality from the customer's perspective, measurement of quality in activities and results, and bottom-up problem diagnosis and solution design to achieve continuous, incremental improvement (Wang, 2008).

TQM is seen as an approach and methodology to manage organizational change, but according to Cao *et al.* (2000), it adequately addresses only one of four dimensions of change, (from Flood, 1993). TQM appears to succeed when focus is needed on changes to *organizational processes*, but it lacks the capability to serve change contexts dominated by *organizational structure, culture and/or power distribution*. It is argued that this limitation hampers TQM success since, as Leavitt (1964) and Nadler (1988) advise, change in one dimension often produces compensatory change in others.

2.2.8 Organizational, Process and IS Innovation

The Conference Board of Canada (2011) defines innovation as "a process through which economic or social value is extracted from knowledge – through the creation, diffusion, and transformation of ideas – to produce new or improved products, services, or processes." The Conference Board highlights four distinctive types of innovations: (1) radical or breakthrough changes that result in new or fundamentally changed products and services; (2) radical or breakthrough changes that result in new or fundamentally changed business and management processes and practices; (3) incremental improvements that add to or sustain the value of products and services; and (4) incremental improvements that enhance efficiency and effectiveness of existing business and management processes and practices.

In contrast to Hammer's (1990) radical re-engineering manifesto, Davenport (1993; with Stoddard, 1994) advanced ways for IT to enable *organizational and process innovation*. Davenport proposed that IT-enabled innovation could improve performance by overcoming geography in a process; by exploiting advantages of process speed; by redesigning a process from a serial to a parallel flow; and by capturing knowledge and learning.

Avgerou and McGrath (2007) define *IS innovation* as practices that develop, deploy, and use information and computing technologies together with organizational change, citing Markus and Benjamin (1997), Orlikowski (1996), and Scott Morton (1991) as advocates.

2.2.9 IT-Enabled Business Change

An early conceptualization of extensive business change through information technology is from Gibson & Jackson (1988). Zuboff's *In the Age of the Smart Machine* (1988) is considered a seminal work on the effects of and prospects for information technology to facilitate change. Zuboff coins the term *informate*, which means to use IT to enable workers to expand their understanding of the breadth and context of their work and to use that knowledge for autonomous decision-making.

Venkatraman (in Scott Morton ed., 1991; 1994) provides a framework to capture the concept of business and IT integration through what he terms, *IT-induced reconfiguration*. The model has five levels of change that relate two dimensions of change program ambitions: the scope of organizational impact, and the range of potential benefits from IT investments. These representations distinguish the two lower levels as flavours of evolutionary business process improvement, from the three upper levels, which represent more revolutionary IT-enabled business or organizational transformation configurations. The Venkatraman framework provides a guide that an organization can apply to define and assess the scope of change it desires to achieve in relation to what it is capable of achieving.

Earl (1994), Fiedler *et al.* (1994), and Mitchell & Zmud (1999) feature IT enablement as characteristics of business process redesign and process innovation. Manwani (2008) defines IT-enabled business change as a mix of two very different aspects of change content - information technology and business change - which are achieved through business programs, initiatives and projects that execute the processes to deliver change. The content focus is the business activities and business rules of an organization, which may or may not be enabled by information technology. This counters expectations that an *IT Project* alone can bring about organizational change.

2.2.10 Organizational Development and Change

A seminal contribution to the theory of development and change in organizations is by Van de Ven & Poole (1995), who use an interdisciplinary literature review to identify alternative theories that explain processes of change in the social and natural sciences. These theories are distilled inductively into two dimensions based on the *mode of change*

and *units of change*. Modes of change are either prescribed *a priori* or constructed and emergent. Units of change are either a single change entity or multiple entities. The resultant combination is four basic process theories, each with an implicit 'motor' driving change, and each representing a basic school of thought with a rich and long-standing intellectual tradition: *life cycle, teleology, dialectics*, and *evolution*. These theories serve as building blocks to explain processes of change in organizations as "different sequences of change events that are driven by different conceptual motors and operate at different organizational levels" (p.510). The authors identify circumstances when each theory applies.

The lifecycle theory defines a process of change as following prescribed, sequential stages of development for a single entity, with contents of each stage that pertain to its institutional or logical application. The developing entity has an underlying form, such as architecture and design, as well as a logic, program, or code, which supply rules to regulate delivery of the change. Garud & Van de Ven (2002) affirm that a lifecycle process of change "moves the entity from a given point of departure towards a subsequent end that is already preconfigured in the present state."

The second model for the single change entity pertains to a constructive, emergent mode of change. This teleological model defines the change process as an iterative cycle of goal formulation, implementation, evaluation, and goal modification, based on socially constructed views, learning, adjustment, and consensus among process participants. Unlike the lifecycle model, there is no prescribed sequence of events, prefigured rules, or a logically necessary direction.

> "Instead, theories based on teleology focus on the prerequisites for attaining the goal or end-state: the functions that must be fulfilled, the accomplishments that must be achieved, or the components that must be built or obtained for the end-state to be realized." (Garud & Van de Ven, 2002) (p. 209)

Competitive forces characterize two theory families that involve multiple entities. The dialectical model (p.210), "is rooted in the assumption that the organization exists in a pluralistic world of colliding events, forces, or contradictory values that compete with each other for domination and control" (Garud & Van de Ven, 2002). These may appear as conflicting goals or priorities between units or interest groups within an organization or as

opposing forces from entities external to the organization. The process is a constructive interaction between opponents that may lead to preservation of the status quo, or an antithesis that may lead to a creative resolution of conflict via a discontinuous synthesis.

The evolutionary theory of organizational development and change offers processes that occur within organizational entities and between different organizations as they compete for scarce resources in a common environment. Evolutionary change can be a continuous, gradual process with short, slow steps occurring over time (Thomson, 1982), or it can be saltational, as explained by punctuated equilibrium theory (Romanelli & Tushman, 1994).

2.2.11 The Diversity of Organizational Change

Table 2.2 summarizes literature via pairs of adjectives that describe the nature of organizational change approaches, choices, conditions, scope, and ambitions. While this suggests empirical change diversity (Wallace, 2007), according to Grandori & Prencipe (2008), there is a tendency for research to be more concerned with the process of change (how to change) rather than organizational elements, components, or structural properties (what to change).

Table 2.2: Types of Organizational Change

Organizational Change Polarities	Key Sources
Episodic ◄——► Continuous	Weick & Quinn (1999), Orlikowski (1996)
Incremental ◄——► Transformational	Kanter *et al.* (1992), Venkatraman (1994), Ackerman (1997)
Planned (Designed) ◄——► Emergent	Lewin (1947), Mintzberg (1994), Dawson (1994), Wilson (1992), Iles & Sutherland (2001)
Prescribed ◄——► Constructive	Van de Ven & Poole (1995)
Simple ◄——► Complex	Wallace (2007)
Single Project ◄——► Programmatic	Wallace (2007), Thorp (2003), Manwani (2008)
Evolved ◄——► Architected	Tapscott & Caston (1993)
Evolutionary ◄——► Revolutionary	Pettigrew (1985)
Piecemeal ◄——► Quantum	Miller & Friesen (1982)
Variant ◄——► Invariant	Grandori & Prencipe (2008)
Receptive ◄——► Non-Receptive	Pettigrew & Whipp (1991)

2.2.12 Dimensions of Organizational Change

Since the 1940s, researchers have attempted to gain insight into organizational change dynamics and to help organizations successfully implement change (Walker, Armenakis, & Bernerth, 2007). With the advent of powerful capabilities of information technology, recent attention has turned to how IT can drive, facilitate, enable or constrain

change. It is recognized that change leaders and agents must consider a multitude of factors and conditions specific to the context of the changing organization. Organizational context is one of three dimensions of factors common to all change efforts (Armenakis & Bedeian, 1999), the second being the content of the change solution, and the third being the processes used to deliver the change.

Pettigrew's extensive work on organizational continuity and change at ICI (1985; 1987), and with the UK National Health Service (with Ferlie & McKee, 1992), concluded that analysis of organizational change accompanying the initiation of a new business system should explore the relationship and interplay among the *content* of change, the *context* of change and the *process* of managing change. This three-dimensional framework was designed to alert researchers to a much wider array of possible sources of organizational change than just general management practices.

Pettigrew advises (cited by Symons, 1991) that, "formulating the content of a strategic change crucially entails managing its context and process". Context may be a critical shaper of the process of change, yielding a conclusion that organizational change management must be sensitive to context. Pettigrew *et al*. (1992) noted variations in organizations' receptivity for change and proposed a linked set of conditions that collectively define receptive contexts for change, and by their absence, non-receptive change contexts.

While subsequent research on organizational change has explored these dimensions and component factors, Walker at al., (2007) argue that little research exists about the integration of such change factors. Damanpour (1991), (following Pettigrew & Whipp, 1991), suggests that successful change may ultimately be determined by the fit between content, contextual and process factors. Ward and Elvin (1999), (citing Morris, 1996), observe that interdependencies of IT and business content create unique characteristics and difficulty.

An analysis of IT implementation practices by Bartoli and Hermel (2004) concludes that often the context and process are neglected, and the content is centred on tool efficacy, rather than on the needs to be satisfied. Gibson (2003) advises that IT-enabled business change requires a process capable of making changes to the entire *business system*.

2.2.13 Management of Organizational Change

The literature differentiates theories on the active management of organizational change management at the levels of the organizational entity and the individual. Research into the process of managing organisational change begins with early work of Lewin (1947), who conceptualizes that change progresses through successive stages referred to as *unfreezing*, *moving*, and *freezing*. This has been the genesis for a stream of organizational change research that contains various models and frameworks (Fernandez & Rainey, 2006).

Judson (1991), Kotter (1996), and Armenakis *et al.* (1999) propose elaborate multi-phase models to help change agents implement change. In particular, the Kotter eight-phase model combines prescriptions for the process of change with some ideal conditions of receptivity to change identified by Pettigrew *et al.* (1992). Fernandez & Rainey (2006) extend this work to the public sector and offer evidence of critical roles of public managers in bringing about organizational change. They then advance (pp.169-173) eight factors and propositions that can influence outcome of a public services initiative through interventions at various points in the change process.

Hiatt (2006), supported by *Best Practices in Change Management* (Procsi, 2009), proposes a system for how change management strategies, tactics, and techniques are assembled to facilitate change. The foundation of this system is five process elements for change in individuals: *awareness* of the change rationale and content; *desire* to change; *knowledge* of the change and how it will affect them; *ability* to make the required change; and *reinforcement* of the change in practice (trademarked as *ADKAR*).

Hiatt (2006) posits that desired change occurs when there is alignment of successful implementation (design and delivery) of change content, with successful, reinforced adoption of the change by each individual affected. Hiatt recommends management responses and techniques for communications, sponsorship, readiness assessments, coaching, training, and overcoming resistance. With these interventions, individuals are prepared to effectively and efficiently perform the roles needed to operate the processes and to use supporting information systems.

Hope Hailey & Balogun (with Johnson, 2002; 1999) propose the *Change Kaleidoscope* as a diagnostic framework to codify a range of contextual features and implementation options that require consideration and judgement during change planning. The authors assert that organizational change design choices are best made by simultaneously referring to the full set of contexts, ideally using a multi-disciplinary approach.

Design choices for implementation are: *change path* (transformation, re-alignment, or evolution); *change style* (ranging from participative to highly directive); *change start-point* (when and how initiated); *change target* (individual behaviours or roles and structure); *change management roles* (leadership, process management); and *change levers* (structural or individual mechanisms to generate change). These options enable decision-makers to determine what best fits their contexts.

Contextual features to be considered are *time* (how urgent, long-term versus short-term); *scope* (how much change – breadth and depth); *preservation* (assets, characteristics and practices to be sustained); *cultural diversity* (organizational units and disciplines); *change implementation capability* (organizational, managerial and individual); *capacity* (to invest resources for change); *readiness for change* (individual awareness and motivation); and *power* (authority and leadership).

Weiner (2009) focuses on *organizational readiness*, which is defined as a multi-level, multi-faceted organization level construct in the internal change context dimension. This includes a theory of the determinants and outcomes of organizational readiness, which involves collective behaviour change in the form of a total business systems redesign – simultaneous changes in staffing, work flow, decision making, communication, and reward schemes. Szabla (2008) captures a multi-dimensional view of resistance to organizational change, highlighting that understanding the reasons for resistance by individuals can inform managerial response to the change context.

2.2.14 Socio-Technical System Theory

Socio-technical theory views implementation of a new system as dependent on the culture and power of the local social system in which the solution is operationalized. Leavitt's socio-technical model (1964) views organizational systems consists of four interacting and

aligned components – *task, structure, actor,* and *technology*. The model is augmented by the concepts of an *environment* (Kwon & Zmud, 1987) and *culture* (Davis et al., 1992).

Mumford (1987) stresses the core principle that social and technological acceptance of a new system depends upon end-user participation in decision-making to achieve a degree of control over their new work environment. Lyytinen & Newman (2008) use socio-technical theory to characterize the content and engine of information systems (IS) change.

2.2.15 Technochange Management

Markus (2004) introduces the concept of *technochange* to represent those situations where IT drives major organizational changes, as distinct from typical IT projects or change programmes. Technochange stands for *techno*logy-driven organizational *change*. Harison & Boonstra (2009) define technochange projects as those where organizations adopt new information technologies that lead to major changes in organizational processes, people's work, and performance. Markus argues that such situations are both high-risk and high-reward. These require an integrated technical and organizational solution as well as an implementation process based on prototyping. Markus (2004; p.5), concludes,

> "Effective technochange management requires a different kind of attention to the features of the *'solution'* and a different kind of change *process* from those prescribed by either IT project management or organizational change management"

Since being introduced by Markus, technochange has been prominent in technology and project management literature and in other contexts (Willcocks & Sauer, 2005). Harison & Boonstra (2009) discuss special competencies for managers to successfully carry out technochange management processes to deliver comprehensive solutions. Peppard & Ward (2005) stress the critical importance of understanding the comprehensive business change context of technochange projects in seeking value from IT investments. Boudreau & Robey (2005) explore technochange using human agency theory noting, "As technological artefacts become more tightly integrated into larger systems or networks, a narrower range of enactment may be expected from users" (p.5).

Chae & Lanzara (2006) focus on why large-scale technochange is difficult and often failure-prone. They see technochange as an instance of institutional change and design in

which self-destructive mechanisms are inherently embedded. It is argued and illustrated that development and redesign of large-scale information systems involve both the exploration of alternative institutional arrangements and exploitation of pre-existing ones, and a delicate balance must be struck to overcome incoherencies and dilemmas between the two models.

2.2.16 Failure and Success in IT Implementation and Business Change

Studies of IT (and business change) implementations generally follow one of two paths to discovery. Some researchers, (e.g. Al-Ahmad et al., 2009; Gibson, 2003; Sauer, 1993; Schmidt et al., 2001; Yeo, 2002), examine reasons for IT-enabled change failure. This body of knowledge, residing in a corpus of literature concerned with the phenomenon of failure, identifies more than one hundred factors or conditions. Unique perspectives are from Lyytinen & Robey (1999) who study learning failure in systems development, and its contribution to on-going project failure, and Drummond (1996), who studies the relationship between politics and the assumption of risk.

Many authors focus on positive project and project management conditions (e.g., Baker et al., 2008; Cooke-Davies, 2002; Pinto & Slevin, 1988). Others propose *critical success factors* (CSFs), those conditions leading to success, extending the Rockart (1979) definition. The U.S. General Accounting Office (GAO) (Powner, 2014) identifies seven critical factors that they found in a sample of successful federal IT projects.

Cooke-Davies (2002) notes a distinction between what De Wit (1988) calls *project success*, (measured against the project objectives) and *project management success* (measured against the "iron triangle" of cost, time and quality). Cooke-Davies (2002) distinguishes *success criteria* (how success will be judged), from *success factors* (inputs to management system that lead to success).

What complicates the discussion of success or failure is that frequently there is no consensus among participants as to whether a change initiative succeeded or failed (Naughton & Peters, 1976). Success may be defined in relation to an individual or group role with its own goals, interests, and expectations (Robinson, 1994), such as software developers (Linberg, 1999).

2.2.17 Project Management

The Project Management Body of Knowledge (PMBOK) lexicon defines project management as "Application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (PMI, 2012). This model of project management is *content-agnostic*, with general knowledge areas and processes that are applied in all situations. Turner (2006) defines project management as "the means by which the work of the resources assigned to the temporary organization is managed and controlled to deliver the beneficial change desired by the owner".

Criticisms of a theoretical basis for project management arise from two angles. First, as Sauer & Reich (2007), and others argue, "…design and reporting of much project management research lacks explicit statements of its theoretical underpinning" (p.1). Second, efforts to develop project management theory (e.g. Turner, 2006) tend to normative prescriptions. Sauer and Reich conclude that project management, like general management, may be best suited to a number of descriptive theories of constrained scope.

Hansich & Wald (2011) attempt to systemize the different theoretical perspectives on project management. The authors note (p.7) "…the degree of trans-disciplinary integration is not as high as one might expect…" given the diverse streams of contributory research. Moreover, they find that the organisational context in which the project is embedded is not taken into account to its full extent. The authors suggest an integrated research approach that: is theory based and theory building; covers projects (temporary organizations) and project management; integrates trans-disciplinary approaches and results; integrates theory and practice; and differentiates among independent (influencing) variables, and dependent (resulting) variables, and context (contingency) factors.

Rosacker & Rosacker (2010) observe that public sector IT projects have incurred increases in budget, implementation time, and the range of stakeholders impacted. Yet, studies on effectiveness of project management processes in the public sector are viewed as one of the largest gaps in the project management literature (Wirick, 2009).

An empirical study by Sauer & Reich (2009) on the nature of project management in IT-enabled business change reports increasing emphasis on the context dimension of such

efforts, as defined by Sauer & Cuthbertson (2003). Bygstad & Lanestedt (2009) note a further challenge for project management of IT-based innovations is a need to cover organizational impact (in terms of user behaviour and business benefits) and a detailed project plan for desired organizational effects.

2.2.18 IT Project Governance

Prior research observes that there is a hierarchy of governance in organizations. The OECD (2004) defines *corporate or enterprise level governance* in terms of relationships between the board of directors, management, shareholders, and other stakeholders. Corporate governance provides a structure to set objectives, to determine means to attain the objectives, and to monitor performance.

Crawford & Cooke-Davies (2005) propose a secondary tier of *project governance*, citing Hazard & Crawford (2004), who define project governance as formal principles, structures and processes for undertaking and managing individual projects, programs or portfolios of projects. This includes appointment of a project governor or governing body; definition and regulation of roles, responsibilities, decision-making and boundary management; and coordination of relationships, planning and control. Turner & Müller (2003) emphasize a "role of the project manager as chief executive of the temporary [project or program] organization…and as agent of the principal (p.7)"

Governance of IT-enabled change is a special case of project governance. For such projects, a variety of role definitions are advanced for the capacity of project governor, or owner representative, using labels such as executive, project or business change sponsor (Crawford & Cooke-Davies, 2005; Earl, 1992; Manwani, 2010; Reich et al., 2008; Turner & Keegan, 2001); senior responsible owner (OGC, 2011); process owner (Davenport, 1993; Harmon, 2007; Keen & Knapp, 1996; Smith & Fingar, 2003); and business system owner (Fujitsu Consulting, 2009).

Given the limited body of empirical research and varied role definitions, Manwani (2010) recommends that follow-up research be undertaken "to validate the role of the sponsor during the [business change] lifecycle and to identify any variations between organizations. This would extend into refining the skills requirement for the sponsor…

(p.175)." Manwani *et al.* (2009) also suggest work "to explore in more detail the relationship of the sponsor with other [managerial] roles such as the programme [or project] manager, change managers and programme management office (p.4)."

2.3 The Dimensions of IT-Enabled Business Change

Pettigrew has asserted (1987) that analysis of organizational change accompanying the initiation of a new business system should explore the relationship and interplay among the *content* of change, the *context* of change and the *process* of managing change. This Section explores each of these topics as possible change dimension constructs for the integrated change model.

2.3.1 The Content of an IT-Enabled Business Change Solution

This section synthesizes findings from the literature concerning the *content* or substance of the change being introduced by an IT-enabled business change initiative. Section 2.2 has highlighted the many variations of IT-enabled business and organizational change. This section draws upon many of these same sources to emphasize how the content of change is defined.

In a discussion of the transformation of firms, Pettigrew (1987) defines the dimension of (strategic) content as "…particular areas of transformation under examination… technology, manpower, products, geographical positioning or corporate culture" (p.657). Walsham & Waema (1994) define the content in IS strategy and implementation as "planned changes to products and services, business processes, formal organization structures and roles…and IS [elements that] involve hardware, software, operating systems, and related technologies" (p.153-54). Ward & Elvin (1999) adapt the content-process-context model of Pettigrew & Whipp (1991) to capture the particular nature of IT-enabled change. Based on Venkatraman (1991), they define content components as strategy, structure, operational processes, technology, roles, skills, culture, and employee behaviour. Avgerou (2001) advises "…content of change considered in IS studies should not be technology innovation but the change of heterogeneous networks of institutions and people within which ICT is called to play a role" (p.5).

As Keen & Knapp (1996, p.128) have noted,

> "As a technical concept, *integration* is the extent to which different components of an organization's information technology base can work together…From a business perspective, integration refers to making practical…the sharing of information across business processes."

The MIT90s (Scott Morton, 1991) integrated business system framework contains business change components such as new organizational structures, management processes to empower frontline staff, and education and training on the enabling technology.

Another early contributor to the concept of business and IT integration is Earl (1992), who argues "the time has come to put IT in its … proper place" (p.101). To do this, Earl calls for use of a holistic approach to information systems investment with (a) the business benefit of technology earned through accompanying other business changes; or (b) the business change needs or opportunities determining the capabilities and actions, including IT, that are needed to achieve the change and deliver the business benefit. This orientation places IT *within* the business, leading Earl to propose a shift in thinking about management issues from an IT-centric to a business change perspective on vision, planning, justifying, implementing, controlling, organizing, and learning.

Earl (1994) in his review of business process redesign practitioner developments concludes that the change variables are largely organizational and social and posits that BPR "is perhaps another case of socio-technical systems thinking" (p.17). This references Leavitt's (1964) classic socio-technical systems model, which contains the four variables to which BPR must attend in a congruent way. Lyytinen & Newman (2008) use the Leavitt model and its organizational subsystems of *task*, *actors*, *structure*, and *technology* to describe and explain information system change.

Davenport (1993) extends the Leavitt model to discuss the role of organizational and human resource factors in process innovation in the socio-technical tradition. In addition to IT, other enablers include information, organizational structure, and human resource policy.

Kettinger & Grover (1995) define the objects and enablers of change as these organizational subsystems: *management* (style, values, measures), *people* (jobs, skills, culture), *information technology*, and *organizational structures*.

The Rummler & Brache (1995) framework has three levels of solution content: an organization level, a process level and a performer or job level. This approach recognizes a contribution from information technology at the process level. Other components are policies, procedures, service agreements, performance measures, job designs and reward systems. The performer level is based on principles of behavioural psychology and features a specialized *human performance system*.

Manwani (2008) defines IT-enabled business change as a mix of two aspects of the content of organizational change - information technology and business change. The content focus is on changes to business rules and activities of an organization, changes that may or may not be enabled by information technology. The Manwani business solution design model integrates components from five *domains*: organization (structure, performance measurement and management, culture); people (jobs and roles, motivation and reward, human resources policy); processes (integrated with jobs/roles, information flows, process management); information (structured data, documents, business intelligence, knowledge); and technology (information and communications hardware, access, application software).

Markus (2004) proposes that a comprehensive technochange solution should cover changes to: business processes/workflows, job designs, skills training, organizational or functional structures, management, human resource policies, performance management systems, spatial layouts, resource allocations, metrics and incentives.

Table 2.3: IT-Enabled Business & Organizational Change Content

Source	Domains of Change Content or Enablers						
	Process	Org.	People	Mgmt	Info	Tech	Other
Scott Morton ed. (1991)	x	x	x	x		x	Strategy
Walsham & Waema (1994)	x	x				x	IS Strategy
Rummler & Brache (1995)	x	x	x			x	Measures
Hammer & Champy (1993)	x	x		x		x	
Davenport (1993)	x	x	x		x	x	Policy
Venkatraman (1994)	x	x	x			x	
Manwani (2008)	x	x	x	x	x	x	Alignment
Kettinger & Grover (1995)	x	x	x	x		x	
Stoddard & Jarvenpaa (1995)	x	x				x	
Earl (1992)	x	x				x	
Markus (2004)	x	x	x	x	x	x	Space
Ward & Elvin (1999)	x	x	x	x		x	Strategy
Lyytinen & Newman (2008)	x	x	x		x	x	
Avgerou (2001)		x				x	Networks

Table 2.3 summarizes findings from the literature sources in terms of the coverage for the content of IT-enabled business and organizational change.

Pettigrew (1987) reminds us that, "…formulating the content of a strategic change crucially entails managing its context and process". The next two sections address these two dimensions of change as potential constructs for the integrated change model.

2.3.2 The Processes of IT-Enabled Business Change

Processes of business change represent means by which the change solution content is delivered. In planned change, a structured intervention is launched to take an organization from an evolutionary target and path to a new target and path, representing an *ideal future state*. Such an intervention is commonly referred to as a *project*, a change *programme* or, as often used in the public sector (and in this document), a change *initiative*. These are temporary organizational structures and agencies to manage resources and to take action to achieve a specified purpose (Turner & Müller, 2003).

2.3.2.1 Change Initiative Management Processes

Ward & Elvin (1999) claim that effective change is carried out by a set of actions that specify and deliver the content of change, which produces desired outcomes. A successful change initiative will appropriately reconcile the content, outcomes and context. The process by which the initiative is to be carried out is also influenced by the owner's original intent.

The change initiative includes processes for governance of the initiative, which might involve an executive, project or business change sponsor; senior responsible owner; process owner; and/or business system owner. Processes conducted by a steering committee, governing council or steering board, may aid leadership and stewardship of the initiative.

Other considerations for change processes include the structure of the project, program or initiative; the choice of solution delivery sourcing model (e.g., turnkey, outsource, privatization); project management processes (e.g., PMI, 2012); solution delivery methods (e.g., software development); and implementation management and deployment processes.

2.3.2.2 Change Initiative Roles and Responsibilities

According to Cooke-Davies (2002), business owners empower a secondary group, who decide which actions to take and perform roles to them carry out. This is a temporary organization with defined roles and responsibilities to ensure effective use of resources.

Managerial roles include an executive, project or business change sponsor; and process owner or business system owner. The project manager is defined as an agent of the principal (owner). Other characteristics for the project organization are team calibre, capability, capacity, composition, and collaboration.

2.3.3 The Context of IT-Enabled Business Change

Pettigrew (1987) offers two classes of contextual settings: outer (external) context is the social, economic, political, and competitive environment in which the organisation operates; and inner context refers to the structure, culture, and internal political setting governing the definition and implementation of change. Walker *et al.,* (2007) defines context as, "the pre-existing forces in an organization's external and internal environment" (p.763).

2.3.3.1 Contextual Factors

Kwon & Zmud (1987), cited by Cooper & Zmud (1990), examine technology diffusion, organizational innovation and IT implementation literatures. They identify five context categories: the *user community* (job tenure, education, resistance to change); the *extant organization* (specialization, centralization, formalization); *complexity of adopted technology*; the *task* to which technology is applied (task uncertainty, task variety, performer autonomy and responsibility); and *organizational environment* (uncertainty, dependency).

Hope Hailey & Balogun (2002; with Johnson, 1999) identify contextual factors at the organizational level: *urgency to change* (how soon?); *scope of change* (how much change?); *readiness to change* (awareness and commitment); *capacity to change* (financial and human resources), *capability to change* (skills and abilities); *culture* (uniformity or diversity), and *existing assets and characteristics* (what not to change); and *power to change* (by whom?).

Weiner (2009) defines organizational readiness as a multi-level, multi-faceted organization level construct in the internal context. Kwon & Zmud (1987) advocate that future research should explore the impact of multiple contextual factors by implementation stages.

Top management support is often identified as a key to successful change (e.g., Fernandez & Rainey, 2006; Kotter, 1995; Nadler & Nadler, 1998) and IT implementation (Jeyaraj et al., 2006; Plant & Willcocks, 2007; Remenyi, Sherwood-Smith, & White, 1997).

2.4 How Change Success is Evaluated

2.4.1 Theories of IT Investment Evaluation

Bannister (2001) provides a useful framework to categorize IT evaluation research, distilling the vast and often contradictory range of literature into four groupings of interest: cost, evaluation methods, benefits and value, and multi-perspective (holistic).

The current research is nominally concerned with concerns of cost and evaluation methods. Issues with determining, measuring and managing the economic cost of an IT investment and the on-going "run rate" costs to operate the resultant system are pertinent only to the extent that they might constrain the solution. The proposed research scope considers that application of evaluation and decision-making methods concerning a proposed initiative are antecedents to the definition, design and implementation of change. It is assumed that definition of the desired change would be outlined in the project initiation documents (e.g., the business case for change).

There is considerable debate in business, professional, and academic circles about the *benefits* or *value* of IT as an investment or as a productive asset. This debate has spawned a flurry of activity in IT evaluation research. One body of research, which Bannister (2001) and others refer to as the *microeconomic school of thought*, looks at aggregate IT investment in a firm or sector in relation productivity gains or financial performance to that firm or sector. Bannister concludes,

> "The considerable resources invested in researching the economic impacts of IT at a firm level have yet to yield results that are either conclusive or convincing. If hard economic data are not sufficient to provide clear evidence of IT value, it may be that either this value lies elsewhere, in the softer or intangible benefits of IT investment, or that a different approach to measuring success is needed" (p.46).

Bjornolfsson & Hitt (2000) study how firms realize greater productivity and transform their organizations via investments in information technology. They conclude, "a significant component of the value of information technology is its ability to enable complementary organizational investments such as business processes and work practices" (p.24).

A school of thought summarized by Bannister (2001), from Peters (1994), and Remenyi *et al.* (1997) is that quantification of soft benefits can add value to economic measures of productivity gains, cost savings and revenue increases.

Cronk & Fitzgerald (1999), citing Broadbent *et al.,* (1995) and Katz (1993), promote an "IS business value" concept. They derive three value dimensions: (1) *system dependent* value that is added to the organization from information system content characteristics; (2) *user dependent* value that is added to the organization as a result of user characteristics, such as skills and attitudes; and (3) *business dependent* value that is added to the organization from business factors such as business and information system goal alignment.

2.4.2 A Theory of Information Systems Success

DeLone & McLean (1992) posit a multidimensional model to measure information system (IS) success, with interdependent relationships between six major success constructs and variables. Researchers have attempted to extend or re-specify the original model. Taking account of these contributions, (DeLone & McLean, 2003, 2004) propose an updated IS success model. The updated model has six interrelated constructs of IS success: *information quality*, *system quality*, and *service quality*, *(intention to) use*, *user satisfaction*, and *net benefits*, with associations between pairs of constructs. An interpretation is that a technical solution can be evaluated in terms of information, system, and service quality; and these characteristics affect subsequent use or intention to use, and user satisfaction. As a result of using a system, certain benefits will be achieved. The net benefits will (positively or negatively) influence user satisfaction and further use of a system.

Research by the US-based CIO Forum (Levinson, 2010; p.1) identifies "a clear definition of success" as a less-considered, but no less important, factor influencing IT success attainment. In particular, "…project success must be defined in terms that are meaningful to the business…(such as) the expected value proposition of the project..."

2.5 The Government Domain for IT-Enabled Change

IT-enabled business and organizational change are terms that are applied generally to corporations, governments, and non-profit organizations. There are important distinctions, however, in the nature of change between the private and public sector. In recognition of these distinctions, Osborne, Radnor, and Nasi (2013) refer to the scope of IT-enabled change in government as *public service delivery systems*. Alternatively, the term *IT-enabled public program change* is used. A third term that exclusively covers public sector IT-enabled change is *electronic (e-) government*.

2.5.1 The Nature of IT-Enabled Public Services Change

Public sector change usually is concerned with designing, developing and implementing a new government *program,* making changes to an existing program, or changing how an existing program is delivered (Levin, 2007). Within corporate contexts, the terms *program(me)* and *initiative* are both used to define a collection of interrelated *projects* that are designed to deliver a common outcome. However, in government organizations, the term *program(me)* usually means a set of policies, regulations, and services that exist to meet a public goal. Government organizations, therefore, often use the term *initiative,* rather than program(me)*,* to mean a collection of projects.

An initiative that delivers public service change consists of organization-level components similar to those of a corporate business system, such as organizational structure, internal policies, workflows, information technology, job designs and procedures (Rummler & Brache, 1995). Specific organization-level components that apply to public systems are public policy, legislation, administrative rules, regulations, and compliance mechanisms. Osborne *et al.* (2013) refer to the set of solution components to be delivered by an IT-enabled initiative in the public sector as *public service delivery systems*. Wallace (2007, p.20) concurs, stating that public services change has "…variation spanning everything from a simple modification of an individual's practice to a multiplicity of linked and highly experimental practices affecting an entire public service system".

Another distinction between the public and private sector is the definition and measurement of organizational performance. Government organizational performance

measures cannot use shareholder value maximization (a *raison d'être* for corporate enterprise). The World Bank (2004) characterizes the public sector target measure as the *maximization of value to citizens.*

In project management, Wirick (2009) explains the challenges faced by public-sector managers such as satisfying a broad community of stakeholders; working within government procurement rules and contracts; and planning under constraints of electoral cycles.

2.5.2 Electronic Government

E-government has become an umbrella term for the application of information technology and organizational change to improve the structure and operations of government. The World Bank (2004) states that the value in e-government is through public agency use of information technology to transform relations with citizens (G2C), businesses (G2B), and other arms of government (G2G). This can serve a variety of ends: (1) better delivery of government programs and services to citizens, (2) improved interactions with business and industry, (3) citizen empowerment through access to information, and (4) more efficient government management. Ultimate benefits can be less corruption, increased transparency, greater convenience, revenue growth, and cost reductions.

Twizeyimana and Andersson (2019) offer a multidimensional framework to advance the understanding of the public value of e-government. These public value dimensions are *improved public services*, *improved government administration*, and *improved social value*.

2.5.3 Public Sector Change Inhibitors

A number of factors, organizational conditions, and managerial practices appear to hinder IT-enabled public program change initiatives, public services delivery systems, and e-government. First, the diversity of stakeholders and the potential for contradictory values and expectations can lead to perceptions of change initiative failure (Rose, Flak, & Saebo, 2018).

There is a tendency of public sector managers to plan and perform change initiatives within government organization *silos* (Osborne *et al.*, 2013), rather than for public services systems that deliver solutions across integrated functions and multiple organizations. In part this reflects the nature of laws and regulations that belong to a specific mandate or program, but changes are frequently needed to cross-functional processes (Rummler & Brache, 1995).

Inter-organizational technical solutions necessitate a high level of cooperation among multiple solution component providers as well as physical connectivity and compatibility. This often necessitates assignment and execution of an *information system integrator* role to ensure performance of an integrated technical solution. This agreement is often absent from contractual arrangements between agencies and their primary IT provider (Wirick, 2009).

Fernandez & Rainey (2006) apply organizational change management theory to the public sector and argue that critical roles are needed for public sector managers to lead organizational change. They advance (pp.169-173) eight factors and propositions that can influence outcomes of public services initiatives through interventions in the change process.

Remenyi *et al.* (1997), Thorp (2003), Manwani (2008), and Jenner (2009) warn of difficulties in attributing value or benefits to a specific change initiative. Frequently, there are many concurrent initiatives to enact legislation, increase program effectiveness, or improve service delivery, and outcomes cannot be attributed to a specific program or initiative. Moreover, realization of benefits from IT-enabled change initiatives is often deferred for several years after closeout.

2.5.4 Citizen Adoption of e-Government Services

Most early research into citizen adoption of electronic government services (e.g., Venkatash et al., 2003) is based on versions of the technology acceptance model (TAM). The common concept is that user acceptance of an IT system is jointly determined by its *perceived ease of use* and *perceived usefulness*. More recent research has paid attention to citizens' trust, in two respects – *trust of the government or agency that offers the service* and *trust of the information technologies that enable the service.* The latter concern is with the sharing of personal information online and, if applicable, the security and effectiveness of the payment mechanism. A fifth factor is *computer self-efficacy*, the belief of an individual's ability to use technology in various settings. Studies of such factors in e-government settings have yielded some consistent, and some contradictory results. But evidence from some contexts suggests that each factor is positively associated with citizen intention to use certain types of e-government services.

2.5.5 Public Sector Research Opportunity

Much existing literature and on-going research on public sector change focuses on delivery of programs and services for individuals, e.g., health, education, and human services, (e.g., Bannister, 2001; Casebeer, 2007; Hinings et al., 2003; Homa, 1998; Iles & Sutherland, 2001; Levin, 2007; Pettigrew et al., 1992; Wallace et al., 2007b; Weiner, 2009).

Governments also deliver programs that respond to conditions in the natural world. There is less literature on the contribution of information technologies to the effective operation and administration of programs in transportation, public works, natural resources, and environmental protection and about change in these contexts.

2.6 Chapter Summary

The literature review that informs this research has surfaced and evaluated an extensive body of knowledge that ascribes many different meanings and terminologies to the concept of *information technology-enabled change*.

The review has explored features of prominent models and frameworks used in information technology and organizational change fields of study. One conclusion is that there is an important requirement to integrate the concepts of management processes, solution content, and organizational context, as essential aspects of an intermediate stage of the change lifecycle. These three dimensions link an initial stage where the intended improvement is defined to a final stage where results are determined.

A third area of discovery is that there are distinctions in application of these concepts to public services systems change and within external and internal contexts of government. While there is a body of research into organizational change in public program areas that serve individuals (e.g., health, education and human services), there is a paucity of literature about operational and administrative change in programs that respond to conditions of the natural world, such as environmental protection, resource development, and transportation.

Insights from the literature lead to the need and desire to explore the research question:

> ***How are successful information technology-enabled public services change initiatives governed, managed and performed?***

This question is being studied by developing and applying a model that integrates the three change dimensions within a planned change lifecycle.

3. Research Approach

3.1 Introduction

The purpose of this research is to design, develop, demonstrate, and evaluate an integrated change lifecycle model (ICLM) to facilitate a more complete understanding of organizational and managerial characteristics - factors, conditions, and practices - that are associated with successful information technology enabled public services change initiatives.

This research is exploratory, but unlike the often-cited research on failures of *information technology* and *business change projects* (e.g., Beer & Nohria, 2000; Brache, 1996; Hammer, 1990; Kotter, 1995; Standish Group, 2009), this work focuses on determining characteristics of *successful* change initiatives. In adopting this stance, the researcher is particularly interested in learning from participants what they believe worked well, how this action was undertaken, and possibly why this might have contributed to success.

This Chapter explains how the design research paradigm was applied, linking this to the problem domain, and the solution artifact. It also documents what information was required to develop an artifact that can help to answer the research question and explains how the information was actually collected, analyzed, synthesized, and interpreted.

Section 3.2 discusses philosophical underpinnings of design science research and assumptions for study of management, organization, information systems, and technology.

Section 3.3 details the research design and methodology phases, which applies qualitative research techniques using two case studies to demonstrate and evaluate a change model.

Section 3.4 discusses the types and sources of information needed, explains methods and protocols used to collect and manage this information, and techniques used to analyze, synthesize and interpret the findings.

Section 3.5 explores the criteria used to evaluate the trustworthiness of qualitative research, which are defined as credibility, dependability, and transferability.

Section 3.6 identifies potential limitations inherent in the research design and methods generally and site-specific as well as measures taken to address these limitations.

Section 3.7 summarizes key messages of this Chapter.

3.2 Philosophy of Design Science Research

As discussed in Chapters 1 and 2, the domain of the problem to be addressed and the class of solution to be designed lies at the intersection of knowledge about organizations, management, information systems, and technology. In essence, managers within organizational contexts use information technology and other resources to define work systems through which their performance improvement goals are accomplished (Alter, 2003; Benbasat & Zmud, 1999).

Herbert Simon is considered the leading authority on the importance of design in these and other fields of endeavour. In his seminal book, *The Sciences of the Artificial,* Simon (1996) analyzed the fundamental differences between the study of systems in the natural world and those created artificially, and concluded:

> "Design… is the principal mark that distinguishes the professions from the sciences. Schools of engineering, as well as schools of architecture, business, education, law and medicine, are all centrally concerned with the process of design" (p. 111).

Two streams of literature have emerged that apply the design science research paradigm: (1) organization and management, and (2) information systems and technology.

3.2.1 Design Science in Organization and Management Research

According to Romme & Georges (2003) mainstream organization and management research historically has been based on either natural science or the humanities (social or behavioural science). Natural science helps with understanding organization and management systems while humanities contribute to understanding and reflecting on human experiences inside organizational practices. Romme & Georges (2003, p. 559) argue that organization and management research needs a design mode to contribute to solving the fundamental weakness in organization and management theory - the *relevance gap* between academic theory and practice. This has also been identified by Pettigrew et al. (2001); Wilson (2002); Dresch, Lacerda, and Antunes (2015); and Huff, Tranfield, and Van Aken (2016). This argument is reinforced by van Aken (2005) who advances design science in management as a means "to produce relevant contributions to the solution of relevant organizational problems" (p. 33).

Referring to Simon (1996), Romme & Georges (2003) argue that a design approach to organization and management studies involves inquiry into systems that do not yet exist, rather than testing the validity or truth on existing systems. Romme & Georges (2003, p. 559) provide a conceptual framework that defines the main differences and complementarities of natural science, humanities, and design as the three recognized ideal-typical modes of engaging in organization and management research (Table 3.1).

Table 3.1: Ideal-Typical Modes of Engaging in Organizational Research

Characteristic	Organizational Research Modes		
	Natural Science	**Humanities**	**Design**
Purpose:	Understand organizational phenomena, on the basis of consensual objectivity by uncovering general patterns and forces that explain phenomena	Portray, understand, and critically reflect on the human experience of actors inside organized practices.	Produce systems that do not yet exist—that is, change existing organizational systems and situations into desired ones.
Role Model:	Natural sciences (e.g., physics) and other disciplines that have adopted the science approach (e.g. economics).	Humanities (e.g. esthetics, ethics, hermeneutics, history, cultural studies, literature, philosophy)	Design and engineering (e.g., architecture, aeronautical engineering, computer science).
View of Knowledge:	*Representational:* Our knowledge represents the world as it is; nature of thinking is descriptive and analytic. Science is characterized by (a) a search for general and valid knowledge and (b) "tinkering" in hypothesis formulation and testing.	*Constructivist and narrative:* All knowledge arises from what actors think and say about the world; nature of thinking is critical and reflexive.	*Pragmatic:* Knowledge in the service of action; thinking is normative and synthetic. Design assumes each situation is unique; it draws on purposes and ideal solutions, systems thinking, and limited information. Emphasis on participation, discourse as medium for intervention, and pragmatic experimentation.
Nature of Objects:	Organizational phenomena as *empirical objects*, with descriptive and well-defined properties that can be effectively studied from an outsider position.	*Discourse* that actors and researchers engage in; appreciating the complexity of a particular discourse is given precedence over the goal of achieving general knowledge.	Organizational issues & systems as *artificial objects* with descriptive as well as imperative (ill-defined) properties, requiring non-routine action by agents in insider positions. Imperative properties also draw on broader purposes and ideal target systems.
Focus of Theory Development:	Discovery of general causal relationships among variables (expressed in hypothetical statements): Is the hypothesis valid? Conclusions stay within the boundaries of the analysis	Key question is whether a certain (category of) human experience(s) in an organizational setting is "good," "fair," etc.	Does an integrated set of design propositions work in a certain ill-defined (problem) situation? Design and development of new (states of existing) artifacts tends to move outside boundaries of initial definition of the situation.

3.2.2 Design Science in Information Systems and Technology Research

For information systems and technology research Vaishnavi, Kuechler, and Petter (2017) summarize contrasting ontological and epistemological assumptions implicit in natural science and social science research approaches, which are authoritatively expressed in

widely-cited works by Bunge (1984) and Guba and Lincoln (1998). Gregg, Kulkarni, and Vinze (2001) add meta-level design science research features of the *socio-technology* approach to contrasts of positivist and interpretive approaches.

Vaishnavi *et al.* (2017) build upon Gregg *et al.* (2001) to summarize the philosophical underpinnings of natural science, social science and design science research perspectives, in the context of information systems and technology. Specific additions to the design science research perspective from Vaishnavi *et al.* (2017) are: (1) *iterative circumscription* that determines (or reveals) the reality and knowledge that emerges from the research effort, and (2) *axiology*, the study of shared values in a community based on what researchers hope to find through their efforts.

Table 3.2: Philosophical Assumptions of Research Perspectives

Basic Belief	Research Perspective		
	Positivist	**Interpretive**	**Design**
Ontology What is the nature of reality?	A single reality; knowable, probabilistic	Multiple realities, socially constructed	Multiple, contextually situated alternative world-states. Socio-technology enabled.
Epistemology What is the nature of knowledge?	Objective; dispassionate. Detached observer of truth	Subjective, i.e. values and knowledge emerge from the researcher-participant interaction.	Knowing through making: objectively constrained construction within a context. *Iterative circumscription* reveals meaning.
Methodology What approach will obtain the desired knowledge and understanding?	Observation; quantitative, statistical	Participation; qualitative. hermeneutical, dialectical.	Developmental. Measure impacts of artifacts on the composite system.
Axiology What values does the researcher hold and why?	Truth: universal and beautiful; prediction	Understanding: situated and description	Control; creation; progress; improvement; understanding

From Guba & Lincoln (1998), adapted by Gregg *et al* (2001), augmented by Vaishnavi, Kuechler & Petter (2017).

3.2.3 Design Science Research Objectives

Design science research seeks to change the state-of-the-world through the creation and introduction of innovative artifacts. Design science researchers are comfortable with alternative world states. Purao (2013) observes, "*Design science researchers...'dare' to create artifacts intended to change the world".* In contrast, the positivist ontology typically uses a single, given composite socio-technical system as a unit of analysis. The multiple world-states of design science differ from multiple realities of the interpretive paradigm in that design science researchers typically believe in a single, stable underlying physical reality that constrains the multiplicity of world-states.

Vaishnavi *et al*. (2017) conclude that, epistemologically, a design science researcher knows that a piece of information is factual and knows what that information means through the process of development and circumscription. An artifact is developed and its behavior results from interactions between components. Descriptions of interactions are information and to the degree to which the artifact behaves predictably the information is true. The meaning of the artifact is precisely the functionality it enables in the composite system.

Bunge (1984) asserts that design science research is most effective when its practitioners shift between pragmatic and critical realist perspectives, guided by a pragmatic assessment of progress in the research cycle. Purao (2013) describes in detail how the design science researcher arrives at an understanding of the phenomenon and the design of the artifact simultaneously.

3.2.4 Design Science Guidelines and Methodology

The purpose of this research is to design, develop, and evaluate an integrated change lifecycle model that can be applied to gain a more complete understanding of organizational and managerial characteristics - factors, conditions, and practices - that are present in successful information technology (IT) enabled public services change initiatives.

Hevner et al. (2004) present guidelines for applying design science to information systems and technology research. First, design science research requires the creation of an innovative, purposeful artifact in the form of a construct, a model, a method, or an instantiation, which is a technology-based solution for an important and relevant “business problem domain”. To be recognized as a novel research contribution, the artifact must either solve a problem that has not yet been solved, or provide a more effective solution.

The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment. The design and development of the artifact must be done rigorously, and the research outputs provide clear and verifiable contributions to knowledge. The artifact must be evaluated in order to ensure its viability and utility as a solution for the specified problem. Research results should be presented effectively to both technology-oriented and management-oriented audiences.

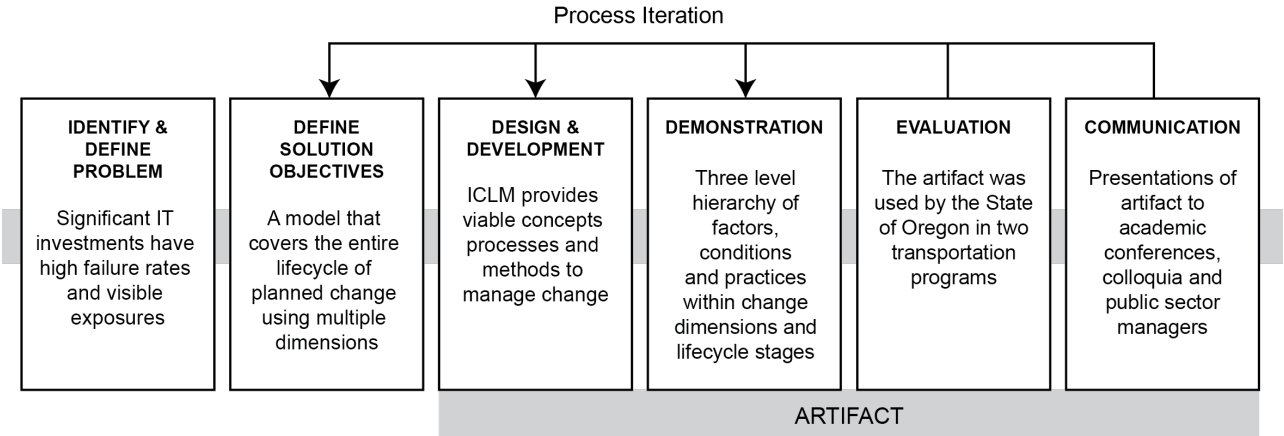
3.3 Research Methodology Phases

The problem that has served as the focal point for this research is the absence of a comprehensive model for understanding the multiple dimensions of change within a change initiative lifecycle context. The Design Science Research paradigm provides an overall methodology for the design, development, demonstration, and evaluation of such a model.

The specific DSR approach adopted for this research is explained with reference to existing authorities (e.g., Hevner et al., 2004; Nunamaker et al., 1991; Peffers, Tuuranen, Rothenberger, & Chatterjee, 2007; van Aken, 2005)

Figure 3.1 depicts the methodology employed in this study, which corresponds to the Design Science Methodology (DSM) for information systems research adapted from Peffers et al. (2007). Following is a discussion of the methods and techniques used to produce each of the deliverables defined by the six sequenced phases of the adapted methodology. This includes the rationale for the selection and application of methods and techniques appropriate to each phase.

Figure 3.1: A Design Science Methodology for the Integrated Change Artifact



Adapted from Petters et al. (2007)

Features of the adapted DSM as applied to the current research include:

(1) The model was designed, developed, demonstrated, evaluated, and communicated using an iterative approach.

(2) The initial model design was derived from the Pettigrew (1987) change dimension framework of content, context and process, with elaborations from Rummler & Brache (1995), Venkatraman (1994), and Balogun & Hope Hailey (2008).

(3) An empirical design was developed, demonstrated, and evaluated using a case study of the e-Government initiative for Oregon Driver and Motor Vehicle (DMV) Services. Results were described using a three-level hierarchy of factors, conditions, and practices based on the three change dimensions and change lifecycle stages.

(4) An advanced design iteration was developed, demonstrated, and evaluated using the Right of Way Information Tracking System (RITS) initiative for Oregon Department of Transportation (ODOT). Results were described using an expanded three-level hierarchy of factors, conditions and practices based on the change dimensions and lifecycle stages.

(5) Interim versions of the model and characteristics were presented at research colloquia and academic conferences, which led to improvements in the model design.

(6) Versions of the model and its characteristics were communicated to program and system managers from the case studies and related organizations.

Following is a detailed description of how the artifact was legitimized with reference to the phases of the adapted Design Science Methodology shown in Figure 3.1.

3.3.1 Problem Identification and Definition

A myriad of academic research and practitioner narratives claim that significant IT investments in change initiatives incur high failure rates and visible exposures. This impacts financial performance in the private sector and citizen trust of government in the public sector. Many studies attempted to attribute failure or poor performance of IT-enabled change initiatives to isolated causes, such as weakness in project management, incompatibility of system components, shortcomings in change leadership, and employee resistance.

What complicates the problem definition is that frequently there is not a consensus among stakeholders or participants as to whether a change initiative has succeeded or failed. Change initiative success may be based on the achievement of mission-related outcomes or it may be defined in relation to an individual or group role with its own goals, interests, and expectations.

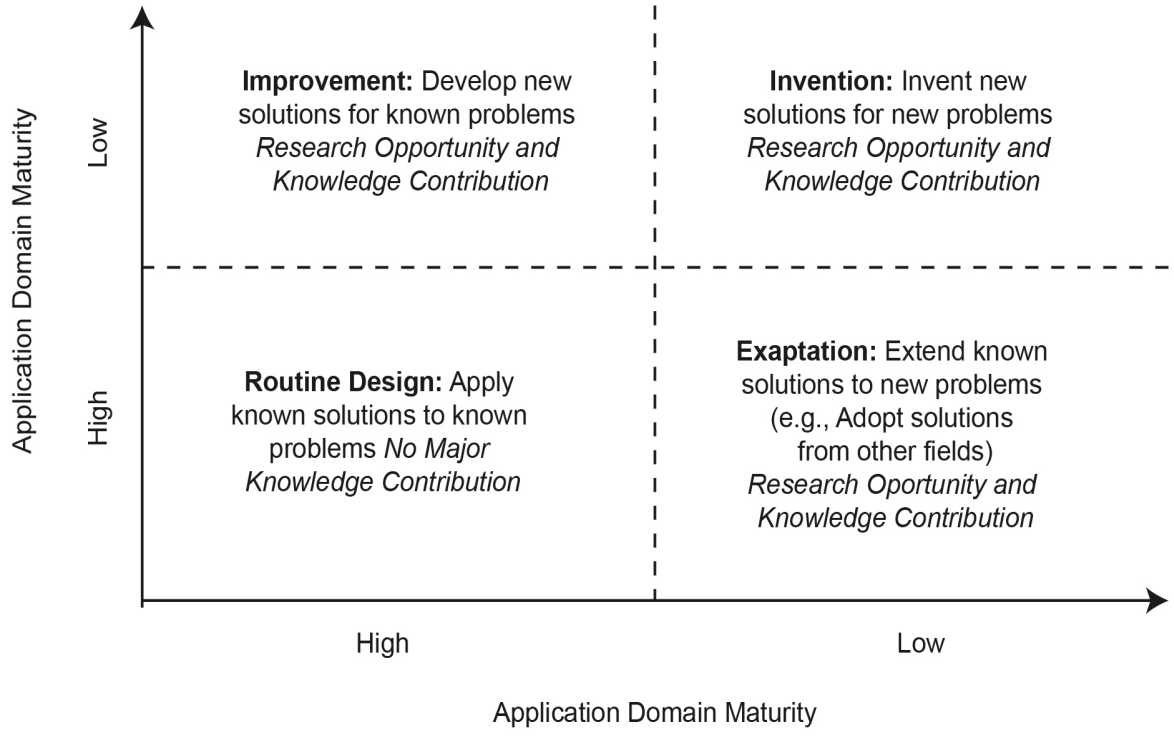
Some experts claim that a major reason for lack of success is that leaders and practitioners of change have not developed the necessary understanding of the complex, multidimensional nature of what occurs within the organization that *receives* the technology,

and what *they* must do to facilitate success. In this broader view, Armenakis & Bedeian (1999), in their review of the 1990s change literature, conclude, "analyses of organizational change have generally tended to be limited in scope, focusing on one set of considerations or another (p.155)". Beer & Nohria (2000) assert that an integrated theory or framework for understanding organizational change does not exist.

3.3.1.1 Design Science Research Knowledge Contribution Framework

Gregor and Hevner (2013) propose a framework to understand and position knowledge contributions from a Design Science Research (DSR) project. The potential contribution depends upon the starting point of the DSR project in terms of the *problem maturity* and *solution maturity*. Figure 3.2 presents research project contexts and potential contributions. The x-axis shows the maturity of the problem domain context from high to low. The y-axis represents the prevailing maturity of the artifacts that are available as starting points for solutions, also from high to low.

Figure 3.2: Design Science Research Knowledge Contribution Framework



Source: Gregor & Hevner (2013, p. 345)

The positioning of the research covered in this thesis is based on the conclusion from the literature that the application domain maturity is *high*. The lack of success in IT-enabled change initiatives has been thoroughly studied and extensively documented over the past

thirty years. But solutions that consider all dimensions of change over a complete lifecycle of planned change stages are not available, leading to the conclusion that the maturity of the solution is *low*. This suggests the placement of this DSR project in the quadrant of *Improvement Research*.

Section 3.3.2 outlines what would be needed in a solution that integrates change dimensions within a project lifecycle. The Improvement from this artifact is described and evaluated to demonstrate the advancement of knowledge of academic interest as well as relevance to practice.

3.3.2 Artifact Performance Objectives and Scope

To expand the knowledge and tools available to address the problem, this research should produce: (1) An integrated model that elaborates multiple dimensions of change across the entire lifecycle of prescribed change. (2) A description of how the model can support organizational and managerial solutions to overcome the problem of high failure rates in IT-enabled change initiatives. (3) Identification of factors, organizational conditions, and managerial practices that are associated with successful change initiatives in the public sector. (4) An improved understanding of what constitutes success in an IT-enabled change initiative from the various perspectives of key change initiative roles and stakeholders.

The model should align with the differentiating features of planned change initiatives as defined by the Van de Ven & Poole (1995) model of life-cycle theory for prescribed change. These features are defined as a unitary sequence of phases that are cumulative in knowledge with relationships among phases derived from a common underlying process. The multiple dimensions of change to be explored are those originating with Pettigrew (1987; with Ferlie & McKee, 1992) who concluded that analysis of organizational change accompanying the initiation of a new business system should properly explore the relationship and interplay between the *content of change*, the *context of change*, and the *process of managing change*. This three-dimensional perspective is designed to alert researchers to a much wider array of potential sources of change than just the impact of general management.

Development of this model affords an opportunity to extend the Pettigrew framework from general business transformation to the content, processes, and organizational environment for IT-enabled change, with an emphasis on the public sector. It also provides a potential scope extension of the Pettigrew framework beyond strategy formation to include solution delivery. An integrated model can facilitate a detailed examination of an extensive array of process and contextual factors and content components in the definition, design, and implementation of an IT-enabled solution.

The model should elaborate in detail a three-tiered hierarchy for each change dimension that is derived from the process improvement levels defined by Rummler & Brache (1995) for solution content; the Project Management Institute (2008) for project management processes; and Balogun & Hope Hailey (2008) for defining and responding to the organizational context for change.

The Rummler & Brache (1995) framework has three domains of solution content: an organization level, a process level, and a performer or job level. The contribution from information technology is recognized in the process domain. Other components are policies, procedures, service agreements, performance measures, job designs and reward systems. The performer level uses principles of behavioural psychology and to define a specialized *human performance system*.

Balogun & Hope Hailey (2002; with Johnson, 1999) identify eight internal contextual factors: *urgency to change* (how soon?), *power to change* (by whom?), *readiness to change* (awareness and commitment), *capacity to change* (e.g. financial and human resources), *capability to change* (skills and abilities), *culture* (uniformity or diversity), and *existing assets* (what not to change).

3.3.3 Artifact Design and Development

This phase determines the architecture and desired functionality of the artifact. Previous studies of IT-enabled change in the public sector have demonstrated research characteristics, which are best suited to a qualitative approach. Multiple iterations of the artifact are produced with the initial artifact originating from academic literature, professional discipline standards, and practitioner narratives. Iterations of an empirical version of the

artifact derived from the synthesis of findings first from the Oregon DMV e-Government case study. The advanced artifact elaborates the categories, characteristics, and themes based upon the ODOT Right of Way case study.

3.3.3.1 Discussion of Thematic Analysis Technique

Thematic Analysis using Templates, also referred to as *Template Analysis*, is a strategy and technique used to analyze and interpret the rich store of textual material obtained from qualitative research collection techniques. Typically, this material includes transcripts of semi-structured interviews, published documents, formal reports, diaries, and notes from participant observations.

Thematic Analysis in organizational, business and management research is a relatively recent addition to a researcher's tool-kit. Crabtree and Miller (1999) and King (2006b) are considered advocates and authorities on the underpinning and use of the technique, based on its application to studies of health care. Waring and Wainwright (2008) offer a distinctive approach by using coding templates within the domain of business and management qualitative research. They develop and apply the technique in the context of cases that employ IT to improve health care processes.

In the current study of public services system change, case findings were developed from identified patterns of characteristics by applying *Thematic Analysis* techniques. This was facilitated by a descriptive and interpretive coding schema that originated with an *a priori* set of categories and themes, based on observations in each change dimension and lifecycle stage. The characteristics and themes were elaborated as interesting patterns emerged. Coding was applied to verified individual interview proceedings, supplementary project and solution documents, and quality assurance reports, manually and aided by productivity tools.

3.3.3.2 Interpretive Codes

The change dimensions and change lifecycle stages were used as the primary coding category, represented by a set of seven first-level codes. Second-level categories were postulated for each primary coding category using components, factors, and conditions known to be associated with each lifecycle stage and change dimension. The third and any lower level in the hierarchy of coding were reserved for emergent themes in findings related

to each category, and organized by the most closely associated second-level component, factor, or condition.

Initial *a priori* sources for second-level categories for each change lifecycle stage and change dimension were derived from a combination of:

(i) Academic literature: e.g., Hope Hailey et al. (1999) for organizational change environment; Bryson (1995) for strategic direction; Borins (2008) for public services innovation; Cohen and Levinthal (1990) for absorptive capacity; Weiner (2009) for organizational readiness.

(ii) Professional discipline standards: e.g., Project Management Institute (2012) for project management processes; IEEE Software & Systems Engineering Standards Institute of Electrical and Electronics Engineers (2007) for software development; Association of Change Management Professionals (ACMP) practice standards for organizational change management; and Oregon State and Public Knowledge standards for quality assurance [QA] assessments of information technology (IT) investment projects.

(iii) The researcher's professional practice and experience of thirty years covering strategic management, business process redesign (BPR), and quality assurance reviews and risk assessments on information technology-enabled public sector change initiatives.

The interview guide references an initial set of primary and second-level categories, which frequently were shared with informants prior to or during the semi-structured interviews. Explaining the research model and second-level categories helped to elaborate the questions being asked by the researcher or to act as a catalyst for discourse.

The first-level codes are the four change lifecycle stages and three change dimensions from the model, which were unchanged by the data exploration for both case studies. Second-level categories and codes were refined many times in each case after key informant interviews, important document reviews and upon reflection after interpretation.

3.3.3.3 Descriptive Codes

Two types of descriptive codes were used to distinguish among sources of textual material. Case codes identify whether the information source is from interviews or documents associated with Driver and Motor Vehicles e-Government Initiative (coded DMV);

or with the Right of Way Information Tracking System Project (coded RW). There are no information sources that crossed over the two cases, as the sponsoring organizations, programs, and initiatives are independent.

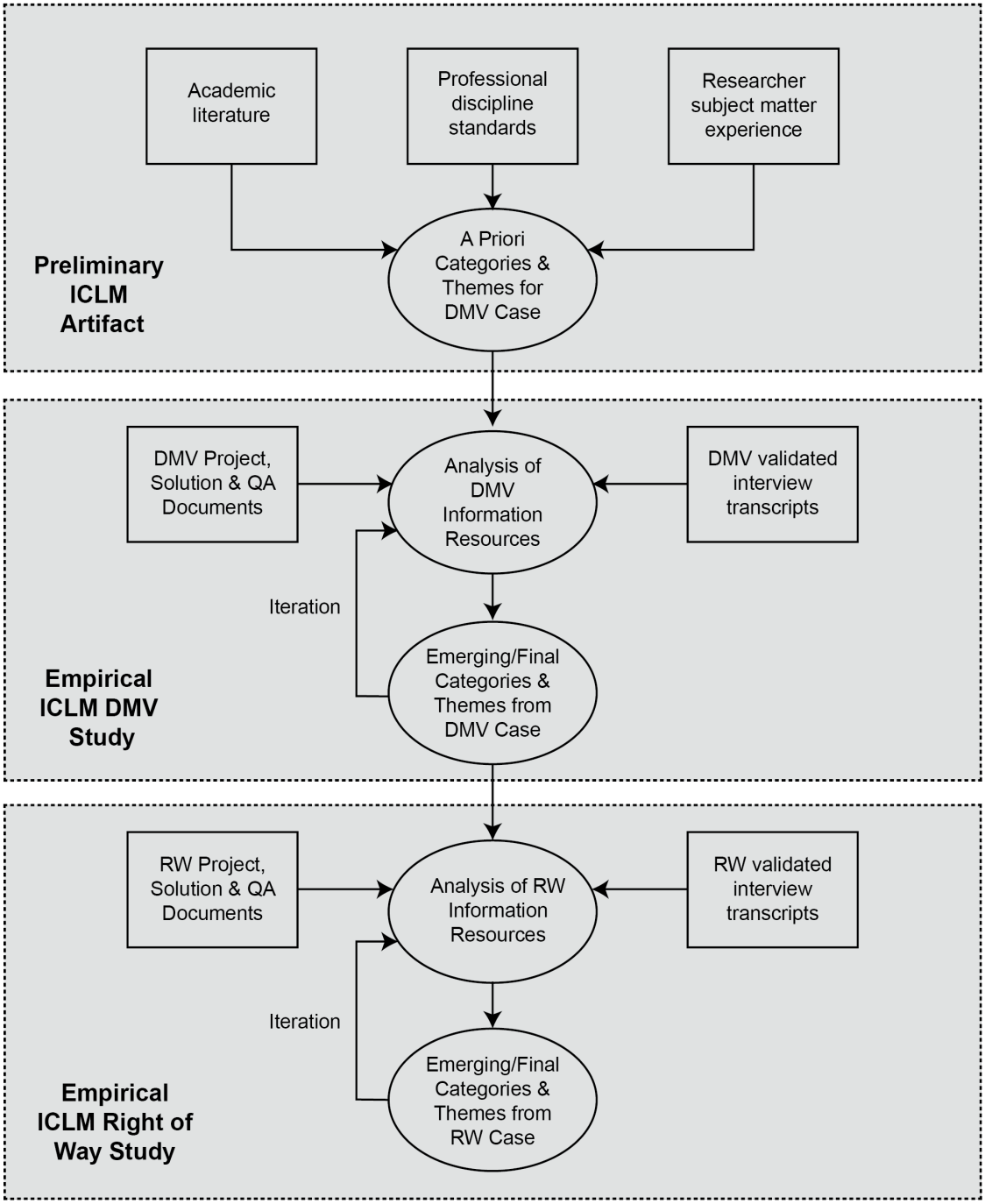
Descriptive codes were also used to distinguish among various project roles performed by interviewees and document authors who supply textual material. Role codes were used to identify twelve unique role categories for both cases, with some using terms that apply to both cases and some of which pertain to only one case. Roles range from Project Executive Sponsor (ES), to Project Manager (PM), Business Solutions Team (BT) and Information System Developer (IS). Where interviews took place with an individual who performed multiple project roles, the interview transcript(s) and coding distinguished the specific information source by role.

3.3.3.4 Application of Coding Schema

A set of initial categories of characteristics was derived from the knowledge sources defined in section 3.4.2 and tentatively applied to the first case – the DMV e-Government Applications initiative. As the data from sources for this case was analyzed, some original categories and characteristics were discarded or set aside, while others were merged. This resulted in the level 2 categories and level 3 characteristics that organize the findings for the DMV case in section 5.3. This process involved several iterations as new insights were gained by the researcher. The level 3 characteristics reflect the nature of the success-oriented perspective adopted for this research in that they are positive expressions of factors, organizational conditions or management practices.

The modified set of categories and characteristics, along with those that were set aside, became the opening set for the analysis of the second case – the Right of Way Information Tracking System (RITS) Project. As data from the various sources for this case was analyzed, some previous categories and characteristics were set aside, while others were merged. This resulted in the level 2 categories and level 3 characteristics that organize the findings for the Right of Way case in section 6.3. Figure 3.3 illustrates the performance of multiple iterations as new insights emerged. The concluding set of categories and characteristics are referenced in Appendix B.

Figure 3.3 – Iterations of Artifact Design and Development



3.3.4 Demonstration of Artifact

This phase of the methodology demonstrates use of the artifact in two case studies that were selected to help solve the problem of persistent failure in public services change initiatives. Characteristics associated with successful change in the cases are organized into a three-level hierarchy of factors, conditions, and practices within the change dimensions and lifecycle stages.

3.3.4.1 Selection of Cases for Design, Demonstration and Evaluation

The public sector change context offers many case study opportunities. Wallace (2007) characterizes the scope and complexity of public sector change as ranging from simple modification of an individual's task, practice or procedure, to a multiplicity of innovative processes and practices that affect an entire public service system.

Informal discussions were held with ODOT managers and senior staff to identify change initiatives within their organization that could be candidates for the case study research. Selection of a suitable change initiative involved outcome-based, content-based, process-based and contextual criteria. Table 3.3 lists the initiatives and projects that were identified and considered.

Table 3.3: Assessment and Selection of Case Studies for Model Evaluation

Initiative	Change Result	Solution Content	Project Processes
Bridge Program Outsource	✓ "Successful" change ✓ Improved program/ service ✓ Completed, tangible change	❑ IT-enabled change ambition ❑ IT innovation/innovative use ✓ Organization-wide impact ✓ Holistic system change ✓ Affects multiple processes	✓ Planned change model ❑ Initiative organization ❑ Documentation intensive
DMV e-Government	✓ "Successful" change ✓ Improved program/ service ✓ Completed, tangible change	✓ IT-enabled change ambition ✓ IT innovation/innovative use ✓ Organization-wide impact ✓ Holistic system change ✓ Affects multiple processes	✓ Planned change model ✓ Project organization entity ✓ Documentation intensive
Transportation Operations Center System (TOCS)	✓ "Successful" change ✓ Improved program/ service ✓ Completed, tangible change	✓ IT-enabled change ambition ✓ IT innovation/innovative use ✓ Organization-wide impact ✓ Holistic system change ✓ Affects multiple processes	✓ Planned change model ✓ Project organization entity ✓ Documentation intensive
TransInfo Database Replacement	✓ "Successful" change ❑ Improved program/ service ✓ Completed, tangible change	❑ IT-enabled change ambition ✓ IT innovation/innovative use ❑ Organization-wide impact ❑ Holistic system change ✓ Affects multiple processes	✓ Planned change model ✓ Initiative organization ❑ Documentation intensive
Right of Way Information Tracking System (RITS)	✓ "Successful" change ✓ Improved program/ service ✓ Completed, tangible change	✓ IT-enabled change ambition ✓ IT innovation/innovative use ✓ Organization-wide impact ✓ Holistic system change ✓ Affects multiple processes	✓ Planned change model ✓ Project organization entity ✓ Documentation intensive

Because the focus is on successful planned change, the selected change initiative must be complete and be judged by the project sponsor and business solution owner to have achieved its intended results, defined as meeting stated objectives. A content-based criterion is that information technology must be indispensable to the content of the change solution.

A process-based selection criterion is that there must be comprehensive, publicly available documentation of change initiative aims, circumstances, conditions, deliverables and results. This implies that a qualified initiative uses a document-intensive solution delivery methodology and that public disclosure laws facilitate the availability of information. A fourth criterion was some familiarity of the researcher with the initiative, possibly arising from a contributing role. This participant-observer perspective was advantageous for gaining access to interview candidates and documents that might otherwise have been unavailable to third parties, as well as providing a longitudinal view of the case.

The selection of program areas within Oregon Department of Transportation (ODOT), including Driver and Motor Vehicles (DMV) administration, is predicated in part on the fact that these agencies are members of North American associations (American Association of State Highway Transportation Officials [AASHTO] and American Association of Motor Vehicle Administrators [AAMVA], respectively), which represent the common interests of 50 U.S. state governments and 10 Canadian provincial governments. Any transportation agency in a U.S. state or Canadian province has similar core functions, processes and systems that support a common mandate to develop and manage programs related to the jurisdiction's system of highways, roads, bridges, railways, public transportation services, and transportation safety programs. This offers the possibility that the findings, conclusions, and managerial recommendations from this research may be transferable to the broader transportation community of practice.

3.3.5 Evaluation of Artifact

This research methodology phase observes and assesses how well the artifact supports a solution to the problem. The original objectives are compared with the actual observed use of the artifact as demonstrated in the two case studies. Characteristics associated with successful change are organized into a three-level hierarchy of factors, conditions and practices within the three change dimensions and five lifecycle stages.

Previous studies of IT-enabled change in the public sector have demonstrated research characteristics typically associated with a qualitative approach. The current research is focused on a small selection of IT-enabled change initiatives in their "natural

settings", exploring these in depth and with detail to gain a richness of understanding. A range of qualitative data collection techniques have been employed – semi-structured individual participant interviews, group interviews, focus groups, and document reviews. The research is both inductive in building theory, as well as deductive in evaluating characteristics of successful change.

Given the research question, there is no intention or need to apply quantitative methods to these data. Previous studies have explored and commented on the inherent complexity of comprehensive business systems change. A plethora of constructs, variables and explanatory factors have been identified in prior research, most of which are beyond the control of the investigator. Many factors cannot be directly observed; moreover, many appear correlated. It is impossible to control for, or assess, the impact of all factors.

This research is exploratory and descriptive in nature and, unlike often-cited research on failures of *information technology* and *business change projects* (e.g., Beer & Nohria, 2000; Brache, 1996; Hammer, 1990; Kotter, 1995; Standish Group, 2009), this research focus is on what has contributed to *successful* change initiatives. This stance facilitated an open dialogue with participants on what they believed worked well, how, and possibly why.

3.3.5.1 The Nature of Qualitative Research

The essence of qualitative research is to make sense of and recognize patterns in words to build a meaningful picture without compromising its richness and dimensionality (Leung, 2015).

> …qualitative research can aim to seek answers for questions of "how, where, when who and why" with a perspective to build a theory or refute an existing theory. Unlike quantitative research which deals primarily with numerical data and their statistical interpretations under a reductionist, logical and strictly objective paradigm, qualitative research handles non-numerical information and their phenomenological interpretation, which inextricably tie in with human senses and subjectivity. While human emotions and perspectives from both subjects and researchers are considered undesirable, biases confounding results in quantitative research, the same elements are considered essential and inevitable, if not treasurable, in qualitative research as they invariable add extra dimensions and colors to enrich the corpus of findings.

Interpretive methods of research in information systems are "aimed at producing an understanding of the *context* of the system and the *process* whereby the information system influences and is influenced by the context" (Walsham & Waema, 1994) (pp. 4-5).

3.3.5.2 Rationale for Case Study Strategy

The research design is a selection of case studies of IT-enabled public services change initiatives from a transportation agency in a U.S. state government.

> Yin (2009, p.18) defines the case study as,
> "An empirical inquiry that investigates a contemporary phenomenon in-depth and within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident".

As IT-enabled change initiative involves a large number of factors, conditions and practices across the three dimensions of change. An IT-enabled change initiative is a contemporary phenomenon, and is influenced by contextual conditions. Multiple sources of evidence are available and are analyzed to provide a rich description of the undertaking and its context. These multiple sources converge to validate findings and support conclusions.

The interplay among content, context and process has been fertile ground for previous case study inquiry. Case studies of organizational change, IT-enabled change, and IT innovations authored by Walsham & Waema (1994), Walsham & Sahay (1999), Bartoli & Hermel (2004), and Walker *et al.,* (2007) each use the Pettigrew (1987) framework.

The phenomenon of IT-enabled change also meets a fuller case study definition from Remenyi (2012). This research involves designing a response to a complex and challenging management problem that demands an empirical approach with many factors, conditions and variables, some of which are specified, but not all of which may be obvious.

This research focuses on the IT-enabled public services change initiative as the unit of analysis. By using the Pettigrew (1987) framework of content, process, and context as a theoretical foundation for the integrated change model, the approach clearly recognizes the context in which the problem is situated and answers are sought. The study is enriched by the multiple sources of data and evidence found through the techniques used. The case study design has provided an opportunity for cross-case analysis and comparisons between the different units.

The case study selection complies with the suitability profile defined by Remenyi (2012). Public services delivery is an important and interesting scope for IT-enabled change inquiry. ODOT is a sizeable public sector organization with more than 5,400 employees and responsibility for multi-billion dollars of physical transportation assets under development, operation and maintenance. ODOT has multiple business lines and program areas, each with their own unique issues, mandate and structure. The Oregon Transportation Commission (OTC) and ODOT executive management provide direction and leadership.

The case study organization meets the accessibility criteria in that the researcher has unlimited access to the organization, documents and participants. The researcher is based in western Canada and has consulted to DMV and ODOT for more than 20 years.

3.3.6 Communication of Artifact

Presentations to academic conferences, research colloquia, and public sector managers were used to diffuse the knowledge resulting from the artifact design, and its demonstration and evaluation. These included the *9th* and *11th International Conferences on Knowledge, Culture & Change in Organisations* in Boston, MA and Montreal, Canada; the *18th International Research Society for Public Management Conference (IRSPM)* in Ottawa, Canada; and the *Academy of Management Doctoral Consortium* in Philadelphia, PA. A paper on an early iteration of the artifact was developed and published with the proceedings from the IRSPM conference. Scholarly review of the paper resulted in removal of the term *business* at the first level of the hierarchy. A concern was that the model might be interpreted as being linked to the *New Public Management* (NPM) paradigm, where public organizations import managerial processes and behaviour from the private sector (Boyne & Walker, 2004).

A number of iterations of the artifact were presented and suggested improvements provided by academic audiences during Henley Research Colloquia at Greenlands and Rotman. In response, modifications were made to the purpose statements for the highest level constructs as well as the characteristics within each.

Advanced versions of the integrated model were presented to and discussed with managers and technical staff from ODOT Highway Division and Information Systems branch in Salem, Oregon.

3.4 Information Sources and Collection Methods

3.4.1 Types of Qualitative Information

This section defines the information that was collected to demonstrate and evaluate the artifact. Bloomberg & Volpe (2008) define three types of field-based information needed in most qualitative studies: *contextual, demographic* and *perceptual*.

3.4.1.1 Contextual Information

Contextual information describes the organizational environment – external and internal - within which each change case is situated. The external context is U.S. state government, the State of Oregon, the Oregon Department of Transportation (ODOT), and external authorities, such as the Oregon Transportation Commission.

Internal context covers: strategic direction and plans, core values, goals and objectives of the Transportation program areas where the cases are sited, and which own the change result; the structure of the program area and IS organizations; information resource management (IRM) and information technology (IT) plans; the history of previous IT-enabled change initiatives; legacy business systems; IT governance structure, processes and practices; project management processes and practices; and systems delivery processes and methodologies. Aspects of the program area and IS organizational culture explored were receptivity and organizational readiness to change. Contextual information was derived from organizational and project documents and interviews with key informants.

3.4.1.2 Participant Demographic Information

Demographic information was collected as participant profiles for individuals selected for interviews or focus groups. Information includes regular organization and change initiative roles and responsibilities; work history in private sector, state government, current role; previous IT change initiative experience and observations; education and training in general, and specific to IT-enabled change; and any pertinent personal characteristics.

Demographic profiles of research participants help to understand differences and similarities of perspectives, for example, by role and background. This information was used in thematic and comparative analyses presented in Chapter 7. Most participant information was obtained from either a pre-interview survey or from answers in the participant interview.

3.4.1.3 Perceptual Information

Perceptions of change initiatives are based on participants' social constructions of direction, conditions, and circumstances experienced. Perceptual data relies on interplay between an interviewee and interviewer. An interview guide and semi-structured question set elicited participants' narratives of experiences, involvement in decisions, group dynamics, and to what extent initiative and personal objectives were met. Perceptions of experiences and circumstances were captured independently for each participant (collectively for focus groups) using participant-validated interview transcripts, augmented by interviewer journals.

Table 3.4: Overview of Information Sources for IT-Enabled Case Studies

Type of Information	Information Collected	Method or Technique
1. Contextual	Strategic direction, plan, values, goals, objectives; structure of IS and program area; IRM and IT plans; IT-enabled change history; legacy systems; IT project governance; project management; systems delivery methods; change receptivity and readiness.	Document reviews Key informant interviews Observation Systems architecture Quality assurance report
2. Participant Demographic	Profiles of participants' roles, experience, discipline, preparation, position	Document reviews Participant survey
3. Perceptual	Individual perceptions of change initiative experiences as participant and/or leader based on literature-informed interview questions.	Literature synthesis Document reviews Interview guide Participant interviews
4. Areas of Exploration (based on Integrated Change Lifecycle Model)		
▪ What are meanings of *information technology-enabled change*?	Composite definition tentatively derived from literature, then reviewed and validated in public sector context with key informants	Literature synthesis Key informant interviews
▪ How is *success* defined for IT-enabled public services change?	Several possible definitions and proposition developed from literature, used in Interview guide for discussion with key informants	Literature analysis Key informant interviews
▪ What *stages of the* business change *lifecycle* relate to public services change?	Discussion document containing conceptual framework and component descriptions as interview guide for use with all participants	Literature synthesis Interview guide Participant interviews
▪ What *initiative processes and managerial roles* are needed during business change lifecycle?	Definitions of initiative processes and managerial roles derived from literature, governance and project documents; validated by key informant interviews.	Literature synthesis Document reviews Key informant interviews
▪ What characteristics define effective change process and managerial role *performance*?	Perceptions of initiative performance for defined processes and roles collected from all participant interviews, with questions derived from literature.	Literature synthesis Document reviews Interview guide Participant interviews
▪ How is the quality of the solution content recognized?	Several possible definitions and proposition developed from literature, and in Interview guide for discussion with key informants.	Literature analysis Key informant interviews
▪ What are key features of the *external and internal context* for public services change initiatives?	Contextual factors derived from literature, then organizational and project documents reviewed, followed by confirmation by key informants during interview	Literature analysis Environmental scan Document reviews Key informant interviews
▪ In what ways can *change design and implementation* be sensitized to the organizational context?	Perceptions of change management effectiveness collected from all participant interviews, with questions derived from literature.	Literature synthesis Document reviews Interview guide Participant interviews

3.4.2 Participant Interviews

The primary information gathering method was individual interviews with participants who played key roles in each change Initiative being studied. An objective of qualitative research interviewing is "to gather descriptions of the life-world of the interviewee with respect to the interpretation of the meaning of the described phenomena" (Kvale, 1993; p.174, cited by King, 2006a). A multi-stakeholder interview scheme covered the roles of project sponsor, business system/process owner, project manager, solution provider (internal and external), system/process manager, and solution customers, users or adopters. Participants were identified from project documents, their status determined, and they were contacted directly with the consent of the project sponsor.

An initial field test with DMV was undertaken to explore the utility and effectiveness of the proposed interview methods. A draft interview guide was developed, questions were drafted and refined, two trial interviews were conducted, transcripts were developed, and findings validated.

The interview sequence was a step-wise process, starting with key informants. Each key informant interview was semi-structured, with open-ended questions for each construct. Secondary informants were identified from project documents, contacted directly, with the consent of the project sponsor, and interviewed using a semi-structured protocol, which began with a single question for each change stage and dimension:

a) Why was this initiative originally undertaken?
b) What was the content of the solution that was delivered to produce change?
c) How did the *project* organization deliver the solution?
d) How did you prepare managers and staff to absorb change and use the solution?
e) What has been achieved in terms of results and accomplishments?
f) When might the benefits start to be realized and how will you know?

In most instances, follow-up questions were developed during the interview to help with understanding and to clarify previous answers. Where possible, the discussion from each interview was captured in an audio recording to augment the researcher's detailed notes. The content of the discussion was validated and augmented by the interviewee, and a final transcript was produced.

Both case studies used the same interview guide and questions as a starting point as both used the same constructs – the change lifecycle stages and dimensions from the preliminary Model. Supplementary questions in the semi-structured approach frequently differed between interviews within cases due to different roles of participants, as well as between cases since these questions explored specific characteristics of each case.

3.4.2.1 List of DMV e-Government Participant Interviews

A total of 15 interviews were conducted with these individuals concerning their roles on the DMV e-Government Applications initiative for empirical evaluation of the ICLM.

Table 3.5: List of Participants in the DMV e-Government Case Study

Individual (#)	*Organization*	*DMV e-Government Change Initiative Role(s)*
Allen D.	DMV Services	ODOT/DMV Project Manager, DMV e-Government Applications Project
Virginia E.	ODOT Information Systems	e-Government Project Steering Committee member Service Delivery Manager, DMV Applications DMV User Council member
Kathy H. (2)	DMV Services	Processing Services Group Manager JAD Session Participant DMV User Council member e-Government Project Steering Committee member
Tom Mc. (2)	DMV Services	DMV Administrator Executive Sponsor, DMV e-Government Applications Project DMV User Council chair e-Government Project Steering Committee member
Sheryl M.	DMV Services	Business Team Lead JAD Session Participant Business Architect, DMV e-Government Applications Project
Bill S. (3)	DMV Services	Customer Services Group Manager Business Owner, DMV e-Government Applications e-Government Project Steering Committee member JAD Session Participant DMV User Council member
Nell K.	Dept. of Administrative Services	State e-Government Project Manager
John K.	Covansys, Inc.	Project Manager, DMV e-Government Applications
Becky H.	IBM Global Services	IT Component Provider – Software Specialist
Katherine L.	SPT Consulting Group, Inc.	Quality Assurance Analyst, DMV IT Project QA & Risk Assessment Program
David S.	SPT Consulting Group, Inc.	DMV Industry Specialist, DMV IT Project QA & Risk Assessment Program

3.4.2.2 List of RITS Participant Interviews

A total of 28 interviews and focus group sessions were conducted with these individuals concerning their roles on the Right of Way RITS initiative for the empirical evaluation of the ICLM.

Table 3.6: List of Participants in the Right of Way Case Study

Individual (#)	*Organization*	*RITS Project Role(s)*
Rick C. (2)	Right of Way Section	State Right of Way Manager Executive Sponsor, RITS Project Project Steering Committee chair
Joe G. (2)	Right of Way Section	Right of Way Operations Manager Business Owner, RITS Acquisition Solution Project Steering Committee member
Mike K. (2)	Right of Way Section	Right of Way Operations Manager Business Owner, RITS Property Management Solution RITS Project Steering Committee member
Geri H. (3)	Right of Way Section	Right of Way Business Transition Manager System Manager, RITS Acquisition Solution Right of Way Management Team member
Michael S. (2)	Right of Way Section	System Manager, RITS Property Management Solution Right of Way Management Team member
David B. (2)	Region 4 Technical Center	Region Right of Way Manager Right of Way Leadership Team member RITS Project Steering Committee member Region 4 Pilot Implementation User Representative
Ron W.	ODOT Information Systems	Transportation Applications Service Delivery Manager
Tim B.	ODOT Information Systems	Highway Division IS Customer Service Manager RITS Project Steering Committee member
Lynn C.	ODOT Information Systems	Transportation Applications Project Delivery Manager RITS Project Steering Committee member
Shaydon S.	Region 3 Technical Center	Business Process Subject Matter Expert Operations Trainer
Leslie M.	Right of Way Section	Business Process Subject Matter Expert Business Transition & Training Coordinator
Richard D.	Right of Way Section	Business Process Subject Matter Expert Operations Business Process Architect
Suzanne G.	ODOT Information Systems	RITS Project Product (Solution) Manager
Greg F.	ODOT Information Systems	RITS Project Process Manager
Mary W.	Region 4 Technical Center	Region 4 Pilot Implementation User Representative
Jenny K.	Region 4 Technical Center	Region 4 Pilot Implementation User Representative
Christy W.	Right of Way Section	Business Process Subject Matter Expert Headquarters Operations User Representative
Chuck W.	Right of Way Section	Business Process Subject Matter Expert Headquarters Operations User Representative
Jennifer W.	Right of Way Section	Business Process Subject Matter Expert Headquarters Operations User Representative
Melissa D.	Public Knowledge, PLC.	External Quality Assurance & Risk Assessment Auditor

3.4.3 Project and Solution Documentation

Various project (initiative) and solution documents provided additional insights and are a form of triangulation to validate findings from participant interviews. Process-oriented sources included Agency policies, directives, and procedures on topics such as project governance, project management, application systems delivery, and organizational change management. Solution-oriented deliverables such as requirements, designs, and implementation plans produced by agency and external provider staff were also reviewed and analyzed for each specific change case. As defined in 3.2.1, documentation on external and internal contexts was assembled and evaluated.

Tables 3.7 and 3.8 list the project and solution documents that were collected and reviewed, and their potential contribution to understanding each lifecycle stage and change dimension for DMV e-Government and Right of Way Tracking System initiatives.

Table 3.7: List of Project and Solution Documents for DMV Case Study

Document Title	Document Coverage – Lifecycle Stage & Change Dimension
State of Oregon Information Resource Request	• Policy & Strategy • Solution Content • Defined Improvement • Project Process
Oregon DMV IT Governance Policy	• Policy & Strategy • Solution Content • Defined Improvement • Project Process
e-Government Project Statement	• Policy & Strategy • Project Process • Defined Improvement • Organizational Environment • Solution Content
Covansys/DMV Integrated Project Plan and Schedule	• Solution Content • Project Process
Covansys/DMV Stage II Contract	• Project Process
Project Change Requests	• Project Process
Business Tasks Plan & Schedule	• Project Process
DMV Monthly Project Status Reports	• Project Process
Macroscope v4.0 - Productivity Center (P+)	• Solution Content • Organizational Environment • Project Process
Project Weekly Status Reports	• Project Process
Steering Committee meeting minutes	• Project Process
Recommended System Architecture	• Solution Content
System Dynamics Proposed Work Processes	• Solution Content
Covansys Training Plan	• Organizational Environment
DMV e-Government Product Quality Criteria	• Defined Improvement
e-Government Applications Test Plan (v1.0)	• Project Process
e-Government Applications Implementation Plan	• Organizational Environment
e-Government Applications Acceptance Test Plan	• Project Process
Requirements Management Plan	• Solution Content
Configuration Management Plan	• Project Process
Various e-mail communications on issues of interest	• Project Process

Table 3.8: List of Project and Solution Documents for Right of Way Case Study

Document Title	Document Coverage – Lifecycle Stage & Change Dimension
State of Oregon Information Resource Request	• Policy & Strategy • Solution Content • Defined Improvement • Project Process
IT Investment Management Briefing	• Policy & Strategy • Solution Content • Defined Improvement • Project Process
RITS Project Statement	• Defined Improvement • Solution Content • Project Process • Organizational Environment
RITS Steering Committee Meeting Presentations & Minutes	• Solution Content • Organizational Environment • Project Process
RITS Steering Committee Status Reports	• Project Process: Cost, Schedule & Activities
RITS Project Open Items Log	• Project Process: Issues, Decisions & Actions
COI Council IT Project Status Reports	• Project Process: Issues, Risks, Schedule, Costs & Resources
ODOT IS Project Change Request	• Project Process: Schedule & Resources
RITS Project Completion Report	• Solution Content • Organizational Environment • Project Process
Right of Way As-Is Business Process Structure	• Solution Content • Organizational Environment • Project Process
Right of Way Staff Survey Assessment	• Solution Content • Organizational Environment
Right of Way As-Is Business Process Descriptions & Analysis	• Solution Content • Organizational Environment
RITS Business Solution Assessment & Gap Analysis	• Solution Content • Organizational Environment
Right of Way Business Transition Plan	• Solution Content • Organizational Environment • Project Process
Right of Way To-Be Business Process Maps & Descriptions	• Solution Content • Organizational Environment
RITS System Implementation Plan	• Solution Content • Organizational Environment • Project Process

3.4.4 Independent Quality Assurance and Risk Assessment Reports

Oregon state-wide policy governing IT investments and IT-enabled process change requires that initiatives of a certain cost, scale and complexity are subject to periodic quality assurance reviews and risk assessments by external independent consultants. As a source of triangulation, detailed IT project risk assessment and quality assurance reports were collected, reviewed and discussed with the authors and respondents for both initiatives.

The risk assessment and quality assurance reports provided comprehensive, longitudinal coverage of lifecycle stages and the change dimensions for both the DMV e-Government and Right of Way Information Tracking System initiatives.

3.5 Trustworthiness of Research

This section discusses criteria generally used to evaluate trustworthiness of design research results using qualitative research and case study methods and techniques. It then explains steps that were taken to ensure trustworthiness of the ICLM design and the data collected for the ICLM evaluation.

It is generally accepted in quantitative research that the quality of data analysis and results are judged by the criteria of *validity*, *reliability*, and *generalizability*. For qualitative research, Bloomberg & Volpe (2008) suggest criteria for evaluating qualitative research require terminologies that better reflect the nature and distinction of this type of research. Lincoln & Guba (1985) and Guba & Lincoln (1998) propose the criteria of *credibility*, *dependability,* and *transferability* to evaluate trustworthiness of data used in and results from qualitative research. Klein and Myers (1999) advise that quality in interpretive field research should be guided by the *principle of contextualism*, which "requires critical reflection of the social and historical background of the research setting so that the intended audience can see how the current situation under investigation emerged" (p. 72).

For case studies, Yin (2009) proposes criteria that are common in social science methods: (1) *construct validity* – identify correct operational measures for concepts being studied; (2) *internal validity* – seek to establish a causal relationship (in explanatory studies), where certain conditions are thought to lead to other conditions; (3) *reliability* - demonstrate that the study operations, such as data collection procedures, can be repeated with the same results; and (4) *external validity (generalizability)* - define a domain to which study findings can be generalized. To ensure trustworthiness of design science research, Gregor & Hevnor (2013) suggest that the *viability* of the artifact be evaluated using criteria that include *validity*, *utility*, *quality*, and *efficacy*.

To evaluate the ICLM in this thesis, an integrated approach was adopted from these sources. The criteria applied are: (1) *viability of the designed artifact*; (2) *dependability of the process* used to construct, demonstrate, and evaluate the artifact; and (3) *transferability of the designed artifact* within the general problem domain. Next is a discussion of techniques used to address trustworthiness of this research and its products, according to these criteria.

3.5.1 Viability of Designed Artifact

The *viability* of the designed artifact is evaluated in Chapters 5, 6 and 7 using the criteria of *validity*, *utility*, *quality*, and *efficacy*. Validity in design science means that the artifact works and does what it is supposed to do in operational terms. Utility is whether the artifact is useful in practice and as a basis for further research and development. Hevner *et al* (2004) (p.85) define quality as the summative evaluation of an IT artifact in terms of *functionality*, *completeness*, *consistency*, *accuracy*, *performance, reliability, usability*, and *organizational fit*. Efficacy is a determination of whether an intervention works in principle under optimal, strictly controlled or ideal conditions. Effectiveness is a determination of whether an intervention works in real life situations, where confounding factors might exist.

3.5.2 Credibility of Findings

This criterion refers to whether participants' perceptions match up with the researcher's portrayal of those perceptions. Credibility parallels the quantitative criterion of validity, including validity of constructs and measures, and internal validity. Evidence to support credibility includes researcher self-reflection about subjective perspectives and biases. In this study, the researcher recorded reflective field notes and maintained a research journal during the process. Concurrent consulting assignments performed by the researcher within the organizational setting provided the opportunity for prolonged engagement with and persistent observations of the selected cases. This supplemented the understanding of the cases and adds to the credibility of the research accounts.

To evaluate the artifact, triangulation of data sources was used to examine consistency of findings. This included individual interviews, change initiative documents, solution documents, external risk assessments, and quality assurance reports. Interviewees reviewed and validated transcripts to verify their statements and fill in gaps. The interview guide was adapted to the different participant roles in the change initiative.

Information collected from the four sources identified in Section 3.4 was compared to corroborate evaluation findings. Participants validated interview proceedings by reviewing transcribed interviews and summaries of conclusions. Findings and conclusions were documented in a case report sent to each organization for review and validation.

3.5.3 Dependability of Research Process

This criterion parallels the quantitative research criterion of reliability. According to Guba and Lincoln (1998), dependability refers to whether the processes and procedures used to collect and interpret the data could be replicated by another researcher. The documentation for this research includes detailed and thorough explanations of how the data were collected and analyzed, providing the equivalent of an *audit trail*. Chapters 5 and 6 narrate the organizational setting and circumstances of each change initiative used in the evaluation of the artifact. The data, interview notes, and documentary reports could be made available for study by other researchers for further refinement and evaluation of the artifact.

3.5.4 Transferability of Artifact

Because it is not possible to conduct studies on all issues in all settings before making a policy or program decision, it could be valuable for management practitioners to consider the results of studies conducted in other settings. Transferability in management and organizational research is whether a study has made it possible for researchers or practitioners to determine whether similar findings could be present in their organizational settings. Decision-makers would assess whether research conducted elsewhere is appropriate for use in their own setting.

According to Burchett *et al.*, (2011) two central assessments to consider are whether an intervention evaluation is applicable (i.e., an intervention could be implemented in a new, specific setting) and whether it is transferable (i.e., original study findings could be as effective in a new setting as they were in the original setting; Wang *et al.*, 2005). Assessments of the applicability and transferability of research findings can encourage effective interventions to be introduced in settings where they would be beneficial, or can prevent interventions from being introduced to settings where the balance of benefits, impacts, and costs in the original setting may not be as effective.

Bloomberg & Volpe (2008) define transferability as the fit or match between the research context and other organizational contexts, as judged by consumers of the research. This is achieved by providing information in suitable depth to explain what is present or has occurred in the research setting. Transferability is enabled by richness in the case

descriptions, which serve as a vehicle to communicate a holistic and realistic story. The amount and detail of information supplied in the study about organizational and case project context, background circumstances, and events enables other researchers and practitioners to surmise how their organization could use the results.

Burchett *et al.*, (2011, p. 422) introduce a framework (originated by Wang *et al.*, 2005) to assess the potential applicability and transferability of research findings. Six dimensions are proposed: congruence, ease of implementation, intervention setting, effectiveness, study design and methods, and adaptation. These dimensions are elaborated in a public health context as groupings of 14 factors and explanatory issues with similar themes. Table 3.9 is an adaptation of the Burchett (2011) framework that has been used to assess the applicability and transferability of the proposed ICLM interventions from the two IT-enabled change cases to more general settings.

Table 3.9: Criteria for Applicability/Transferability of Model

Dimension	Factors	Issues affecting applicability/transferability
Congruence	With previous experience	Knowledge of similar projects/programs
	With beliefs and values	Inherent value in intervention approach or content
	With other evidence	Findings from other studies
Ease of implementation of the intervention	Intervention characteristics	Content or approach, cost, implementation issues
	Capacity to implement	Acceptability, affordability, human resources, organizational will
	Sustainability of implementation	Ability to maintain implementation over time
Setting of intervention	Intervention need	Focused on IT-enabled change problem, addresses determinants of problem
	Country-level influences	Geographical location and proximity, development level, within-country differences
	Jurisdiction-level influences	'Culture', urban-rural settings, IT self-efficacy
	Organization-specific influences	Risk tolerance; maturity of IT governance, project management; recognition of organizational change
	Program-specific influences	Competencies: business processes, IT solution content; absorptive capacity
Effectiveness of the intervention	Original study findings	Outcomes presented, relevance of outcomes to different context, interpretations of themes
	Potential effectiveness	Based on: perception of own situation, intervention approach, perceived ease of implementation or experience with similar interventions
Research-specific factors	Methods/study design	Case study methods, scale or coverage of intervention, methods of analysis/synthesis
	Results	Additional information about findings
	General quality	Internal validity, 'soundness' of the study
Adaptation	Separate, essential phase of research use	Adapt to suit context, to become implementable; may influence other applicability/transferability factors

In Chapter 8, the Burchett framework is used to assess the potential applicability and transferability of the Integrated Change Lifecycle Model to other public services and program areas, as well as to private sector businesses and non-government organizations (NGOs).

3.6 Limitations of Research Methodology

This section identifies potential limitations to the design research methodology as executed and what was done to address some of these limitations. It identifies problems inherent in design science research that use qualitative case study evaluation methods and techniques generally, as well as limitations that are specific to the particular site selected for the case studies.

3.6.1 General Limitations

Limitations in qualitative research typically arise from the restricted number of cases that can be explored within the allotted time and resources. In this study, two cases were chosen from an estimated 30 IT-enabled change projects undertaken by the target organizations over the past decade. The sample was purposefully selected, based on specific criteria, rather than a random selection. Therefore, results from the "sample" evaluation are not generalizable even to the agency studied, let alone to the myriad of IT-enabled public services change initiatives in other contexts.

Countering this limitation to some extent is that results may be transferable to similar program areas in other North American states or provinces, with equivalent organizational contexts. The possibilities for transferability of the artifact to other situations within the problem domain is discussed further in Chapter 8.

In qualitative case studies, there is also a limitation inherent in the types of data collection techniques used to explore a complex topic. Interview findings are subjective interpretations by the researcher based on subjective answers from subjective interpretations of interview questions by participants. The use of multiple interviews and multiple sources, some of which are more objective, has helped to address subjectivity of the sources. Peer reviews and participant validation of findings were conducted to address potential subjectivity of the researcher.

3.6.2 Site-Specific Limitations

In the use of the two cases to evaluate the artifact, there is potential for site-specific bias from the researcher's prior experiences and roles on the case study projects and more generally as a management consultant to the organizations where the cases are sited. This is principally an "interpretation bias", but could also extend to data collection bias from "selective listening". The potential for interpretation bias was mitigated somewhat by multiple sources of evidence and the external validation of the findings and conclusions in each of the cases. Audio recording of each interview and the participant review of the transcript addressed the potential for data collection bias.

For related reasons in this context, there was also the potential for participant sensitivity due to their previous experiences with researcher in his various consulting capacities, and the reaction, both positive and negative that may have evoked. Since the research is based on successful change projects there was also a potential *rose-coloured glasses* effect, where only successful processes, practices, and performances are acknowledged. Both potential limitations were mitigated somewhat with an interview preamble that introduced these cautions to the participant.

3.6.3 Ethical Issues and Response

This section explains how the researcher considered ethical issues that might have arisen in the conduct of the study and the steps that were taken to address potential issues.

The study data collection, analysis, and reporting processes were designed in accordance with University of Reading standards for business and management research (see Appendix B). The study involved archival research, access to publicly available documents and records, access to publicly available data, questionnaires, surveys, focus groups and other interview techniques. No personal identity information was sought, accessed, or retained. Participants were advised that they could withdraw from the research process at any stage if they wished, and their contribution expunged from the accounts. Arrangements have been made to publish research results and, if confidentiality is affected, to obtain written consent of the Chief Information Officer. Information Sheets and Consent Forms were prepared, distributed, and completed in accordance with University guidelines.

Issues of confidentiality, arrangements for storage and security of documentation material during and after the study, and for arrangements for the disposal of this material in physical or electronic form have been addressed and have been implemented during each phase of the study.

3.6.4 Researcher Advantages and Potential Bias

During the period of conducting this study, the researcher was employed as a management consultant with engagements in the commercial and government sectors in Canada, and with the State of Oregon government. Each of these engagements, as well as other experiences, were on various aspects of organizational change enabled by investments in information technology. Thus, the researcher brings to the inquiry process a range of practical experiences as a working professional in the principal subject area, with knowledge and understanding of the external government context, as well as the Oregon Department of Transportation internal environment.

The researcher recognizes and acknowledges that these experiences, while they may facilitate a valuable and unique perspective, could also introduce bias in the research design and to the interpretation of the research findings. A number of actions have been taken to mitigate these risks. In addition to the explicit early disclosure of the researcher's assumptions and theoretical orientation, the researcher has engaged in on-going personal critical reflection on these issues and has discussed emerging concerns with professional colleagues and research supervisors.

To address potential issues of subjectivity, and to strengthen the credibility of findings, the researcher deployed several procedural safeguards, including audio recordings of interviews, use of an independent third-party transcription service, validation of interview transcripts, triangulation of data sources, triangulation of methods of analysis, and theme reliability checks by colleagues.

3.7 Summary of Research Approach

In summary, this Chapter provides a detailed description of the design science research methodology, as adapted to the goal of designing an integrated change model. Qualitative techniques and case studies were employed to explore and illustrate the presence of factors, organizational conditions, and managerial practices in successful information technology-enabled public services change initiatives. Case studies were a purposeful selection of IT-enabled change initiatives conducted in multiple transportation program areas within Oregon State government.

The data collection methods include individual interviews with key informants and other case participants, a review of case initiative and solution documentation, and a study of independent quality assurance review and risk assessment reports on the cases performed by external auditors.

A review of the literature led to the design of a theoretical IT-enabled change model. This preliminary model integrates three change dimensions - processes, solution content, and organizational context - within a planned change lifecycle. The model and its constructs are used to explore the main research question, to define and investigate related themes, to frame the interview guide, and to organize the collected data. Trustworthiness of the findings was addressed by triangulation of data sources and methods, and validation of transcripts by each interviewee.

4. Towards an Integrated Change Lifecycle Model

4.1 Introduction

To effectively cover the scope of the management and organizational problem discussed in Chapters 1 and 2, the target model must be comprehensive in its intent and scope. The model should be an umbrella under which characteristics of governance, management, and performance of successful public services change initiatives can be explored across multiple dimensions of change over the entire life span of such initiatives.

The review and critique of the academic literature on the multi-dimensional nature and lifecycle of IT-enabled change, combined with practitioner insights from management consulting, have contributed to development of an *Integrated Change Lifecycle Model (ICLM)*. This Model is intended for organizations to plan new change initiatives and to evaluate initiatives in progress.

Chapter 3 reported on the methodology that was employed to design, develop, demonstrate, and evaluate the *Integrated Change Lifecycle Model.* Chapter 4 presents two iterations from the design and development of this Model. Section 4.2 describes a preliminary version that was adapted from existing knowledge about organizational and business change and is focused on the three dimensions of change, which Pettigrew (1987) originated as process, content, and context.

Section 4.3 introduces theories and models of the change lifecycle, then selects and assesses possible choices to operate as the lifecycle constructs for the integrated design.

Section 4.4 presents a second, more complete, pre-empirical version of the Model. It integrates the three change dimensions within a planned change lifecycle, which is based on an adaptation of Manwani's *IT-Enabled Business Change* framework (2008).

An empirically validated, integrated Model from an iterative design and development process is the primary outcome of this research. An intermediate version is elaborated, demonstrated, and evaluated via a case study of the Oregon DMV e-Government initiative. Chapter 5 reports characteristics from the Oregon DMV case study evaluation for each change dimension and lifecycle stage.

An advanced empirical version of the Model is based on a second case study – ODOT's Right of Way Information Tracking System (RITS) initiative. Chapter 6 reports the characteristics for each change dimension and expanded lifecycle stage, based on the RITS case study evaluation. Chapter 7 describes the advanced Integrated Change Lifecycle Model resulting from this empirical research stage.

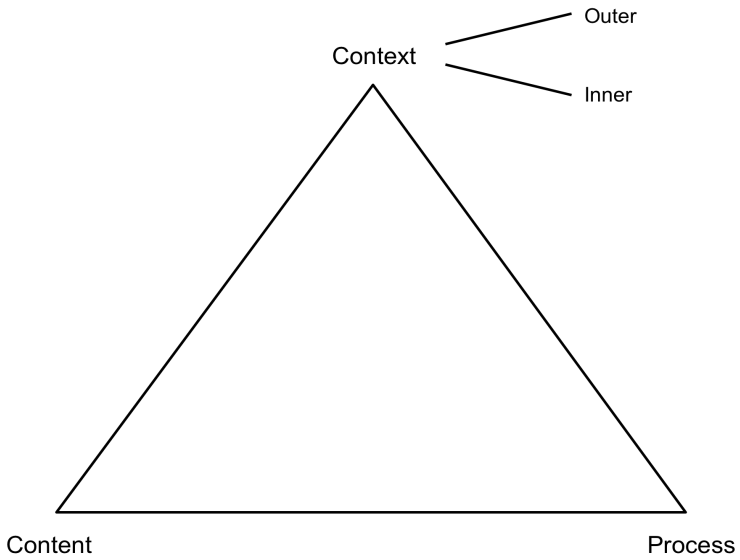
4.2 The Dimensions of Change

4.2.1 Theories and Models for the Dimensions of Change

The first set of constructs for the preliminary Model was derived from the well-established theory of dimensions of organizational change, as elaborated by Armenakis and Bedeian (1999); Kuipers et al. (2014); Pettigrew and Whipp (1991); Pettigrew et al. (2001); Ward and Elvin (1999). These dimensions are defined as: (1) the *content* or substance of the change being introduced; (2) the *processes* by which the change is governed, managed and executed; and (3) the organizational *context*, the forces and conditions present in the internal and external environments of the organization within which the change would occur.

Pettigrew's extensive work on organizational continuity and change at ICI (1985; 1987), and UK National Health Service (with Ferlie & McKee, 1992), concluded that analysis of organizational change accompanying the initiation of a new business system should explore relationships and interplay among these dimensions. This framework (Figure 4.1) is designed to alert researchers to a broad array of possible sources of organizational change.

Figure 4.1: The Dimensions of Business Transformation (Pettigrew, 1987)



Pettigrew advises (cited by Symons, 1991) that, "formulating the content of a strategic change crucially entails managing its context and process". Context shapes the change process, thus organizational change management actions must be sensitive to context. Pettigrew *et al*. (1992) note variations in organizational receptivity to change and offer a linked set of conditions that collectively define receptive contexts for change, and by their absence, non-receptive contexts for change.

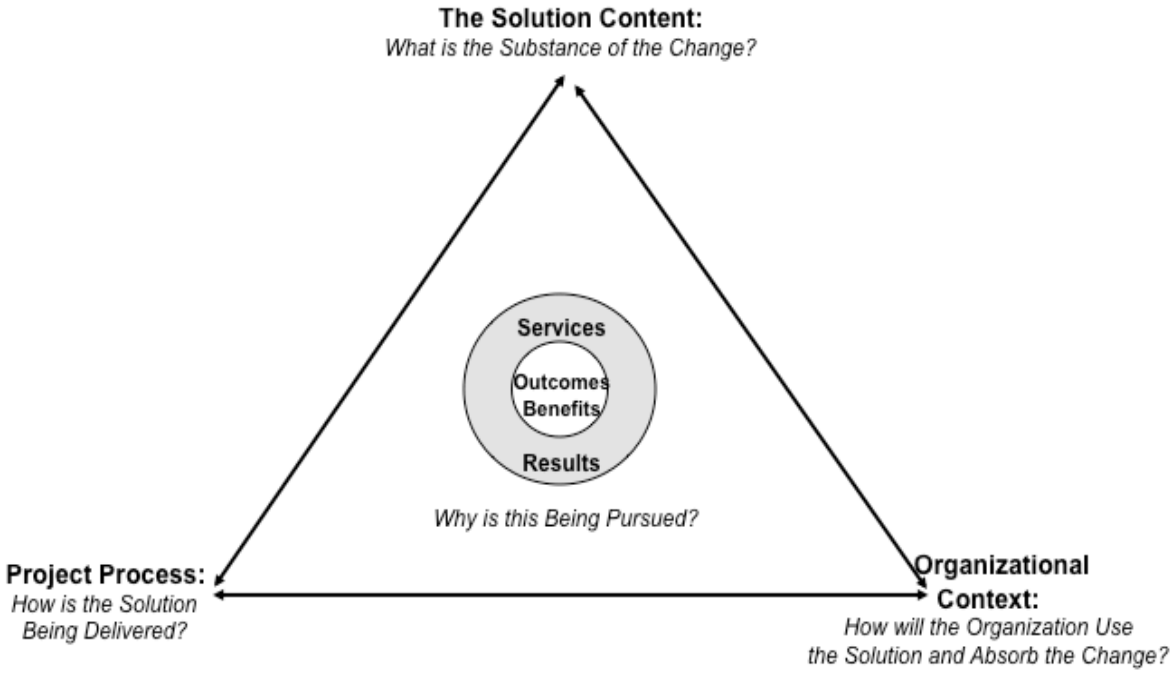
While subsequent research into organizational change has focused on these dimensions, components and factors, Walker *et al*., (2007) argue that little research exists about integration of these components and factors. Damanpour (1991; following Pettigrew & Whipp, 1991), suggests that successful change may ultimately be determined by the fit among content, contextual and process factors. Ward and Elvin (1999) observe that interdependencies among IT and business content supply change initiatives with unique characteristics and difficulties.

Bartoli and Hermel (2004) in their analysis of practices to introduce IT into organizations conclude that often the context and process are neglected, and the content is centred on tool efficacy, rather than on the needs to be satisfied. Gibson (2003) advises that IT-enabled business change requires a process capable of making changes to the entire *business system*.

4.2.2 Initial Design for the Integrated Dimensions of Change

The initial representation of the artifact reflects the evolution of thinking from the late 1980's onward about the management of IT-enabled change. The trend was towards organization-wide improvement initially based on the redesign of individual processes to becoming the transformation of an entire *business system.* (See Scott-Morton, 1991; Hammer, 1991; Davenport, 1993; Tapscott & Caston, 1993; Senge, 1995; Keen, 1995; Rummler & Brache, 1995; Manwani, 2008). Figure 4.2 illustrates the business system concept as applied to the Pettigrew framework with a re-orientation of the change dimensions to focus on solution content.

Figure 4.2: Preliminary Model Design for the Dimensions of Change



In this representation, the solution drives the change agenda, rather than the organizational context within which the change is to occur. Expected results from the change are expressed as services and the change produces outcomes and benefits.

Table 4.1 lists initial categories of characteristics from the extant body of knowledge, and tentatively assigns each to a specific change dimension. These served as *a priori* categories for developing detailed characteristics – factors, organizational conditions, and managerial practices – via demonstration and evaluation of the artifact during case studies.

Table 4.1: Initial Categories of Characteristics for IT-Enabled Change Dimensions

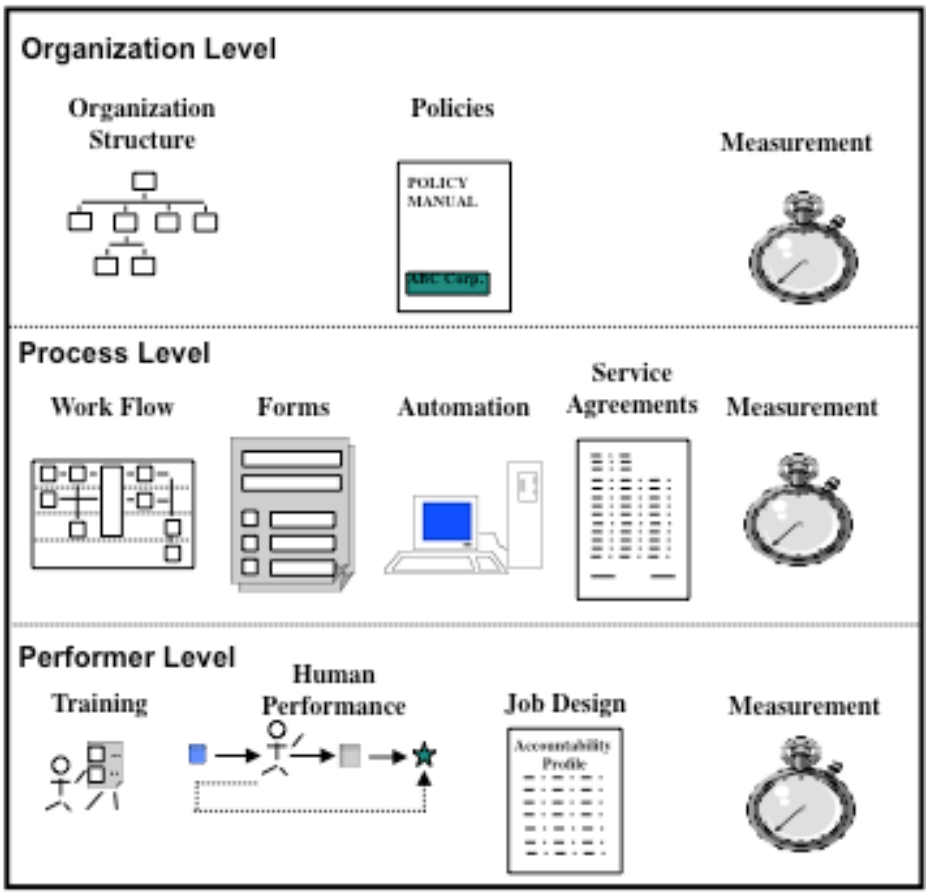
Integrated Solution Content	Project Process	Organizational Context
▪ Organizational Solution Components ▪ Business Process Solution Components ▪ Information Technology Solution Components ▪ Job/Performer Solution Components	▪ Project Initiation ▪ Project Management Processes ▪ Project Governance/Decision Framework ▪ System Delivery Methodology ▪ Roles & Responsibilities ▪ Project Team & Processes	▪ Change Leadership ▪ Operational Capacity ▪ Organizational Culture ▪ Readiness to Change ▪ Receptivity to Change ▪ Organizational Change Process ▪ Individual Transitions
Sources: Davenport (1993); Kettinger & Grover (1995); Rummler & Brache (1995); Tapscott & Caston (1993); Markus (2004); Manwani (2008).	Sources: PMI (2012); Wirick (2009); Turner and Müller (2003);Crawford and Cooke-Davies (2005); Earl (1992); Manwani (2010); (Reich et al., 2008); Turner and Keegan (2001);Davenport (1993); Fujitsu Consulting (2009); Harmon (2007); Keen and Knapp (1996); Smith and Fingar (2003); Cooke-Davies (2002),	Sources: Balogun & Hope Hailey (2008); Pettigrew (2001); Weiner (2009); Kotter (1995); Hiatt (2005); Bridges (2009)

4.2.2.1 Integrated Solution Content

Rummler & Brache (1995) offer a theoretical framework for understanding change content in an organization as an integrated, adaptive system. This framework provides guidance on three levels: (1) The *Organization Level*, which emphasizes an organization's strategic direction, its relationship with its market, major functions, policy and regulatory constraints, organizational structure, and resource allocation; (2) The *Process Level*, which is a means to efficiently produce effective outputs using cross-functional work processes that are shaped by requirements of customers and the organization and may be enabled by information technology; and (3) The *Job/Performer Level*, where individuals in various roles perform and manage processes according to standards and measures, facilitated by training. Figure 4.3 illustrates a typical set of components for an integrated solution in a process redesign initiative, which uses this framework. .

The initial version of the artifact change dimensions has solution content categories with components from the three levels of the Rummler & Brache (1995) framework.

Figure 4.3: Levels and Components of Integrated Solution Content



While the Rummler & Brache (1995) framework identifies automation as a component at the process level, an IT-enabled change initiative applies technology as a cornerstone of the solution. Scott Morton (1991), Davenport (1993), Tapscott & Caston (1993). Venkatraman (1994), Kettinger and Grover (1995), Markus (2004), and Manwani (2008) highlight information technology as a fundamental component of the solution design to enable business change.

4.2.2.2 Project Processes

Project processes in an IT-enabled change initiative are means by which solution content is delivered. In planned change, a structured intervention is launched to take an organization from an evolutionary target and path to a new target and path, representing an *ideal future state*. Such an intervention is commonly referred to as a *project*, a change *program(me)* or, a term often used in the public sector, a change *initiative*. These entities use temporary organizational structures and agencies to manage resources and actions to achieve specific objectives (Turner & Müller, 2003).

The change initiative structure includes processes for governance of the initiative, which might involve an executive, project or business change sponsor (Crawford & Cooke-Davies, 2005; Earl, 1992; Manwani, 2010; Reich et al., 2008; Turner & Keegan, 2001); senior responsible owner (OGC, 2011); process owner (Davenport, 1993; Harmon, 2007; Keen & Knapp, 1996; Smith & Fingar, 2003); and business system owner (Fujitsu Consulting, 2009). Processes led by a steering committee, governing council, or steering board, may aid change leadership and stewardship.

According to Cooke-Davies (2002), business process and system owners empower a secondary group, who decide which actions to take and perform roles to carry them out. This group forms a temporary project organizational entity and has roles and responsibility assignments to ensure effective use of resources.

Other project processes include the solution delivery sourcing model (e.g., turnkey, outsource, privatization); project management processes (e.g., PMI, 2012); solution delivery methods (e.g., Fujitsu Consulting, 2012; Rossi, Henfridsson, Lyytinen, & Siau, 2015); and implementation management methods.

4.2.2.3 Organizational Context

Due to the complexity of the change task, successful change initiatives require a context-sensitive approach. There is no one best way to change: the design and management of the change process needs to be context-specific and dependent on the circumstances and situation (Pettigrew, 2001; Balogun & Hope Hailey, 2008).

The literature differentiates between organization level aspects of the change environment and individual performer aspects. At the organization level, contextual characteristics are initially categorized as *change leadership* (Kanter et al, 1992; Kotter, 1995; Nadler & Nadler, 1998; Balogun & Hope Hailey, 2008); *operational absorptive capacity* (Balogun & Hope Hailey, 2008); *organizational culture* (Kotter, 1995; Pettigrew, 2001); *organizational readiness to change* (Weiner, 2009; Balogun & Hope Hailey, 2008); *receptivity to change* (Pettigrew, 2001); and the *organizational change management process* (Kotter, 1995; Balogun & Hope Hailey, 2008)

For individual job performers, initial organizational context considerations pertain to requirements for and mechanisms needed to ensure smooth *individual transitions* (Bridges, 2009; Hiatt, 2005).

4.3 The Change Lifecycle

4.3.1 Theories and Models for the Change Lifecycle

The second set of constructs was initiated from the literature on the lifecycle of business solution and information technology delivery. A survey of the academic literature and practitioner publications reveals many theories and models that define the progression of IT-enabled change in organizations or are used to manage the delivery of change. The principles and classification schema from Van de Ven & Poole (1995) define a lifecycle as a *single-entity*, *prescribed process* theory of organizational development and change.

The twelve theories and models presented in Table 4.2 apply to planned change, rather than emergent or multiple entity, *teleological* change.

Table 4.2: Change Lifecycle Theories and Models

Lifecycle Theories/Models	Advocate(s)	Features & Limitations
Soft Systems Methodology	Checkland & Scholes (2003)	Application of systems thinking that provides a sequential or iterative means to articulate complex social processes in a participatory way.
Macroscope Informatique®	Fujitsu Consulting (2012)	A comprehensive framework and methodology that covers IS strategy formation, architecture, systems delivery, and benefits realization.
Business Process Reengineering (BPR)	Hammer & Champy (1993), Kettinger *et al.* (1997)	A multi-stage prescriptive approach that drives radical redesign of business processes. Tends to overlook human dimension of change.
Business Process Redesign/Innovation	Davenport & Short (1990), Davenport (1993)	Generic five-step approach to select and redesign processes using information technology, with emphasis on process
Process Improvement and Management	Harrington (1991), Rummler & Brache (1996)	Combines continuous improvement cycle with breakthrough or incremental project-based efforts.
IT-Enabled Business Change Lifecycle	Earl (1995), Manwani (2008)	Integrates business aspects of change within IT Project lifecycle via integrated solution design.
Technological Diffusion Approach to IT Implementation	Cooper & Zmud (1990)	Lifecycle consisting of: initiation, adoption, adaptation, acceptance, routinization, and infusion
Project Management Body of Knowledge (PMBOK®)	Project Management Institute (2012)	Generic project management knowledge areas and processes, independent of solution content.
Organizational Change Management	Lewin (1947), Kotter (1996), Hiatt (2006), Bridges (2009)	Building blocks for managing change at the organizational and/or individual level.
New Product Development and Innovation	Cooper (2000), Tao *et al.* (2009)	Covers product innovation from concept discovery through launch, with distinct decision
Information Systems Development Lifecycle	Hirschheim & Klein (1989)	Waterfall, agile, spiral and object versions; focus is on developing IS artifacts and product
Active Benefit Realisation (ABR)	Remenyi et al. (1997)	Focused on business result of IS; stakeholders have co-evolutionary roles in IS development.

4.3.2 Evaluation and Selection of Change Lifecycle Constructs

The initial filter applied to these theories and models specified that: (1) It should include information technology as a fundamental feature of the solution design; (2) It should produce a set of content deliverables that represent an integrated business change solution; and (3) It should apply to project-based solution delivery, not strategic or tactical planning.

Some of the listed theories and models are not exclusive to, or even directed towards, an IT-enabled business change solution. Others are designed for use in strategic and tactical planning rather than for project-based solution delivery. Based on these criteria, three of these theories were selected for further analysis as candidates to provide lifecycle constructs in the first iteration of an integrated model of IT-enabled change.

4.3.2.1 Technological Diffusion Approach to IT Implementation

Cooper & Zmud (1990) define a six-stage model of the IT implementation process, which is a variation on the Kwon & Zmud (1987) IT implementation stage model that includes post-adoption behaviours developed by Zmud & Apple (1989). The six stages can be viewed as a lifecycle of technological diffusion, consisting of: initiation, adoption, adaptation, acceptance, routinization, and infusion. Each stage is defined with an organizational process and product, which is represented as the status of the IT application solution. This model is IT-solution deployment focused, leading to accepted use of the IT capability in organizational processes, but is less concerned with aspects of an integrated business solution, such as alignment of business policy, processes, and roles.

4.3.2.2 Business Process Reengineering

In response to the proliferation of Business Process Reengineering (BPR) methodologies, techniques, and tools advanced as “proven methods” by BPR consultants, Kettinger et al., (1997) surveyed the academic literature on BPR, and methodologies practiced by leading reengineering consulting firms. The authors derive a stage-activity BPR framework, which contains six stages and 21 high-level activities. The six stages represent a lifecycle for business process change, applicable both to change that is radical (as in classical BPR) or to incremental improvement. The derived framework stages are: envision, initiate, diagnose, redesign, reconstruct, and evaluate.

Kettinger et al., (1997) state, ”…BPR is increasingly recognized as a form of organizational change characterized by strategic transformation of interrelated organizational subsystems“ (p. 56). Kettinger & Grover (1995) define these organizational subsystems as management (style, values, measures), people (jobs, skills, culture), information technology, and organizational structures. In combination, the framework would cover many factors that exist in a business change initiative. A retrospective criticism of the BPR methodologies is that they were oriented towards *scorched earth* solutions and that they tended to ignore the human aspects of change.

4.3.2.3 IT-Enabled Business Change Lifecycle

The Manwani (2008) approach proposes that business and information technology solution components are delivered by following an integrated *IT-enabled business change lifecycle*, rather than by following either an isolated information systems or technology delivery mechanism. This integrated change lifecycle provides managerial guidance for each stage of execution, and extends across all solution content components, grouped as *process, people, information*, and *technology*. The progression extends from the originating concept where the innovation opportunity is aligned to the business strategy; target improvements are defined; the solution is designed and implemented; and the new business system operates in a way that will realize business benefits (Manwani, 2010).

Table 4.3: Comparison of IT-Enabled Change Lifecycle Models

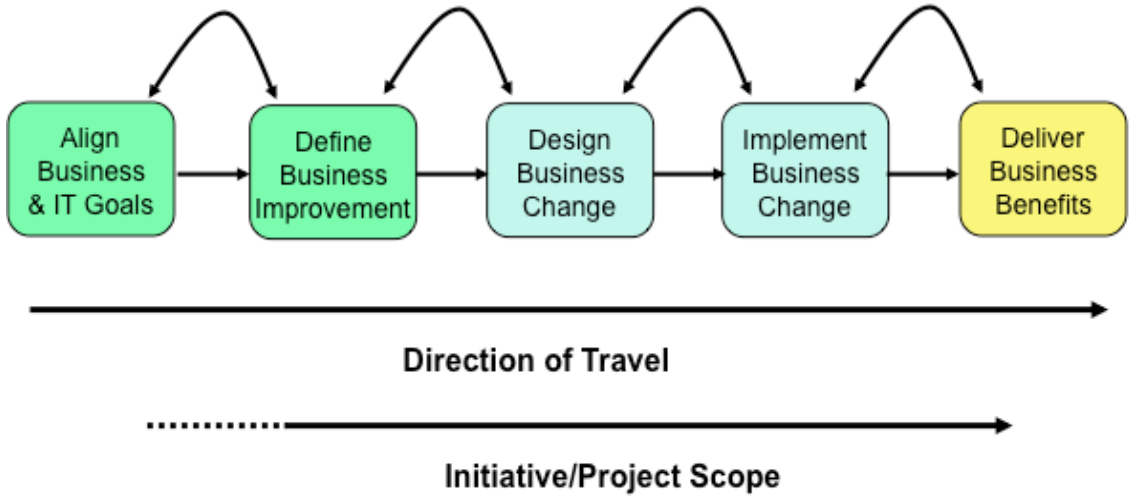
Differentiator	Technological Diffusion	Business Process Reengineering (BPR)	IT-Enabled Business Change Lifecycle
Basic Concept	IT-solution implementation focused.	Drives radical redesign of business processes.	Integrates business aspects of change within IT Project lifecycle via integrated solution design.
Proponent	Cooper & Zmud (1990)	Kettinger *et al.* (1997)	Manwani (2008)
Solution Scope	IT product or application solution	M*anagement* (style, values, measures), *people* (jobs, skills, culture), *information technology*, *organization*	*Process, people, information, information technology*
Limitations	Less concerned with business implementation considerations	Tends to overlook human dimension of change	Management aspects related to change initiative
Process Stages	Initiate, adopt, adapt, accept, routinize, infuse	Envision, initiate, diagnose, redesign, reconstruct, evaluate	Align, define, design, implement, realize benefits

Table 4.3 compares these three information technology-enabled business change lifecycle frameworks that are candidates for the initial lifecycle design for this research.

The IT-enabled Business Change Lifecycle model from Manwani (2008) was selected for further study based on the content of the solution scope, the process stages, and coverage that includes implementation and human aspects of change.

Figure 4.4 illustrates the selected lifecycle model from Manwani (2008).

Figure 4.4: IT-Enabled Business Change Lifecycle Model (Manwani , 2008)



4.4 Preliminary Design for the Integrated Change Lifecycle Model

The two sets of constructs - the change dimensions and lifecycle stages – were integrated into a single model for empirical demonstration and evaluation in the first case study covering the Oregon DMV e-Government Applications initiative. This iteration has four lifecycle stages as adapted from the Manwani (2008) IT-enabled change framework. The coverage of the Business and IT Goal Alignment stage is represented in this version as an antecedent to the Define Business Improvement stage. Although Design Business Change and Implement Business Change are represented as separate stages, characteristics are grouped to help focus on understanding the dimensions of change throughout these stages.

Another consideration in adapting the Manwani (2008) framework was the use of the term *IT-enabled Business Change*. Because the purpose and scope of the artifact and its evaluation are change initiatives in the public sector, alternatives to this term that were explored in the cases were: *IT-enabled public services change*, *public services system change*, and *e-government.*

The pre-empirical demonstration and evaluation version of the integrated model introduced to the DMV e-Government initiative is depicted in Figure 4.5.

Figure 4.5: Preliminary Integrated Change Lifecycle Model

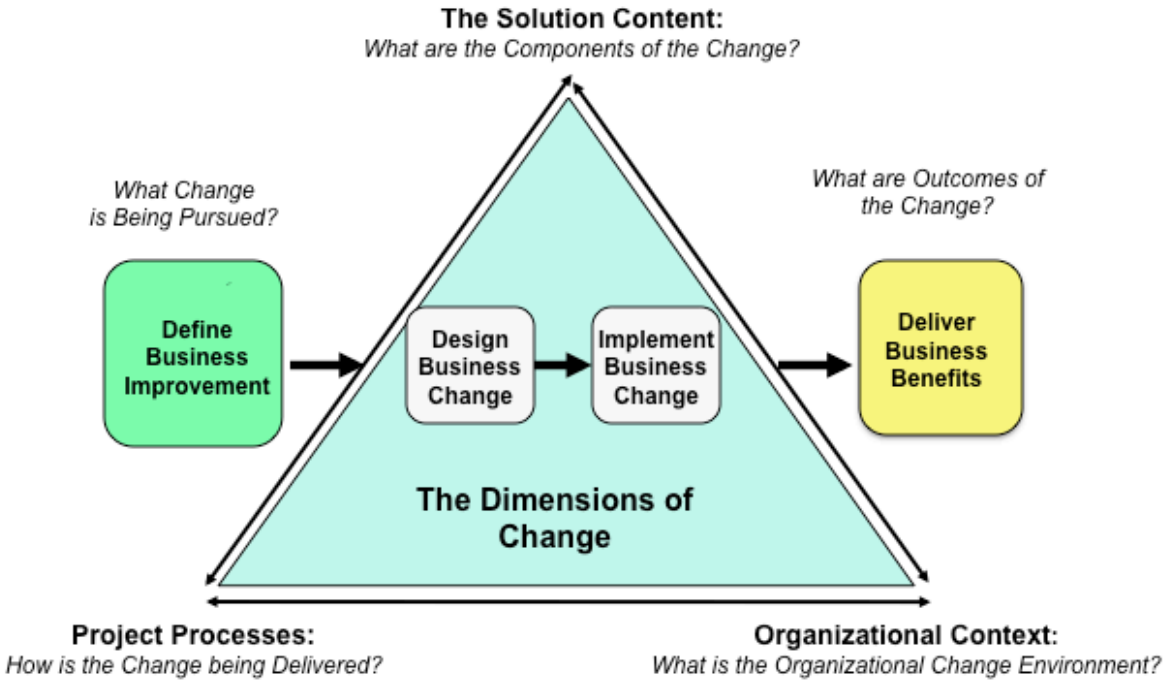


Table 4.4 lists categories of characteristics in this preliminary integrated model as starting points to define and explore each lifecycle stage and change dimension.

Table 4.4: Theoretical Characteristics of Lifecycle Stages and Change Dimensions

Lifecycle Stage/Change Dimension	*Categories* of Characteristics for Preliminary Model
Define Business Improvement	▪ *Targeted Business Improvements* ▪ *Innovative Change Opportunity Evaluation* ▪ *Alignment with Business Strategy* ▪ *Initiative Objectives and Scope*
Design and Implement Business Change: Solution Content Dimension	▪ *To-Be Organization Components* ▪ *To-Be Business Process Components* ▪ *To-Be Information Technology Components* ▪ *To-Be Job/Performer Components*
Design and Implement Business Change: Project Processes Dimension	▪ *Project Governance Policy, Structure and Processes* ▪ *Business System Ownership* ▪ *Change Initiative Organization* ▪ *Project Management Processes* ▪ *Solution Delivery Model* ▪ *Solution Delivery Methodology* ▪ *System Implementation Strategy and Plan*
Design and Implement Business Change: Organizational Context Dimension	▪ *Organization Commitment to Change* ▪ *Organization Change Capacity* ▪ *Organization Operational Readiness* ▪ *Organizational Change Leadership Capability* ▪ *Organization Culture Change Receptivity*
Deliver Business Benefits	▪ *Owner Acceptance of Solution Content* ▪ *Delivery of Improved Business Features* ▪ *Measurement of Results vs. Project Objectives*

5. Case Study: Oregon DMV Services e-Government Initiative

This Chapter applies the case study technique to demonstrate and evaluate the validity, utility, quality, and efficacy of an Integrated Change Lifecycle Model (ICLM) artifact for the Oregon DMV e-Government Initiative. The Chapter begins with a description of the organizational setting for the study, followed by an assessment of the DMV case against selection criteria that confirms its fit for the purpose of Model evaluation. The narrative proceeds with a description of the case, which uses the Change Dimensions and Lifecycle Stages from the Model to organize the content. Section 5.3 then documents findings from the evaluation as themes developed for each ICLM Dimension and Stage.

5.1 Case Study Organizational Setting

5.1.1 Oregon Driver and Motor Vehicle Services Mandate

The Driver and Motor Vehicle Services Division (DMV) is a line of business and organizational entity within the Oregon Department of Transportation (ODOT). DMV's mission is to promote driver safety, to protect financial and ownership interests in vehicles, and to collect revenue to finance Oregon's transportation system. DMV Headquarters is located in Salem, with local customer service Field Offices distributed throughout the state.

Driver safety is pursued through program elements that test, license, educate, and sanction individuals who wish to have the privilege to operate passenger and commercial vehicles. DMV protects financial and ownership interests in vehicles through registrations, titles, liens, plates and stickers for individuals, car dealerships and business fleets.

DMV also has an important responsibility to ensure that the costs it incurs to deliver products and services to its customers are optimized. DMV fees net of costs are a key source of revenue relied on by ODOT and by county and municipal road authorities to fund highway work. ODOT has a growing revenue need to meet the demands of Oregon's aging transportation system features, including pavement, bridges, culverts, signals, and lighting and other issues related to deteriorating condition, seismic vulnerability, current capacity needs, and emergency work.

DMV net revenues have been the second largest contributor to highway financing in Oregon over the past decade, behind only the federal Highway Trust Fund. The United States Congress created this Fund in 1952 to finance improvements on primary, secondary, urban and interstate highway systems. The Fund has relied on increasing volumes of vehicle travel since the prevailing federal fuel tax per gallon rates were set in 1993. Recently, however, Americans have traveled fewer miles in motor vehicles, which has impacted the viability of the Highway Trust Fund. This is due to high unemployment, rising fuel prices, increasing fuel efficiency of vehicles, greater use of electric and hybrid vehicles, and expanding use of public transit and other transportation modes.

5.1.2 Oregon DMV Programs and Functions

Oregon Revised Statutes (ORS), regulations and ODOT policy have mandated DMV to be the agency responsible for many important programs and functions, as listed below.

Table 5.1: DMV Programs and Functions (Source: Oregon DMV Cost of Services Report, 2013)

DMV Program or Function	Description
Identity Management	DMV is the 'de facto' standard-setter for identity management in Oregon. Citizens show their Driver Licenses for identification purposes frequently. DMV also issues Identity Cards for non-drivers.
Driver Education and Teen Driver Programs	DMV is mandated to pay particular attention to new teen drivers, their parents, associated driving schools, and public school education programs
Business Licensing and Management	DMV regulates and oversees car dealerships and other businesses that are authorized to issue vehicle registration plates, stickers and title documents
Vehicle Property Management	DMV manages vehicle registrations, titles, liens, plates and stickers for individuals, car dealerships and business fleets. In order to do this, DMV exchanges data with banks, verifies document authenticity and manages controlled stock of titles, plates and stickers.
Driver Privilege Management	DMV records and/or administers driving violations, demerit points, complicated driving histories, license restoration rules, appeals of driver sanctions, and education programs.
Revenue Generation	DMV collects and administers a large and complicated cash flow, which is generated by millions of transactions annually, to distribute revenue, principally to the State Highway Fund.
Enforcement of other Agency Rules	DMV is mandated to use its processes and systems to enforce policies and programs for other Oregon agencies, as well as certain federal agencies
Information Brokers	DMV operates a significant information business by offering access to data such as Driver License Status, Driving History and Vehicle information.

5.1.3 Oregon DMV Organization Structure

To perform these functions and deliver the mandated products and services, DMV is organized into four Service Groups, which report to the DMV Administrator. Two of these Groups - Field Services (FSG) and Processing Services (PSG) – are *production-oriented*. FSG provides most DMV services and products at 60 Field Offices located throughout the State. Work processes, staff hierarchy and product offerings are similar in all Field Offices. Customers can visit Field Offices to obtain driver licenses, vehicle titles, vehicle registration, and driver and vehicle records, as well as forms, manuals and general information. Located at Headquarters, PSG provides back office processing of transactions received from Field Offices as well as processing mail-in and online transactions. PSG processes accident reports, insurance verification, vehicle registrations and titles, changes of address, and supports driver license issuance, suspensions, records and safety.

Customer Services Group (CSG) and Program Services Group (PGSG) are located primarily within DMV Headquarters and serve principally as support functions. CSG performs first line contact with customers with assistance from Headquarters and from satellite call centers at two correctional institutions, where inmate phone agents answer basic customer questions. CSG also provides records and hearing case management services. PGSG is responsible for driver and vehicle policy, fraud prevention and operational support as well as licensing and regulating vehicle dealers.

5.1.4 Previous IT-Enabled Change Experience

Prior to the e-Government initiative, Oregon DMV had varied experiences with IT-enabled change efforts. The *DMV Re-engineering Project* was a high-profile integrated driver licensing and vehicle services initiative that began in 1993, but was abandoned a few years later, due to organizational disruption, schedule delays, and extreme cost overruns. Subsequently, under new administration, DMV successfully delivered a portfolio of incremental change projects that included improvements to technology and processes for driver license issuance, financial transactions, and vehicle registration performed by car dealerships. DMV then adapted its legacy systems for drivers, vehicles, customers, and field transactions to ensure compliance with Year 2000 requirements.

5.2 Case Description

5.2.1 Case Selection for Model Demonstration and Evaluation

The first case selected for demonstration and evaluation of the Integrated Change Lifecycle Model (ICLM) is the e-Government Applications initiative. Selection of this case for ICLM evaluation is based on an assessment of the case circumstances against multiple criteria.

Since the research focus is on successful change, the selected initiative or project must be completed and be judged by the organization leaders to have achieved its intended results and stated objectives. A second criterion is that information technology is indispensable to the content of the change solution and fully integrated with the public service processes. A third selection criterion is the presence of comprehensive, publicly available documentation of change initiative aims, solution, conditions, processes, deliverables and results, usually supplied by a document-intensive solution delivery methodology. A fourth criterion is availability of, and access to, interviewees and documents throughout the change initiative lifecycle to provide a longitudinal view of the case.

Table 5.2 shows assessment results for this case against these and other criteria.

Table 5.2: DMV e-Government Case Assessment and Selection

Dimension	Case Assessment & Selection Criteria	DMV eGov Assessment
Organization Environment	• Multiple change initiatives from which to choose • Program areas offer opportunity for transferability • Researcher access to documentation and informants • Public disclosure laws facilitate data availability	• 10+ change initiatives • Transferable to 50+ DMVs • Documents and informants accessible • Oregon disclosure laws
Change Result	• "Successful" change initiative • Demonstrated improvement to program or service	• Judged a success by DMV • New delivery channel • e-Government operational
Solution Content	• Projects with IT-enabled change ambitions • IT innovation or innovative use • Organization-wide impact of change • Holistic change to public services system • Affects multiple service delivery processes	• Level 3 change ambition • Innovative use for DMV • Affects 3 of 4 Service Groups • Multi-layer solution • Affects 3 processes
Project Processes	• Planned change delivery mode • Initiative/project organizational entity exists • Project/solution documentation intensity	• Meets planned change criteria • e-Government Project • SDLC documentation

5.2.2 Public Policy and Strategy

A major component of DMV's business strategy in the new millennium was to develop the capability to offer DMV products and services to customers from the convenience of their homes. According to the ODOT Director, "…the *DMV from Home* strategy [is] one of our many efforts at regulatory streamlining. It also is part of our effort to maintain good customer service in an era of tighter budgets with a smaller work force." In the broader context, Oregon's Governor remarked,

> "Our regulatory streamlining initiative is not simply about making it easier for businesses to grow and create jobs in Oregon. Making government services more accessible and convenient for individuals, and more efficient for agencies, also contributes to Oregon's competitiveness and quality of life." (2004)

The vision for e-Government by DMV was defined as "to provide residents of Oregon with a reliable, secure, accessible, and easy to use Internet delivery channel to obtain DMV services." These services were to be available to eligible applicants 24 hours a day, 7 days a week, from the convenience of their home, place of work, mobile device, or any other Internet access point.

While there was no legislated imperative or deadline for Oregon DMV to develop and implement Internet services, other driving forces for change encouraged DMV to enhance its service delivery strategy through innovation. Forces included expectations of a technology-savvy society, increasing volumes of DMV transactions in its mail and field office channels without commensurate resources, maturation in the substance and use of e-government technologies, and DMV's internal organizational absorptive capacity from successful retrofitting of its legacy systems.

As a public agency in Oregon, the Oregon Legislature and Oregon Transportation Commission (OTC) govern DMV's strategic response to its external environment. Based on prior IT-enabled business change experiences, DMV management took a conservative stance on service delivery innovation and chose an e-Government path that was proven elsewhere.

DMV began the DMV e-Government initiative in a somewhat tolerant external environment in 2002. There was no legislated imperative directing DMV to develop and

implement Internet services, nor was there an externally imposed launch deadline. The narrowly–defined scope (an electronic delivery channel for two existing services and minor changes to associated manual work processes) and modest approved budget ($817,000) attracted little attention from authorities outside DMV, and did not attract special oversight or scrutiny by the OTC or the Oregon Legislature.

5.2.3 Definition of DMV e-Government Service Delivery Improvements

The objectives and scope of the DMV e-Government Applications Project were defined through a systematic process to select the best opportunities to improve customer service and to create workflow efficiencies. An Internet Opportunity Evaluation (OE) evaluated 11 DMV existing products and services that were potential candidates for an e-Government service delivery channel. A volume and benefits analysis suggested that Address Changes, Trip Permits, ID cards and Driver License duplicates had the greatest potential return on investment. Vehicle registration renewals and address changes were the highest volume transactions, and would touch the most citizens.

User Council, the governance entity for IT-enabled change projects for DMV, accepted the Opportunity Evaluation report and requested feasibility studies on nine products and services. These feasibility studies evaluated the potential impact on work processes, employees, controls, policies, administrative rules, and inter-agency agreements. These studies considered the impact on DMV and ODOT legacy systems. Based on the studies, the e-Government Applications Project was commissioned, with four potential services: (1) Eligible vehicle registration renewals, (2) Individual address changes, (3) Personal driving record requests, and (4) Custom vehicle plates.

A DMV Project Manager was assigned to develop a Project Statement (similar to a Project Charter) that outlined the effort, organizational structure and resources to accomplish this. Based on this analysis, DMV decided to focus on the first two transaction types to enable residents to renew their vehicle registrations and to change their address of record for all DMV products and services. Using the impact and volume analysis from the feasibility studies, DMV began work on the Project with a clear idea of benefits to citizens and government. It was determined that the initial scope should exclude:

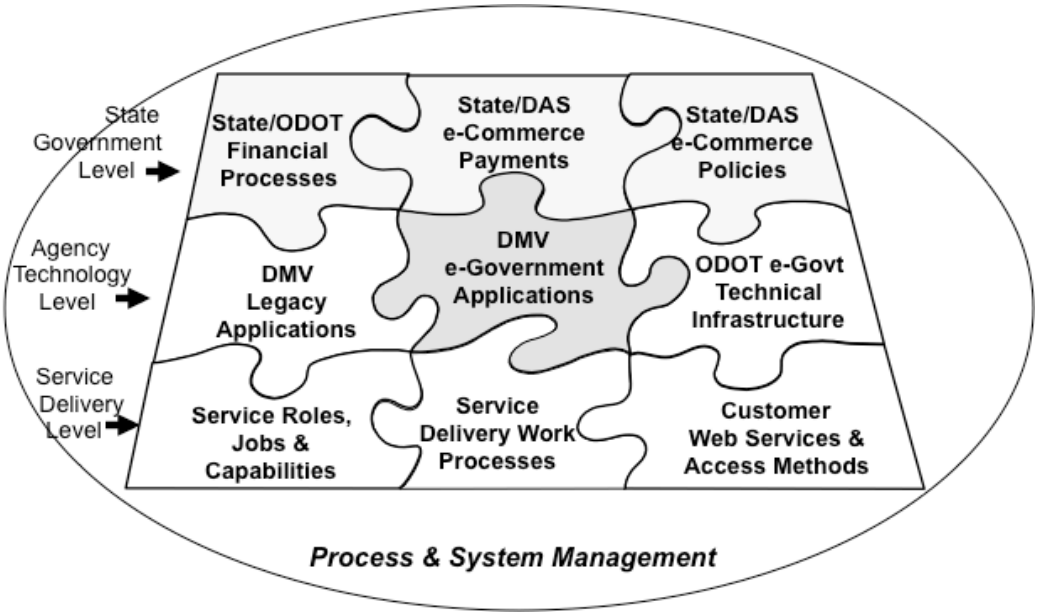
1. Information system interfaces with DEQ to obtain vehicle emission test results required for most vehicle renewals in the Portland and Medford metropolitan areas;
2. Acceptance of credit/debit cards for payments on transactions in DMV field offices;
3. Managing other Internet applications being implemented and maintained internally;
4. Vehicle registration renewals with plate transfers, DEQ certifications, or title action;
5. Change of addresses by businesses.

The initial scope was an integrated service delivery channel solution with new customer- facing processes and adjusted back office processes. DMV launched the Project to build a solution that contained not only new or enhanced IT components, but also new or modified work processes, procedures, data management, skills and knowledge to operate, maintain and support the solution.

5.2.4 The DMV e-Government Solution

The e-Government solution scope includes all components that are needed for a complete, integrated "business system" for vehicle registration renewals and individual changes of address.

Figure 5.1: Levels and Components of the DMV e-Government Solution



As illustrated above, the DMV e-Government solution can be represented by nine integrated components, supported by Process and System Management processes for e-Government. Following is a brief description of each component as designed, developed, and implemented.

Table 5.3: Description of Components of the DMV e-Government Solution

Solution Level	DMV Solution Component	Description
State Government Organizational Level	*State/DAS e-Commerce Policy and Standards*	State of Oregon policy requires credit or debit card payments for e-Government services to use a payment solution developed and managed by Department of Administrative Services (DAS). State Controller's Office sets policies, standards, and procedures to guide card usage for all State agency services, both where the card is present with the purchaser, and situations when neither is physically present (such as for an e-Government transaction).
	State/DAS e-Commerce Payment Solution	The DAS Payment Manager provides e-commerce functionality to link with the DMV e-Government web applications. Transactions over the Internet are facilitated by an interface between the DMV web-based vehicle registration application and the DAS e-Commerce payment solution, with links to State Treasury systems.
	State and ODOT Financial Processes and Systems	State/DAS financial processes capture and electronically transfer fees for vehicle registration renewals. Cash management uses existing clearing bank deposit and transfer mechanisms. ODOT Financial Services operates TEAMS accounting system to record vehicle registration transactions at a summary level. Web-based vehicle renewal payment transactions are recorded as though they were from a new DMV "Field Office". No changes to TEAMS code, only minimal table maintenance and a reconciliation report.
Agency Technology Level	*DMV e-Government Applications*	The core of the DMV e-Government "business system" is the web-based vehicle registration renewal and change of address applications. These applications were developed and hosted on the DMV mainframe under WebSphere, with an interface to the DMV vehicle and customer applications, which maintain official vehicle and customer identities. DMV e-Government applications are linked to the State e-Government portal and payment solution
	DMV Legacy Applications and Databases	DMV vehicle registration and titling system (VRS) and customer information system (CIS) are linked to the two e-Government applications. Modifications enable web applications to access VRS, CIS, vehicles DB/2 database and customer database.
	ODOT e-Government Technical Infrastructure	ODOT IS had planned an e-Government technical infrastructure for all ODOT web services, including architecture and standards for e-Government applications. Changes included ODOT's security protocol and mainframe configurations to support WebSphere, an upgraded version of DB/2, and other connectivity.
DMV Service Delivery Level	*DMV Customer Service Delivery Work Processes*	The e-Government solution changes two types of DMV processes. The web applications automate two customer service processes to form a new delivery channel. The second type of process facilitates and supports the new web applications. New validation and reconciliation procedures for vehicle registration renewals change the fulfillment process to complete a transaction. This new procedure reconciles "cash deposit" entries generated via the State Treasury, when deposits are transferred from the DAS Payment Manager, with issuance of vehicle registration validation stickers. Another change is to refund paid fees when an on-line registration renewal cannot be completed due to eligibility or logistical issues.

Solution Level	DMV Solution Component	Description
	DMV Service Roles, Jobs and Capabilities	New roles and changes in job designs in Processing Services and Customer Services Groups are integral to the solution. Processing Services responsibilities evolved from processing and fulfillment of mail-in renewals to encompass validation, reconciliation and exceptions for on-line channel. DMV customer assistance and support processes enable web-based transactions "around the clock". Customer Assistance manages customer contact as level 1 support for e-mail and telephone inquiry about Internet services. Internet telephone customer support is provided during normal DMV business hours. Customers are encouraged to e-mail questions to Customer Assistance, who endeavor to respond within eight working hours. Customer support involves a new process and working relationship with Information Systems Help Desk for DMV.
	DMV Customer Web Services and Access Methods	Eligible web browsers for customers to access DMV e-Government applications accommodate, and were tested with, a minimum of Microsoft Internet Explorer v5.5 and Netscape Navigator v4.75, in PC and Mac environments. These specifications covered most commonly used web browser versions at that time. DMV continues to be vigilant to ensure a balance between security levels required for customers to access DMV e-Government applications and web browser versions that support these security levels. DMV e-Government applications are compliant with standards under the American Disability Act, and transactions can be performed in multiple languages via browser translation
DMV e-Government Support Mechanisms	*Process and Systems Management*	This supports statewide adoption of the DMV e-Government solution. Roles include system ownership, system management, process management and document control. DMV's systems delivery management standard (Macroscope®) defines owner responsibilities for functional control of a system in production, and managing system functions to meet evolving business needs. Process management covers continuous improvement in work process designs and maintaining process maps, descriptions and procedures. DMV's document control process ensures integrity and currency of e-Government forms, templates and documents

5.2.5 Project Processes – How the Project was Carried Out

5.2.5.1 Project Governance Roles and Processes

Oregon DMV planned and performed the e-Government Project within an established framework for governing, managing and carrying out investments in information technology that enable process change (Oregon DMV IT Governance, 1999). Key roles in this governance structure are the *DMV Management Team*, *DMV User Council* (an ODOT Community of Interests entity), the *Project Steering Committee,* the *Project Executive Sponsor*, and the *Business System Owner*.

DMV Management Team was involved in key decisions prior to and during the Project. The Project Steering Committee met at least monthly during design, development and implementation stages. Due to the Project pace, Steering Committee delegated its decision-making role on most deliverables to managers and expert staff operating within the Project structure. User Council was consulted on and authorized major changes to scope, budget and schedule. User Council and Steering Committee received monthly reports on progress and status on business and IT aspects.

In accordance with DMV IT Governance policy, User Council appointed a member of the DMV Management Team – the Information Technology Services Group (ITSG) Manager - to take on the role of the *Project Executive Sponsor.* The responsibilities of this role included: forming the Project Steering Committee and chairing its meetings; acting as a Project advocate and champion; mentoring the Project Manager; monitoring the Project; providing guidance to the Project Team; and supporting requests to User Council for resources and funding.

The Customer Services Group Manager was the 'de facto' *Business System Owner*, supported by the Processing Services Group Manager, whose work processes and people were to be most affected by the e-Government solution. Both Service Groups had knowledgeable managers with governance roles on User Council and the Project Steering Committee. As Business System Owners, they were involved in solution design details and organizational change preparations.

5.2.5.2 External Quality Assurance and Risk Assessments

Under State of Oregon Policy, administered by Department of Administrative Services (DAS), specified Information Technology projects, especially those which cause change to program or service delivery within State agencies, are subject to periodic, independent, third-party quality assurance reviews and risk assessments.

DAS and DMV selected SPT Consulting Group (SPT) to provide quality assurance and risk assessment services for DMV's e-Government Applications Project lifecycle, starting with a review of a Request for Proposals for applications development. SPT produced several reports, which contained Quality Assurance (QA) Review findings and Assessments

of Project Risks and Agency Risk Management Progress, during the period from late 2002 until November 2003. These Quality Assurance Reviews and Risk Assessments used industry, State, ODOT and DMV standards for IT-enabled change project performance to address four main areas of interest, concern and risk:

- What did DMV set out to accomplish: purpose, expected outcomes, scope and objectives?
- How did DMV and Information Systems (IS) carry out the Project, in terms of governance, solution delivery processes, requirements management, solution design, architectural compliance, technical aspects, project management, human resource management, competencies, and stakeholder engagement?
- What was the level of preparedness for DMV Service Groups and IS to implement, adopt, and assume responsibility to operate, support and maintain the e-Government solution?
- What did the Project actually accomplish?

DMV was required to respond in writing to the findings and suggested mitigations from the QA reports. The reports were shared openly in Steering Committee and Project Team meetings and with the primary IT solution provider. The DMV Project Manager incorporated the risk factors from the external risk assessments into the Project Risk Management Plan and process to ensure visibility and management attention. In the e-Government Applications Project Closing Report (2004), DMV acknowledged the positive contribution of the Quality Assurance Reviews and Risk Assessment products, process and service provider to the success of the Project.

5.2.5.3 Project Management

DMV appointed to the role of the e-Government Project Manager, a DMV business-oriented manager, recruited from its line organization. Project management responsibilities included scope, schedule, budget and risk management of the Project entity and organization; the processes used to design, develop and implement product/solution content; and to some extent, the preparations for the people side of change in each affected Service Group. Although tested by a somewhat limited IT solution background, reports indicate that the DMV Project Manager forged a close working relationship with the Project Manager of the primary IT solution component provider, which facilitated collaboration and flexibility on both sides, in working towards common objectives.

5.2.5.4 Solution Delivery Model and Methodology

The e-Government Applications Project employed an IT solution component "turn-key" delivery model, supported by the DMV Applications unit in securing and managing the solution delivery. The solution was designed and developed using a hybrid systems delivery lifecycle (SDLC) methodology. The hybrid had a contribution from the phases and primary deliverables from the IT solution provider's preferred approach to web development – the Rational Unified Process® (RUP), a rapid application methodology, which involved use cases and iterative requirements and design. The overall Project was managed by DMV based on deliverables from ODOT/DMV's standard SDLC methodology, Macroscope®, which has a more sequenced waterfall structure. DMV and Covansys worked cooperatively to build an integrated approach that satisfied DMV's broader needs as well as delivery parameters of the applications provider.

The DMV e-Government Project organization was the entity with collective responsibility for design, construction and implementation of all solution components in the Service Delivery layer, such as new work processes, procedures and forms, as well as new and refined job roles. While technology suppliers provided browser tools for web access by customers, DMV was, and continues to be, responsible to ensure that customer needs are met. DMV was also responsible for developing organizational capacity, capability, and readiness of the Service Groups and their people, to accept and use the solution.

For the Agency Technology layer, DMV obtained system components from three separate organizational entities under design-build-test arrangements. DMV hired a web solution contractor to supply the e-Government web applications. DMV Applications unit was assigned responsibility to make changes to the DMV legacy vehicles and customer systems to accommodate integration with the e-Government applications. DMV secured technology infrastructure enhancements from ODOT IS e-Government and Technology Management.

For the State Government solution layer, ODOT Financial Services modified TEAMS and related financial processes; DAS e-Government and State Controller's offices supplied and configured the payment manager; and State Treasury adjusted cash management processes.

5.2.5.5 System Testing and Implementation

Business user acceptance testing, performed by the DMV business team, considered, and addressed, all facets of the change program. This was accomplished by desktop simulations and test cases, which covered not only typical transactions, but also those that were unlikely and would require a creative operational response from support personnel. The implementation strategy was a phased approach, wherein the solution was piloted in Deschutes County for period of three months before the applications were enabled for eligible customers throughout the State.

5.2.5.6 Project Team Structure and Roles

The Project Team to design, develop and implement the e-Government solution was set up as a temporary organizational entity, in accordance with DMV Information Technology Governance policy and processes. The Project Team structure consisted of the following sub-units and roles:

Table 5-4: DMV e-Government Applications Project Team Roles and Responsibilities

Role or Sub-Unit	Key Responsibilities
1. Business Lead & Team	Represent the solution-receiving units for the on-line service channel, and the new channel, itself.
2. Business Architect	Provides a business process perspective to technology projects by facilitating communication among business customers, users and IS
3. DMV System Manager	Responsible for performance of DMV's existing systems and focused on long-term system durability, usability and benefits.
4. Technology Lead & Team	Develop, operate and support ODOT e-Government infrastructure, including payment solution connectivity and system security.
4a. System Architect	Defines and documents a unified vision of the integrated information system for vehicle registration renewal and customer address change.
4b. Data Architect	Ensures integrity and transferability of the data needed or supplied by e-Government applications.
4c. Technical Architect	Designs and ensures technical integration and security of web services, legacy systems connectivity, and payment manager.
5. ODOT IS DMV Applications Maintenance	Maintain and support for mainframe legacy applications, as well as the e-Government applications, going forward.
6. ODOT Financial Services Analyst	Ensures continued integrity of financial processes associated with settlement, reconciliation and ODOT corporate accounting.

5.2.6 DMV Organizational Environment for Change

This change dimension is concerned with the readiness, capability and capacity of participating organizational units to operate, support, and maintain their components of the DMV e-Government solution, and the necessary preparations for these changes.

5.2.6.1 Scope of Organizational Change Management

Three types of organizational entities were affected by changes introduced by DMV e-Government applications: individual customers who are the main recipients and beneficiaries of the solution; DMV Service Groups that use the solution in daily processing work; and solution support units in DMV, ODOT IS and DAS, who assist customers, and support web services, the payment manager and financial processes. As organizational change preparation, DMV assessed the impact of the e-Government solution on internal business and technical stakeholders, listed in Table 5-5.

Table 5-5: Stakeholder Impact of DMV e-Government Applications

Organizational Unit	Operational Role Summary	DMV e-Government Impact
DMV Customer Services Group	Provide information and support to customers for all DMV service channels	Owner for on-line service delivery channel; expanded information and support roles and mechanisms
DMV Processing Services Group	Vehicle registration renewal fulfillment and payment reconciliation	Work processes for fulfillment and reconciliation of on-line payments
ODOT IS - Technology Management and Security	Operate, maintain and support ODOT technical infrastructure, connectivity and security	Technical infrastructure to support eGov web access, payment solution connectivity and system security
ODOT IS – DMV Applications	Maintain and support DMV mainframe and client-server applications	Maintain and support DMV eGov applications and legacy interfaces
ODOT Financial Services	Ensure integrity of DMV settlement, payment reconciliation, and accounting processes and systems	Oversee settlement, reconciliation and accounting processes for DMV eGov applications
DAS e-Government Program Office	Develop and supply the e-Commerce payment solution for all State e-Government financial transactions	Manage and sustain State payment solution to meet DMV availability standards
State Controller and Treasurer	Ensure eGov solution conforms to State financial processes and standards	Expanded financial audit scope to include new DMV delivery channel

5.2.6.2 Organizational Capacity, Capability and Readiness

During the implementation phase, an independent assessment explored the readiness of each of these organizations and their processes to ensure that their solution component(s) or support service(s) would operate as DMV and its customers expected. The assessment confirmed the adequacy of preparations for change and/or helped to facilitate additional preparatory actions.

Because this represented DMV's entry into dynamic Internet-based service delivery, the organizational readiness assessment included a review of preparations to ensure that DMV had equipped customers with access capability, information, and support to properly use the channel. Readiness and capability were tested through a pilot implementation with

residents of Deschutes County. Frequently Asked Questions (FAQs) supplied knowledge for customers to use the service.

5.2.7 Project Results Achieved

It is reported that the DMV e-Government Applications Project achieved the following goals and objectives, which apply to both e-Government applications that were selected:

- The solution provides DMV customers with the capability to complete certain DMV transactions via the Internet, 24 hours a day, and 7 days a week.
- E-Government applications design enables customers to have satisfying experiences.
- The e-Government applications were developed in collaboration with DAS and ODOT IS to ensure compliance with established information technology standards and practices.
- The e-Government applications conform to DMV system performance and availability standards to ensure customers have access to the service when needed.
- The e-Government manual work processes that support the new delivery channel better utilize existing field office and headquarters staffing resources.

The DMV e-Government solution was successfully piloted for residents of Deschutes County in January 2004. Using lessons from the Pilot, in March 2004, DMV implemented the solution for eligible customers in other counties, except Clackamas, Multnomah and Washington and the Rogue Valley. A subsequent system release extended the eligibility option to these other areas in 2008.

5.2.8 Benefits Realization

The DMV e-Government delivery channel has now been operational for more than a decade. Customer adoption rates for the new delivery channel began to consistently achieve the Project target of 15% of total renewals statewide by early 2008. A news release (Oregon DMV 2014), reports that vehicle registration renewals using the web has totaled 2.4 million since its inception.

5.3 Observations and Synthesis of Findings

The purpose of the ICLM is to provide a tool that can be used to discover and understand factors, conditions, and practices that are prevalent during the lifecycle of successful IT-enabled public services initiatives. This research question was advanced:

How are successful information technology enabled public services change initiatives governed, managed and performed?

This section presents findings from the evaluation of the ICLM with respect to the Oregon DMV e-Government Applications Initiative. Findings are presented in accordance with the structure of the ICLM – by Change Lifecycle Stage and Change Dimension.

Table 5.6: Number of Findings for Each Lifecycle Stage and Change Dimension

Chapter Section	Lifecycle Stage or Change Dimension (Identifier)	Number of Findings
5.3.1	DMV Policy and Strategy (DS)	**Three**
5.3.2	Definition of e-Government Public Service Improvement (DI)	**Three**
5.3.3	DMV e-Government Solution Content (DC)	**Four**
5.3.4	DMV e-Government Project Processes (DP)	**Twelve**
5.3.5	DMV Organizational Environment for Change (DO)	**Four**
5.3.6	DMV e-Government Project Results Achieved (DR)	**One**
5.3.7	DMV e-Government Benefits Realization (DB)	**Three**
5.3.8	Multi-Stage Project Findings (DM)	**Three**

5.3.1 DMV Policy and Strategy

Three findings pertain to the policies and strategies employed to direct and govern the DMV e-Government Applications Project, and the broader e-Government Initiative.

DS.1 DMV effectively utilized established IT and Project Governance policies and processes.

Oregon DMV planned and performed the e-Government Applications Project within an established framework for governing, managing and carrying out IT investments that enable change (Oregon DMV IT Governance, 1999). Key roles in the governance structure are *DMV Management Team*, *DMV User Council* (an ODOT Community of Interests entity), *Project Steering Committee, Project Executive Sponsor*, and *Business System (Solution) Owner*.

There is evidence that DMV management strongly supported the *DMV from Home* Initiative, and the e-Government Applications Project. Management Team was involved in key business decisions throughout the Project. Steering Committee met at least monthly

throughout the delivery stage. User Council was consulted on, and authorized, changes to scope, budget and schedule.

DS.2 DMV established a Project Executive Sponsor role with clear responsibilities and authority over the entire Project and all change dimensions.

In accordance with DMV IT Governance policy, User Council appointed a member of the DMV Management Team – the Information Technology Services Group (ITSG) Manager - to take on the role of the *Project Executive Sponsor.* The responsibilities of this role included: forming the Project Steering Committee and chairing its meetings; acting as a Project advocate and champion; mentoring the Project Manager; monitoring the Project; providing guidance to the Project Team; and supporting requests to User Council for resources and funding. Responsibilities associated with this role commenced with the commissioning of the e-Government Applications Project.

DS.3 DMV established a Business System Owner role with clear responsibilities and authority for the e-Government service delivery channel solution.

Although the *Business System Owner* role is a standard in DMV's IT Governance structure, business ownership responsibilities were more extensive than usual for e-Government applications. SPT Consulting noted in its initial Project Quality Assurance and Risk Assessment report that,

> "Responsibilities of business ownership will be more extensive for the e-Government applications, since DMV has not yet determined how it will organize to deliver and support electronic customer self-service transactions." (February 2003, p. 14)

Subsequently, SPT reported (May 2003 p. 17) that,

> "A profile of the e-Government Business Owner role and responsibilities has been developed and the Manager, Customer Services has taken on the role. He has demonstrated a particular interest in the organization and job level aspects of the Internet service delivery channel."

DMV developed a profile of the e-Government Business Owner role and responsibilities. Using this, the Customer Services Group Manager became the 'de facto' Business System Owner, supported by the Processing Services Group Manager, whose work processes and people were to be most affected. Both managers were involved in solution details and organizational preparations.

5.3.2 Definition of DMV e-Government Public Service Improvements

Three findings cover definition of public service improvements targeted by the DMV e-Government Applications Project, and establishment of the e-Government Project Team.

DI.1 DMV systematically refined the scope based on potential service improvements

The scope of e-Government Applications was refined by evaluation of opportunities among DMV products and services to improve service delivery and efficiency. The focus was to enable residents to renew their vehicle registrations and individuals to change their DMV address of record.

DI.2 DMV recognized a need and planned a comprehensive service delivery solution.

From the outset, the objective was to design, create and implement an integrated service delivery channel solution with new customer-facing processes and adjusted back office processes. DMV recognized and planned for the reality that the solution would need to contain not only new or enhanced information technology components, but also new or enhanced processes, procedures, data management, and the knowledge and skills to operate, maintain and support the solution.

DI.3 DMV established a temporary organizational entity – e-Government Applications Project – to design, develop and implement the service delivery channel solution.

User Council commissioned the e-Government Applications Project, based upon four potential applications, and assigned a Project Manager to develop a Project Statement (Charter) that outlined the Project structure, effort and resources. Based on this, DMV decided to focus the Project on two services, established an official IT Project, and assigned responsibility to a Project Team.

5.3.3 DMV e-Government Solution Content

Four findings pertain to content characteristics of the DMV e-Government solution.

DC.1 DMV and its partner providers delivered a comprehensive business system solution for the initial scope of e-Government services.

Section 5.2.4 describes DMV's business system solution for e-Government services, which includes new or modified policies, customer service processes, back-office processes, customer support processes, procedures, and performance measures, in addition to the new web applications and their links to legacy DMV systems and the DAS payment manager.

DC.2 Customers have an option to execute much of the vehicle registration renewal and change of address processes independently, using a combination of their own technology and DMV's.

Prior to introduction of on-line services, DMV customers had to perform their part of each process manually. To do this they had either to appear in person at a DMV Field Office or DEQ Test Center (if applicable) or to use the post. Many customers saw these alternatives as inconvenient and time-consuming. The on-line option represents a shared responsibility between the customer and government and saves time and resources for both parties.

DC.3 The e-Government system is a transparent integration of IT components – web applications, DMV legacy systems and DAS payment manager.

As described in Chapter 5.2.4, the technology layer of the e-Government solution has, as its core, new web applications for vehicle registration renewal and individual change of address. These applications exchange data with the DMV Vehicle Registration System (VRS) and Customer Information System (CIS) to validate vehicle and customer identities. This occurs 'behind the scenes' while the customer is on-line. Once these validations have been completed in real-time, the customer is instructed to enter credit card payment details, which activates the payment system.

DC.4 Technical design was proven web development technology, stable DMV legacy applications and databases, and payment manager tested in Oregon government.

Lessons from experiences with previous IT-enabled change initiatives influenced DMV e-Government technology choices and decisions. The web development environment was an industry standard (at that time). DMV legacy systems had functioned properly for many decades, were Year 2000 compliant, and could efficiently exchange data with web applications. The payment manager was a tested Oregon State government environment.

5.3.4 DMV e-Government Project Processes

There are 12 findings that pertain to the processes used to manage the design, development and implementation of the solution in the DMV e-Government Project.

DP.1 DMV procured a well-qualified, web system developer to design and build applications to capture Oregon DMV business rules and service preferences.

DMV briefly considered hybrid Commercial off the Shelf (COTS) IT solution alternatives. In motor vehicles program areas, unique state laws and administrative rules usually inhibit use of COTS package IT solutions. Such solutions are often designed from, and imbed,

practices of other jurisdictions, which have different processes based on their laws and rules. Some external solution providers mistakenly proposed that they could easily transfer existing technologies and, with minor customization, use them as kernels for an Oregon solution. Ultimately, the Agency decided to engage a web system developer (Covansys) to build custom e-Government applications that would reflect existing and desired Oregon DMV processes, and could be integrated with DMV legacy systems and the payment manager.

DP.2 DMV recognized the need, then accepted and carried out the responsibilities of the overall information systems integrator for the e-Government solution.

A consequence of the multi-agency IT solution delivery model was that an *information systems integrator* was required to ensure that all components of the system solution were designed properly, built to specifications, tested in all aspects, and operated in accordance with Oregon administrative rules. DMV managers eventually recognized that *they*, rather than the primary IT solution component provider, needed to develop the capability and capacity to execute the responsibilities of this role to ensure the fit and compatibility of the technology components.

DP.3 DMV recognized the need, then accepted and carried out the responsibilities of the service solution integrator for the new delivery channel.

It is evident that the intention was always to create and implement an integrated service delivery channel solution with new customer facing processes and adjusted back office processes. DMV commissioned the Project on the basis that the solution would need to contain not only new or enhanced information technology components, but also new or enhanced work processes, procedures, data management, and the skills and knowledge to operate, maintain and support the solution. This required DMV to assume the role of a *service solution integrator* - to ensure fit and compatibility of technology components with service delivery processes, job roles, and organization.

DP.4 Project leadership established mechanisms for regular, structured discourse among IT and business solution provider staff.

Project leadership encouraged and set up mechanisms for regular and structured discourse among business solution owners, IT component providers, and representatives of solution operators, during the design, development and implementation stages.

DP.5 DMV appointed as Project Manager a business manager, not an IT Project Manager, to define and perform project processes and responsibilities for all change dimensions.

DMV recruited as Project Manager a DMV business-oriented individual from its line operations. Although tested by a somewhat limited IT solution background, the DMV Project Manager forged a close working relationship with the Project Manager of the primary IT solution component provider, which facilitated collaboration and flexibility on both sides in working towards common objectives.

DP.6 Project processes and responsibilities covered all change dimensions.

The scope of project management processes and Project Manager responsibilities covered the management of the Project entity itself; the tasks to design, develop and implement the solution content; and to some extent, management of the organizational preparations for the people side of change, in each affected Service Group. Implementation management covered technical and business process aspects of the solution. The Implementation Plan reflected a balanced view of what was needed in all change domains and well-rounded project management processes.

DP.7 DMV and IS built collaborative relationships among analysts and business users.

The Project employed an IT solution component "turn-key" delivery model, and benefited from the expertise of IS - DMV Applications in defining and managing relationships affecting the ODOT and DAS solution components. Informants also commented favourably on the collaborative working arrangements among business process analysts, systems analysts, and business users.

DP.8 DMV, IS and primary IT provider applied a hybrid solution delivery methodology.

The e-Government Applications Project used a hybrid systems delivery lifecycle (SDLC) methodology. Web development was organized by the phases and primary deliverables from the Rational Unified Process® (RUP), a rapid application methodology that involved Use Cases and iterative requirements and design, which was the preferred approach of the IT solution provider. The overall Project was managed by DMV based on deliverables from ODOT/DMV's standard SDLC methodology, Macroscope®, which has a more sequenced waterfall structure. DMV and the IT solution provider worked cooperatively to build an integrated approach that satisfied DMV's needs.

DP.9 DMV established structures and mechanisms to ensure that a quality solution was designed, built and implemented.

The DMV Project set up organizational structures and mechanisms to review and verify details of an integrated solution design, to monitor its development, to test the efficacy of the integrated system, and to implement the solution. The latter included an assessment of, and preparations for, the organizational capability, readiness, and capacity of the solution-receiving Service Groups and their people, to accept and use the solution.

DP.10 Responsibilities for design, development and implementation for all change dimensions were suitably distributed among business and technical teams.

The Project to design, develop and implement the e-Government solution was a temporary organizational entity under the aegis of DMV Information Technology Governance policy and processes. The e-Government Project Team structure had representation from all affected Service Groups, key stakeholders and all solution component providers. Responsibilities were assigned for project and task management; for solution architecture, design, development, testing and implementation; and for change preparations involving customers and affected Service Groups.

DP.11 DMV made the commitment, secured necessary capacity, and developed requisite expertise in assigning business resources for all change dimensions.

DMV assigned business resources to design, develop and implement business aspects of the e-Government solution as well as to define requirements, to develop test cases, and to perform user acceptance testing of the integrated information system. DMV made the organizational commitment to create necessary capacity by supplying dedicated managers and staff with experience on previous DMV IT-enabled change initiatives. Many of these people had been trained on DMV's IT Project approaches and methods, while others came with knowledge of the Oregon business rules for vehicle registration and address changes.

DP.12 Business user acceptance testing encompassed the entire service solution

Business user acceptance testing, performed by the DMV Business Team, covered all facets of change by using desktop simulation and test cases for typical transactions and for those that would require a creative operational response by support personnel. Acceptance included a walk-through of test transactions up to the point of issuing a renewal sticker. Processing Services tested and accepted secure pay and settlement reconciliation features.

5.3.5 DMV Organizational Environment for Change

Four findings apply to the organizational environment for the DMV e-Government Applications Project and the organizational preparations that were undertaken in response.

DO.1 DMV recognized the scope and nature of preparations for organizational change.

DMV assessed the readiness, capability and capacity of participating organizational units to operate, support, and maintain their components of the e-Government solution, and directed the necessary preparations for these changes. Three types of organizational entities were affected by the changes introduced by the DMV e-Government applications: individual customers, which were the recipients and main beneficiaries of the solution; DMV Service Groups, whose staff use the solution in their daily processing work; and solution support units in DMV, ODOT IS and DAS, who assist customers, and support the web services, payment manager and financial processes. As part of the preparations for change, the DMV e-Government Project Team determined the business and technical stakeholders that would be impacted in some manner by the e-Government solution and assessed the operational impact on those organizations. The assessment confirmed the adequacy of preparations for change and/or helped to facilitate additional preparatory actions.

DO.2 DMV managers identified potential issues of change readiness, capacity, and capability of individuals in affected units and proactively applied change management actions

DMV managers reported that the knowledge and skills to perform the new back-office work processes and modified roles in affected DMV Service Groups either already existed within the solution-receiving organizational units, or were developed and implemented as part of the Project. Fulfillment tasks under the new system were developed through quality training on processes and components that affect their work. Acceptance testing included a walk-through of transactions up to the point of issuing a renewal sticker. Processing Services tested Secure Pay and Settlement Reconciliation Program features of the payment solution and deemed them to be acceptable. DMV management was able to maintain stability within the solution-receiving units throughout the change lifecycle. This stands out in direct contrast to the unsuccessful DMV “Re-engineering Project”, where a major disruption to several Service Groups occurred just prior to implementation.

DO.3 DMV successfully piloted the new service delivery channel with selected customers before fully implementing the solution for all eligible Oregon residents

Because the change had Agency-wide impact and involved a new technical solution, DMV decided to employ a phased implementation strategy. The solution was piloted for customers resident in Deschutes County for period of three months, along with full back-office processing and customer assistance mechanisms. Facts were gathered and issues were identified and resolved. Then, DMV enabled the solution for all remaining eligible customers elsewhere in Oregon.

DO.4 DMV resolved potential issues with customer capacity and capability to use the e-Government system.

Because this represented DMV's entry into dynamic Internet-based service delivery, DMV helped to equip customers with access capability, information, and support to properly use the new channel. Customer capacity and capability were tested through the pilot in Deschutes County. Frequently Asked Questions (FAQs) as the web link and individualized e-mail responses supply much of the knowledge that customers need to use the service.

5.3.6 Project Results Achieved

DR.1 The e-Government Project achieved its goals and objectives for both services.

The solution gives DMV customers the capability to complete DMV transactions via the Internet, 24 hours a day, and 7 days a week. Customer surveys report that the solution design provides a satisfying experience. The e-Government applications conform to DMV system performance and availability standards, which ensure customers have access to the service when needed. Manual work processes that support the new delivery channel utilize Field Office and Headquarters resources efficiently. The e-Government applications are compliant with DAS and ODOT IS information technology standards and practices.

5.3.7 Benefits Realization

Three findings apply specifically to the stage where benefits and value are realized.

DB.1 Customer adoption rates for DMV e-Government applications attained targets.

The DMV e-Government delivery channel has now been operational for more than a decade. Customer adoption rates for the new delivery channel began to consistently achieve the Project target of 15% of total renewals statewide by early 2008.

DB.2 Existing DMV service delivery channels compete with on-line vehicle registration renewals.

The annual volume for on-line vehicle registration renewals has matured at slightly more than 20% of renewals from all DMV service delivery channels. Findings from recent customer service surveys indicate that the substitutability of the online channel for other alternatives is inhibited partly by existing laws and regulations, partly by customer procrastination, and partly by socially constructed choices. Table 5.7 summarizes characteristics of the four channels available for vehicle registration renewals and how they might affect customer decisions on which method best suits their needs.

Table 5.7: Comparison of DMV Service Delivery Channels for Vehicle Registration Renewal

Delivery Channel / ***Characteristic***	**DMV Field Office**	**Postal Service Mail-in**	**DEQ Emission Test Center**	**e-Government Online**
Availability	Regular DMV Business Hours	USPS Collection Hours	Regular DEQ Business Hours	Virtually 7 days & 24 hours per day
Customer Experience	Wait Times can vary unpredictably	Consistent, but delayed result	Wait Times can vary unpredictably	Immediate with FAQs & Help Desk
Eligibility	All Customers	Customers with Renewal Notice	Portland & Medford Residents with Renewal Notice	Customers with Renewal Notice & PIN on Notice
Payment Options	Cash or Check	Check	Cash, Check, Debit Card or Credit Card	Debit Card or Credit Card
Fulfilment Process Cycle	Depart with Sticker	Receive Sticker by Mail in 6-10 Days	Depart with Sticker	Receive Sticker by Mail in 3-5 Days
Legal Status	Immediately in Compliance	In Compliance upon Mail Receipt	Immediately in Compliance	In Compliance upon Mail Receipt
Average Share by Channel *(2013)*	33.0% State-wide	19.7% State-wide	26.9%, only for Portland & Medford	20.4% State-wide

The first factor is that environmental and motor vehicle laws require a vehicle located either in metropolitan Portland or the Medford area, which collectively account for 45% of Oregon residents, to pass an emissions test before its registration can be renewed. An inter-agency agreement between DMV and DEQ allows customers to renew their registration at a DEQ Test Center after their vehicle passes the emission test, and to pay for both transactions using a common commercial payment method. A DEQ agent then renews the registration and issues a sticker at the Test Center.

This enables the owner to demonstrate immediate compliance with motor vehicle law, which requires a current registration sticker to be displayed on the license plate. Customers

find this process more convenient than performing an on-line renewal themselves after a successful emission test, although the e-Government application supports this option. The convenience and effectiveness of the integrated DMV/DEQ channel has limited online channel adoption in emission test areas. The 2013 data confirms that approximately 60% of those eligible renewed at DEQ sites.

According to DMV records, the volume of renewals at Field Offices has held steady since the online offering was introduced. Customer surveys indicate a major factor is that a Field Office is 'an agent of last resort' for customers whose registrations expire imminently, or have expired, and who cannot wait for stickers to be mailed. Evidence suggests other factors that influence customers to visit a Field Office are: a need for social contact; a preference for personal service; a distrust of government-based technologies, especially involving payment data; and low computer self-efficacy.

DB.3 DMV is proposing financial incentives for vehicle registration on-line renewal.

DMV calculates the unit cost of a vehicle registration renewal by DMV staff at a Field Office at about $6 per transaction more than a renewal processed via the e-Government channel. DMV data indicates that the vast majority of on-line renewals are substitutes for renewal by mail, where DMV savings are only a few pennies per transaction. Customers do save the cost of a stamp, any check processing fees, and a possible journey to a mail outlet. As an incentive to use the electronic channel and to recover costs to the Agency and the State Highway Fund, DMV proposed to charge an additional $6 for a staff-processed vehicle registration renewal at a DMV Field Office.

5.3.8 Multi-Stage Findings

Findings that cover multiple change dimensions and/or multiple lifecycle stages are:

DM.1 DMV executed the e-Government Applications Project as a planned change using a lifecycle model that required deliverables for each change dimension.

DMV Management Team and User Council mandated that the e-Government initiative follow a change life cycle framework with decision gates at specified points of knowledge and progress. Early deliverables that led to decisions on scope and investment included business cases, feasibility studies, and an Opportunity Evaluation (OE). Approval of the OE channeled

subsequent project initiation work into DMV's standard System Delivery Lifecycle (SDLC) methodology, which prescribed sets of deliverables for the analysis, design, development and implementation of the information system and for project management. DMV established management checkpoints and approvals at the end of each SDLC phase, which the Project Steering Committee governed. The DMV standard SDLC methodology Macroscope® was used for the e-Government Project and solution content, but was augmented with web development documentation, such as use cases, as well as business process workflows, and organizational change preparation instructions.

DM.2 DMV appreciated challenges inherent in its internal organizational environment and took decisions and actions to mitigate the effects.

Informants and initiating documents indicate that DMV undertook the e-Government Applications Project with an appreciation of many technical, operational and organizational challenges that they would need to overcome, including:

- Risk adverse culture and apprehension about IT-enabled public services change prevailed throughout DMV and ODOT, a repercussion of the abandoned "Re-engineering Project".
- A policy that an agency that accepts credit card payments for an e-Government service must use the State e-Commerce payment solution standard. The payment solution had been piloted in three agencies, but DMV had higher demands in terms of transaction volumes and critical availability requirements.
- High levels of anxiety and potential change resistance among staff in the DMV Processing Services Group, which would be most affected by the e-Government solution, and had been adversely affected by the DMV Re-engineering Project.
- The absence of web-development capability in DMV Applications Development section, which is the primary system development and maintenance services supplier to DMV.
- Reliance on other sections in ODOT and DAS to design and deliver technical infrastructure needed for DMV's e-Government applications to be built and function correctly and reliably.
- The lack of flexibility in DMV's legacy vehicle and customer databases and applications.

DMV applied this knowledge to inform its decisions and, where possible, translate these challenges into actions in the determination of the e-Government solution content. This also led to adjustments to certain processes needed to deliver the solution, as well as additional organizational preparations needed for staff to accommodate the change.

DM.3 DMV acknowledged and responded effectively to potential quality deficiencies and risks from periodic external quality assurance reviews and risk assessments.

State of Oregon Policy requires periodic, independent, third party quality assurance (QA) reviews and risk assessments on Information Technology projects that change program or service delivery. These services were performed throughout the e-Government Applications Project life cycle, commencing with a review of Request for Proposals for applications development, through the Implementation stage. DMV appeared to respond effectively to most findings and suggested mitigations from the QA reports. The reports were shared openly in Steering Committee and Project Team meetings and with the primary IT solution provider. The DMV Project Manager incorporated risk factors from the external risk assessments into the Project Risk Management Plan and Process to ensure visibility and encourage management attention. In the e-Government Applications Project Closing Report (2004), DMV acknowledged the positive contribution of the Quality Assurance Reviews and Risk Assessment products, process and service provider to the success of the Project.

5.3.9 Summary of Evaluation Findings

Findings from the DMV Project were discovered, organized and presented according to the change dimensions and lifecycle stages from Integrated Change Lifecycle Model. The ICLM provides a longitudinal perspective from innovation strategy through to benefits realization. Findings were synthesized from participant-validated transcripts of individual interviews, documents from the Project and/or solution, independent assessment reports from external quality assurance reviews and risk assessments, and researcher notes both as a participant-observer during the Project era and as an independent observer for this study.

Governance and direction of the initiative was based on an established Information Technology Governance model and processes that DMV adapted this to the e-Government Project. Roles and responsibilities were defined for a Project Executive Sponsor and Business System Owner, which were assigned to DMV Service Group Managers.

DMV carefully studied what service delivery improvements were achievable before User Council commissioned the Project and set up the Project Team. The Team had responsibility for a complete public service delivery channel solution, not just an IT solution.

Findings pertaining to solution content are that the DMV e-Government service delivery channel integrates several technical solution components, each of which is supplied and supported by a different organization. Non-technical solution components are policies, customer service processes, back-office processes, user support processes, procedures and performance measures.

Several themes pertain to processes used to manage delivery of the integrated solution. DMV designed management processes, roles, and responsibilities to cover all dimensions of change, and accepted organizational accountability to perform as the overall *information systems integrator* for the e-Government technical solution. DMV also recognized the need to perform the role of *service solution integrator* for the new Internet-based service delivery channel.

For the organizational environment for change dimension, DMV recognized early in the lifecycle that there might be issues with the readiness, capacity and capability of participating Service Groups to handle the change. DMV managers identified potential organizational change impediments and were proactive in mitigating these risks. DMV also addressed potential customer concerns through a pilot implementation in one area of the State, testing of various customer web browser configurations, and customer-focused information and support.

In terms of results, DMV considers the e-Government Project to have achieved the goals and objectives for both implemented services. Customer adoption rates have reached target levels; however, in terms of benefits realization, customer behaviors have sustained the pre-eminence of in-person service at Field Offices over the self-service Internet channel.

Three findings extend across all lifecycle stages and change dimensions. First, DMV followed a planned change framework that required specified management decision gates, incremental knowledge assembly, and deliverables for all change domains. Second, DMV had an early appreciation of many technical, operational and organizational challenges to overcome. DMV used this knowledge to inform decisions and translate these challenges into actions that covered each change dimension. Third, DMV accepted and responded promptly and effectively to external assessments that identified potential quality deficiencies and risks.

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6. Case Study: ODOT Right of Way Information Tracking System

This Chapter applies the case study technique to evaluate the validity, utility, quality, and efficacy of the Integrated Change Lifecycle Model (ICLM) artifact for the Right of Way Information Tracking System (RITS) Project for the Oregon Department of Transportation. The Chapter begins with a description of the organizational setting for the study, followed by an assessment of the case against selection criteria that confirms its qualification for the purpose of Model evaluation. The narrative proceeds with a description of the case, which uses the Change Dimensions and Lifecycle Stages from the ICLM to organize the content. Section 6.3 documents findings from the evaluation as themes developed for each ICLM Dimension and Stage.

6.1 Case Study Organizational Setting

6.1.1 ODOT Right of Way Program Strategic Direction

The Right of Way Mission is timely and cost-effective acquisition of real property necessary for the improvement of Oregon's transportation system and to maximize the return on the Highway Trust Fund investment through management and sale of excess property.

The Vision of the Right of Way Program is to provide expertise in real estate and other right-of-way matters to Oregon Department of Transportation and to other state and local agencies. In cooperation with the Federal Highway Administration (FHWA), the Right of Way program implements *Public Law 91-646*, and the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970*. Right of Way is responsible for appraisal, acquisition, and management of property acquired for public projects. Right of Way also assists people and businesses to relocate from acquired property.

The Right of Way Program defines its core values as dedication to:

- Providing timely access to real property necessary for construction of transportation improvements and for maintenance of existing facilities.
- Ensuring that real property is acquired in conformance with the Fifth Amendment to the United States Constitution and Section 18 of Article 1 of the Oregon Constitution.
- Ensuring that persons required to sell land or to move because of the acquisition of their property are treated fairly, equitably, and humanely.
- Quality, excellence, and cost effectiveness in work processes.

- Open, honest, and professional dealings with employees, the public, user groups, the legislature, local governments, contractors, consultants, and other groups.
- Using entrusted public resources wisely and to protecting and enhancing those assets.
- Providing clear expectations and feedback, recognizing and rewarding performance, communicating important information and decisions, and providing a safe working environment.
- Providing employees with the resources and support necessary to do their job and reach their full potential.

6.1.2 Right of Way Program Organization

The Right of Way Program Section is part of the Highway Division, Technical Services Branch, of the Oregon Department of Transportation. The Section provides expertise in real estate and other right of way matters to the Department. In cooperation with the Federal Highway Administration (FHWA), the Right of Way Section implements Public Law 91-646, the Uniform Relocation Assistance and Real Property Acquisition Policies of 1970, as amended.

Right of Way Section is responsible for appraisal, acquisition, and management of property acquired for public projects. The Section assists people and businesses to relocate from acquired rights of way. The State Right of Way Manager is responsible for administering, directing and supervising the various programs that constitute the Right of Way mandate. The State Right of Way Manager represents ODOT in matters relating to Right of Way by appearing before legislative committees, various boards and commissions, as well as coordinating with other State agencies.

Right-of-way acquisition is delivered by the Operations unit at ODOT Headquarters in Salem, in cooperation with functional specialists attached to Highway Region Technical Centers located in Portland, Salem, Bend, Roseburg, White City, and LaGrande, Oregon.

6.1.2.1 Headquarters Right of Way Operations

At Headquarters, the Operations unit directs the Right of Way program elements essential to Project Delivery and to carrying out the goals and objectives of the Department. The Operations Unit administers program areas of project authorization and coordination, agreements, occupant relocation, appraisal review, performance measurements, quality assurance, title and escrow processing and closing services, contract administration and

payments. The Operations unit also manages condemnation case liaison in collaboration with Oregon Department of Justice (DOJ).

6.1.2.2 Region Right of Way Functions

Five Region Technical Centers are responsible and accountable for all non-central ODOT Project Delivery. Right of Way units in these Centers acquire right of way in coordination with the construction program. Liaison, appraisal, negotiation, and relocation are carried out under direction of the Region Right of Way Managers. Senior Right of Way Agents serve as Right of Way Project Managers within each Region Office. They represent the Region on project development and oversee, coordinate and manage the right of way process life cycle on assigned Projects.

Right of Way Agents prepare appraisals to establish fair market value of properties needed for right-of-way, maintenance, and/or park facilities. They negotiate purchase and acquisition of right-of-way and are involved in relocation of persons who occupy properties that have been acquired. Right of Way Agents perform property management duties, which include renting, leasing or sale of surplus properties, demolition and site clean-up, auctions, salvage and salvage appraisal.

6.1.2.3 Other Right of Way Programs

Program Management is responsible for Property Management, Outdoor Advertising Sign Program, Access Research, and Railroad and Utility Relocation Programs. These areas generate $10 million per biennium in property management revenues and ensure that over $30 million annually in federal funds continue from an effective Outdoor Advertising Sign Program.

6.1.3 Right of Way Business Processes

The Right of Way Business Process Structure (2013) defines the Right of Way Program mandate in terms of the following functions and business processes.

Table 6.1: Right of Way Functions and Business Processes

Program Mandate	Function	Right of Way Business Process
Property Acquisition	Project Initiation	1.4.4 Project RW Scoping & Preliminary Estimation 2.1.4 Inter-Governmental RW Services Agreement 2.3.4 Design Alternatives Needs, Impact & Cost 2.4.1 RW Project Definition & Liaison 2.4.2 RW Property Definition & File Set-up
	Project Approval	2.4.3 Right of Way Programming Estimation 2.4.4 Right of Way Project Authorization 2.4.5 OTC Resolution Reporting
	Acquisition Conveyance	2.4.6 Office Title Reporting 2.4.9 RW Acquisition Conveyance Documents 2.4.16 RW Acquisition Closing Process
	Negotiated Compensation	2.4.7 Right of Way Property Appraisal 2.4.8 Property Appraisal Review & Just Compensation 2.4.10 Offer, Negotiation & Acquisition 2.4.11 Occupant Relocation & Relocation Review
	Adjudicated Settlement	2.4.12 Alternative Dispute Resolution 2.4.13 Right of Way Condemnation
	Project Delivery	2.4.17 Right of Way Certification 2.4.18 Project Related Property Management 2.4.19 Right of Way Project Management
Other Right of Way Programs	Non-Project Related Property Management	5.1.1 Property Research and Classification 5.1.2 Surplus Property Declaration 5.1.3 Surplus Property Sale Authorization 5.1.4 Surplus Property Marketing & Sale 5.1.5 Property Lease, Rental or Permit, as Landlord 5.1.6 Property Sale/Lease Conveyance & Closing 5.1.7 Property Management Accounting & Reporting
	Outdoor Advertising Sign Program	5.4.1 Outdoor Advertising Sign Permit Application 5.4.2 Outdoor Advertising Sign Permit Maintenance 5.4.3 Outdoor Advertising Sign Permit Enforcement
	Access Research & Maintenance	5.5.1 Grants of Access 5.5.2 Indentures of Access 5.5.3 Conveyance of Access

This numbering scheme for the Right of Way business processes is derived from the ODOT *Project Delivery Lifecycle Model* (2010), which defines four stages of Project Delivery, with a fifth stage for Infrastructure Operations and Maintenance.

6.1.4 Previous Right of Way IT-enabled Change Experience

In early 2005, ODOT initiated the Right of Way Data Management System (RWDMS) Project to scan ODOT right-of-way files, maps, contract plans and some general files. This action was intended to develop a centralized document database of ODOT property information. As a result of the successful completion of that initial phase of the RWDMS, ODOT currently stores right-of-way document content in FileNet, a web-based Enterprise Content Management (ECM) suite of tools.

In January 2008, Right of Way launched the next phase of the initiative - Right of Way Acquisition Process Streamline (RWDMS-APS). This development sought to leverage momentum generated by the initial RWDMS phase, and build upon the technical infrastructure deployed, to further streamline and automate key Right of Way Acquisition processes. As work progressed on this scope, an opportunity was introduced to acquire a Commercial-off-the-Shelf (COTS) solution that had the potential to automate all Acquisition and Property Management processes. The re-envisioned effort became known as the Right of Way Information Tracking System (RITS) Project.

6.2 Case Description

6.2.1 Criteria and Selection of This Case Study for Evaluation

The Right of Way Information Tracking System (RITS) Project was undertaken to improve the processes and replace the information systems that are used to acquire and manage property needed for Oregon state highway improvements under the authority of the Oregon Department of Transportation (ODOT). Selection of this case for evaluation of the ICLM is based on an assessment of the case circumstances against multiple criteria.

As the research focus is successful public services change, the selected project must be complete and be judged by organization leaders to have achieved its stated purpose and objectives. A second criterion is that information technology is indispensable to the change solution and is fully integrated within applicable public services processes. A third selection criterion is the supply of comprehensive, publicly available documentation of change initiative aims, solution, conditions, processes, deliverables and results, usually from by a document-intensive solution delivery methodology. A fourth criterion is availability of information and

access to interviewees and documents throughout the entire change lifecycle.

Table 6.2 summarizes an assessment of properties of this case against these criteria.

Table 6.2: ODOT Right of Way Tracking System Case Assessment and Selection

Dimension	Case Assessment & Selection Criteria	ODOT RITS Assessment
Organizational Environment	• Multiple change initiatives to choose from • Program area offers opportunity to transfer conclusions/management recommendations • Researcher has access to documentation and informants • Public disclosure laws facilitate data availability	• 10+ ODOT change initiatives • Transferable to 50+ equivalent program areas • Documents and informants accessible • Oregon disclosure laws
Project Results	• "Successful" change initiative • Demonstrated improvement to program or service • Completed, tangible changes are evident	• Judged a success by ODOT • New processing standards • RITS operational; RAIN & PMI are de-commissioned
Solution Content	• Projects with IT-enabled change ambitions • IT innovation or innovative use • Organization-wide impact of change • Holistic change to public services system • Affects multiple public service processes	• Level 3 change ambition • Innovative use for ODOT • Affects entire program area • Multi-layer solution • Affects 15+ processes
Project Processes	• Planned change delivery mode • Initiative/project organizational entity exists • Project/solution documentation intensity	• Meets planned change criteria • RITS Project entity • SDLC/process documentation

The following sub-sections of this report use the five stages and three change dimensions of the Integrated Change Lifecycle Model to describe the RITS Project.

6.2.2 Public Policy and Strategy

6.2.2.1 An Innovative Change Opportunity

Right of Way property acquisition processes are on the critical path of the ODOT Project Delivery Business Line. Delays can have significant negative cost impacts for ODOT construction projects. In addition, the Oregon Legislature had directed Right of Way to be more transparent and make information about ODOT-owned property available to the public.

The opportunity to exploit an innovative use of technology through a web application was introduced to Right of Way leadership at a favorable juncture. At that time the organization was exploring ways to modernize its property acquisition operations, which would enhance its contribution to ODOT Project Delivery and respond to Oregon Legislature requests for paperwork reduction. The strategy was process streamlining through the innovative use of information technology. Right of Way obtained funding for this initiative from the Oregon Legislature through a Policy Option Package (POP).

6.2.2.2 Purpose and Expected Outcomes

In the Project Information Resource Request (January 2010), the business case justification submitted to secure approval from the DAS Information Technology Project oversight authority, the State Chief Information Officer (CIO), reported:

> "The RITS Project aligns well with ODOT's business strategies and plans and should be considered a priority project for the following reasons: (1) Providing improved public access to ODOT property information can result in incremental revenue…from the lease or sale of properties, which are considered excess. (2) Improving public access capability…will help ODOT to meet on-going requests from the Oregon Legislature to provide…transparency of property information. (3) …to streamline RW acquisition and property management processes will help eliminate delays in information flow and reduce the risk of causing an impact to, or a delay in, ODOT project delivery."

The purpose and expected outcomes defined for the Right of Way Information Tracking System (RITS) Project were: (1) to streamline and automate key right-of-way processes; (2) to electronically capture and manage right-of-way program content (i.e., data and documents); and (3) to replace "in-house" built application systems that support primary program areas – Right of Way Acquisition Information Network (RAIN) and Property Management Inventory (PMI).

6.2.2.3 Business Drivers of Change

An additional business driver for Right of Way leadership and the RITS Project was to support a concurrent reorganization and right sizing of the Right of Way Section. Another driver was to advance the Highway Division Technical Leadership Center vision of information and document sharing across technical disciplines. A third driver was to ensure that the Right of Way business processes, as they are documented and performed statewide using a common information system, are compliant with all state and federal laws, rules and regulations as guided through U.S. Public Law 91-646, The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (Uniform Act).

6.2.2.4 IT Investment Governance Policy

As the IT investment for RITS exceeded the threshold of $0.5 million, the RITS Project required approval of the State Chief Information Officer (CIO) and was subject to the IT governance policies and scrutiny of Department of Administrative Services (DAS), Information Resources Management Division (IRMD). Agency information requirements

under this policy are: a State of Oregon *Information Resource Request*, a *Cost-Benefit Analysis*, and a *Business Case/Feasibility Statement*. This policy also stipulates a requirement for periodic external quality assurance reviews and risk assessments of the Project and solution.

Within ODOT, Right of Way and Transportation Applications Development (TAD) initiated the pursuit of the RITS innovation within an established framework to govern, manage and implement information technology solutions. Key roles in this governance structure are *Transportation Community of Interests (COI) Council*, the *Project Steering Committee*, the *Project Executive Sponsor*, and the *Business System (Solution) Owner*.

6.2.3 Definition of Public Service Improvements

6.2.3.1 Public Services Targeted for Improvement

The first set of services targeted by the RITS Project was the entire life cycle of right-of-way property acquisition, starting with preliminary scoping of the transportation problem and opportunity during preparations for the State-wide Transportation Development Program (STIP). The acquisition cycle concludes many years later when right of-way obligations are discharged after construction is completed. At this point, property acquired is turned over for property management, which explores possibilities for lease or sale of property that is considered excess by the Department.

When the RITS Project was re-formulated in late 2008, the Project Steering Committee authorized pursuit of a solution to streamline most of the 20 processes that might be performed to acquire property as construction right-of-way and the seven processes used to manage the resultant property portfolio. This would improve service delivery to the ODOT Project Delivery Business Line, property owners, occupants, and prospective property purchasers. A second area of emphasis was to improve process and workflow efficiency within the Right of Way organization.

6.2.3.2 RITS Project Scope and Objectives

According to initiating documentation, these RITS Project Objectives were committed to the COI Council by the System Owner and the Project Steering Committee.

- Provide a comprehensive system that allows for right-of-way acquisition, tracking and management of property rights.

- Streamline key, high-value, and return on investment (ROI) aspects of right-of-way acquisition and property management processes.
- Provide efficiencies through the reduction of redundant entry by allowing document and data entry as close to source as possible, and through automated notifications, reviews, and approvals.
- Retire the legacy RAIN (Right of Way Acquisition Information Network); and PMI (Property Management Inventory) systems, and other redundant systems.
- Provide support for Asset Management goals of the Department from the perspective of real estate asset information.
- Enhance system access for Right of Way consultants, so that they can enter data on their project activities. This will reduce duplication of effort and improve review processes.
- Establish Taxonomy for Right of Way content and integrate with ODOT Taxonomy.
- Provide increased public access to information about ODOT-owned property.
- Improve the Right of Way Geographic Information Systems (GIS) search capability by providing enhanced, user-friendly capabilities.

Within this context, the RITS Project was to create a sustainable Right of Way business system solution that provides access to Right of Way documents and data, while enabling continuous improvement in the quality of these documents and data and the business processes that require them. The RITS Project was expected to create business process changes for the Right of Way Business Line and its stakeholders. The intent is that these business processes would be designed to be performed consistently statewide and would rely on top quality documents and data. Upon conclusion of the RITS Project in 2015, achievements were reviewed and compared to these original objectives.

6.2.3.3 Business Case Justification

The State of Oregon Information Resource Request for RITS (January 2010) states that the anticipated benefits of the solution features would be:

- Time savings and fewer ODOT construction cost increases by capturing content electronically.
- Improve efficiency and effectiveness of public access to information about ODOT-owned property, which would also result in better service to the public.
- Reduce data errors by allowing RW consultants to directly utilize the application.
- More timely access to RW project documentation by all authorized staff.
- Improved access to land parcel information during and after acquisition process.
- Improved ability to share information within the program and with other technical disciplines.

6.2.3.4 Assessment of Internal Environment

The Information Resource Request and Strategic IT Investment Management Briefing (January 2010) identify internal risks that pertain to project execution. Risks were raised concerning the lengthy contracting process, the need to coordinate those efforts with DAS and Oregon Department of Justice (DOJ), the impact on schedule attainment, and consequences to the scope that could be accomplished. A secondary concern was organizational impact of enhanced capability to support public inquiries.

Based on a successful initial phase of RITS (RWDMS), ODOT concluded that,

> "A number of success factors are in place, including: strong executive support and strong business leadership; a governance structure designed to obtain input and participation from key stakeholders; a well defined project scope; ODOT staff with prior FileNet ECM product experience; a dedicated business lead for the project; and a strong project manager with an ECM and RWDMS Phase 1 background."

6.2.3.5 Establishment of RITS Project Organization Entity

In 2008, the Right of Way program and Transportation Applications Development section established the RITS Project as a temporary organizational entity to produce and implement the Right of Way Information Tracking solution. Time tracking, cost accounting and budgeting mechanisms were put in place to enable Project controls. This was in accordance with ODOT Information Technology Governance policy and processes under the aegis of the Transportation Community of Interests (COI) Council. The RITS Project organization entity remained in effect until Project completion in late 2015.

6.2.4 Right of Way Information Tracking Solution Content

Delivery of improved Right of Way services involves three dimensions of change: the *content of the change* to the business system, *processes or methods* that deliver the change, and the *organizational environment* in which change occurs. The first sub-section focuses on content of the change – the business system solution, which is enabled by RITS technology.

The RITS scope is all components needed for an integrated "public services system" for redesigned or incrementally improved property acquisition and management processes. Figure 6.1 illustrates RITS solution content components, supported by Process and System Management. While each component is defined separately, many are inter-dependent. For example, *processes* define requirements for *information* and *program roles and capabilities*.

Figure 6.1: Levels and Components of the Right of Way Information Tracking Solution

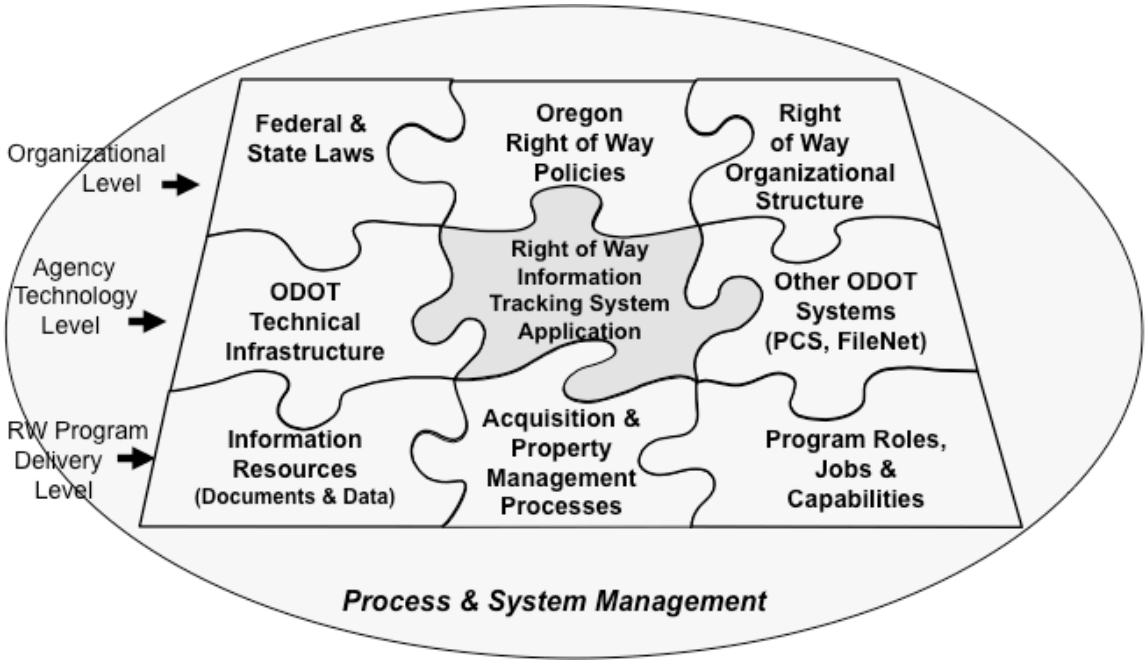


Table 6.3: Descriptions of Right of Way Information Tracking Solution Components

Level	RITS Solution Component	Description
Organizational Level	*Federal and State Laws*	Federal Uniform Act governs Right of Way program. RITS has no impact on Federal law. RITS objective is to improve Oregon program compliance with this Act and transparency of ODOT acquisition processes subject to federal scrutiny. RITS is to ensure compliance with Oregon law for property appraisals and occupant relocation practices.
	Right of Way Policy and Standards	Right of Way policies and standards based on RITS enabling right-of-way acquisition and property management processes. Specifies policies that will change and appropriate mechanism for making these changes. Includes revisions to Oregon Right of Way Manual, main source of policy and authority. Technical Service Bulletins, Advisories and Guidance communicate changes to Right of Way policies, standards, procedures, roles and responsibilities.
	Right of Way Organizational Structure	Right of Way roles are subject to revision with RITS used to perform acquisition and property management processes. Includes delegation of Right of Way process authorities, assignment of system task authorities, and changes in reporting relationships.
Agency Technology Level	*Right of Way Information Tracking Application System*	RITS is a web-based integrated application. RITS is a modified web-based integrated COTS package (FlairDocs), for property acquisition and property management, using Microsoft SQL Server. All access to the RITS applications is through a web-browser, tuned to perform most effectively.
	Integration with Other ODOT Systems	RITS is technically integrated with ODOT's Enterprise Content Management System (FileNet), the Project Control System (PCS), Transportation Infrastructure System (TransInfo), Financial System (TEAMS) and Human Resources System (DEHR). Integration of these external systems with RITS may impact their processes.
	ODOT Technology Infrastructure	RITS applications and databases are hosted on a clustered SQL Server located at the State of Oregon Data Center (SDC). External access to RITS uses VPN technology. Application authenticates external users and authorizes appropriate application roles.

Level	RITS Solution Component	Description
Right of Way Program Delivery Level	*Right of Way Acquisition and Property Management Processes*	Enables Right of Way organization to adopt and effectively use RITS by understanding how the system affects right-of-way acquisition and property management work process performance. To-Be documentation identifies content for Right of Way procedure guides and desk manuals.
	Right of Way Information Resources	Comprises the structured and unstructured forms of controlled information - data stores and documents - created, modified or used by RITS, office productivity tools, or manually, during execution of the acquisition and property management processes.
	Right of Way Roles and Responsibilities	Specifies the design of how roles and responsibilities are changing due to use of RITS. Captures these changes in accordance with ODOT/Right of Way administrative practices, and defines the expectations of each role. Process maps and documentation detail responsibilities for Right of Way staff to use RITS and how these have changed from prior practice. May result in changes to Right of Way Position Descriptions. Identifies education and training needs.
Right of Way Support Mechanisms	*Process and Systems Management*	Right of Way Business Systems Management (BSM) long-term function, processes and standards. Expertise needed for BSM: system management, systems administration, business process management, data administration, and document control. ODOT's information systems delivery standard (Macroscope®) defines owner responsibilities for functional control of system after it enters into production; and for managing system to meet evolving needs. Business process management aspects: work process designs for continuous improvement and sustaining process maps, descriptions and procedures. Right of Way document control process maintains integrity and currency of forms, templates and documents that used or created by RITS applications.

6.2.5 Project Processes – How the Project was Carried out

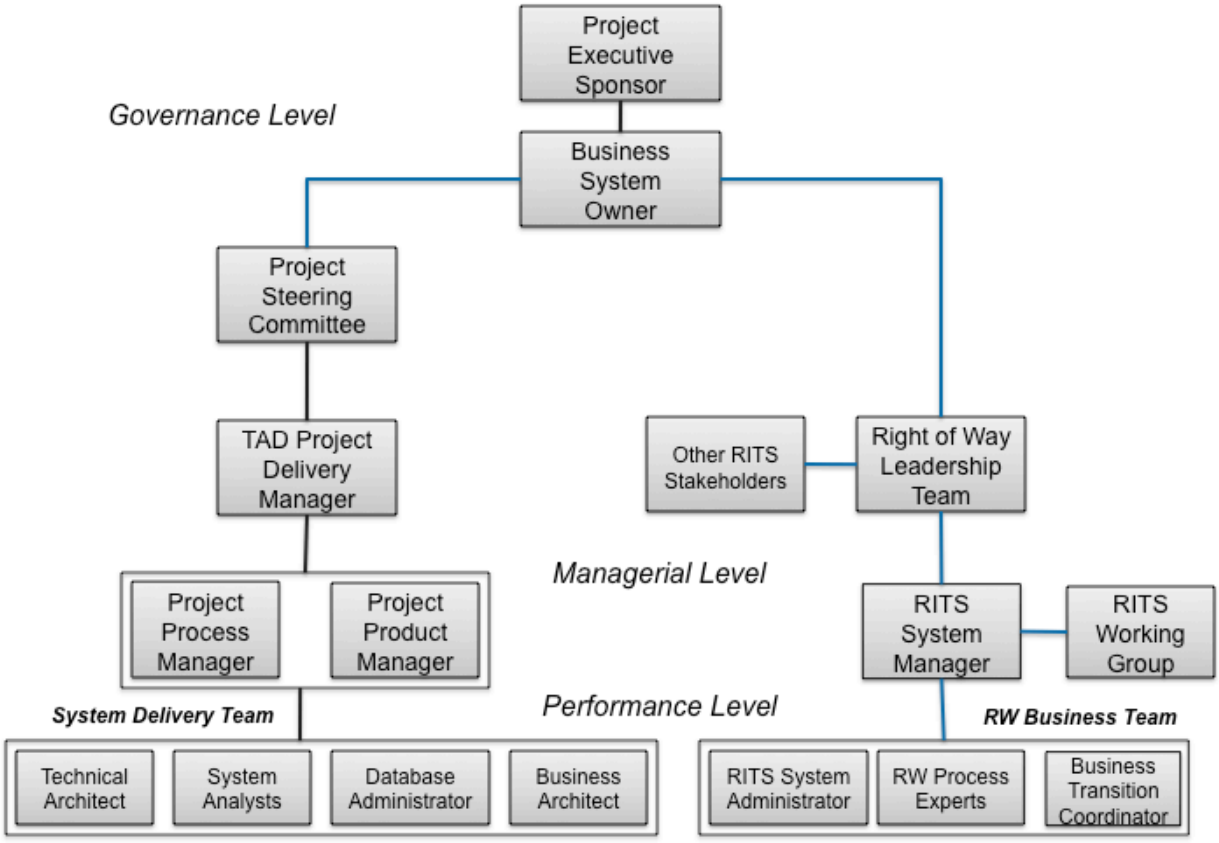
6.2.5.1 Project Governance Structure and Processes

Right of Way and Transportation Applications Development (TAD) planned and carried out the RITS Project within an established framework to govern, manage, and implement information technology solutions. Key governance roles are the *Transportation Community of Interests Council*, the *Project Steering Committee*, the *Project Executive Sponsor*, and the *Business System Owner.*

6.2.5.2 Project Organization Structure, Roles and Responsibilities

Right of Way and Transportation Applications Development established a temporary organizational entity, as illustrated in Figure 6.2, to produce and implement the RITS solution.

Figure 6.2: Right of Way Information Tracking System Project Organization



The RITS Project Statement (2011, 2013) delineates responsibilities for each role or sub-unit. The Project Statement defines review and approval responsibilities for all project management (prefix M) and solution product (prefix P) deliverables generated by the Project Team. In 2014, the Business Transition Plan and task assignments from that Plan led to expanded responsibilities in the Organization Environment for Change dimension for some of these roles and units. The Project organization evolved over time but largely comprised these sub-units and roles**:**

Table 6.4: RITS Project Organization, Roles and Responsibilities

Role or Sub-Unit	Authority	Key Responsibilities
Governance Level		
1. Project Executive Sponsor (ES)	State Highway Engineer Transportation COI Council	Provides strategic direction, advises on scope and IT investment decisions, and secures Project funding.
2. Business System Owner	State Right of Way Manager Chairs Project Steering Committee	Champions vision of future RW program and organization enabled by RITS. Represents overall interests of RW program by ensuring delivery of a quality solution that business accepts. Leads issue resolution. Responsible for RW mitigation response to external QA reports. Directs development and execution of RW Transition Plan.
3. Project Steering Committee (SC)	Business Owner, RWLT member(s), TAD Service Delivery Manager, TAD Project Delivery Mgr, other	Oversees Project, reviews Project status, resolves outstanding issues, provides overall direction for the Project, and oversees realization of benefits.

Role or Sub-Unit	Authority	Key Responsibilities
Managerial Level		
4. RW Leadership Team (RWLT)	Manage RW program centrally and in five Tech Centers of ODOT Highway Regions, operating within approved authorization from State RW Manager.	Provide input to business process streamlining and business requirements, to ensure the implemented solution meets needs of RW program areas, and to contribute to business-centric deliverables such as process models, system test plans, organizational change management, user manuals and training.
5. Other Stakeholders Group	RITS solution could impact stakeholders not directly tied to RW processes.	Focus on support and ODOT enterprise process or system integration. Escalates RITS issues to Working Group or Steering Committee depending on issue.
6. RITS Business System Manager	Member, Right of Way Leadership Team	Roles as defined in ODOT's standard IS Methodology: manage business team, confirm project requirements and operational feasibility of solution, and oversee business transition and implementation activities. Confirm As-Is process documentation and ensure To-Be descriptions and gap analyses reflect RITS. Set RW priorities for allocation of business resources among testing, implementation and transition.
7. RITS Working Group	Represents RW program areas with processes that may be affected by any technology solution.	Focus on impact of RITS on their business processes. Ensure that solution requirements, design, and implementation are acceptable to business. Resolve any issues or escalate to RITS Steering Committee.
8. TAD Project Delivery Manager	Member, Project Steering Committee	Reviews project progress and makes delivery decisions that balance business needs, resources and solution. May decide on issues, risks and change requests or escalate to SC. Maintains relationships with suppliers re: needs, schedules and products.
9. Project Process Manager		Responsible for project management processes (i.e., scope, quality, schedule, budget, communication, reporting, procurement, risk and issue management). Manage RITS Project entity; review and approval process for deliverables that capture the design, development and implementation of product/ solution content; and status reporting to project authorities.
10. Project Product Manager		Ccontrol product quality and delivery to ensure that RITS application is fully integrated with other ODOT systems, i.e., FileNet, TransInfo, and PCS. Manage conversion of data into RITS from RAIN & PMI.
Performance Level		
11. Technical Architect		Designs technical architecture of web-based capability to provide public access to properties for sale; rewrites FileNet searches to utilize COTS data; supports system and acceptance testing of FileNet components
12. RITS System Analysts		Document system requirements & specifications; develop scripts for system and acceptance testing; and support acceptance testing
13. Data Analyst & Database Administrator		Assist with translation map between RITS data model and existing RAIN and PMI databases; functional requirements, testing, and production launch; support for interfaces, data conversion, enterprise data model
14. RITS Business Analyst		Define and document business requirements; develop As-Is and To-Be process models; identifies issues in existing processes and streamlining opportunities.
15. RITS System Administrators		Participate in requirements, process modeling, system design, data conversion, validation and clean-up. Liaison for user acceptance testing and support.
16. RW Business Process Experts (SMEs)		Supply content and insights on property acquisition and property management processes. Identify where RITS impacts processes, policies, documents, local systems and roles. Assess solution design, perform gap analysis, develop transition plan elements, and identify action items for RITS impacts.
17. RITS Business Transition Coordinator		Develops processes, plans, schedules, RW resource requirements and assignments for transition. Aligns transition plans and schedules with RITS System Implementation plan. Lead role in training program

6.2.5.3 Business Ownership of RITS Solution

As defined in the ODOT Information Systems Delivery standard – Macroscope® - the *Business System Owner* is a foundational role in the governance and management of an IT project. Specific responsibilities in scope for the Business Owner for RITS included: (1) championing the vision of future RW program and organization enabled by RITS; (2) representing overall interests of RW program by ensuring delivery of a quality solution that business accepts; (3) leading the issue resolution process at Steering Committee; (4) responsible for RW mitigation response to external QA reports; and (5) directing development and execution of RW Transition Plan.

The State Right of Way Manager was designated as the RITS Business System Owner throughout the life cycle of the RITS Project. Three different individuals held this management position and assumed the RITS business ownership role during the Project. The first individual held that position and performed the owner role from the strategy conception stage and into the Project delivery stage until early 2012. The second State Right of Way Manager was appointed in March 2012 and performed the owner role during the delivery stage through July 2014. The third appointee assumed the position on an interim basis in August 2014, and continued as Business Owner.

6.2.5.4 Business System Management of RITS Solution

The *Business System Manager* is an essential role in the management of an IT project. The ODOT Information Systems Delivery standard, RITS Project requirements, and QA assessment defined the scope of responsibility for the RITS Business System Manager role as: (1) manages business system team; (2) confirms project requirements and operational feasibility of solution; (3) oversees business transition and implementation activities; (4) confirms As-Is process documentation; (5) ensures To-Be process descriptions and gap analyses capture RITS functions; and (6) sets priorities for allocation of business resources for testing, implementation and transition.

Three different individuals held the RITS Project role of *Business System Manager* during the Project. The first RITS Business System Manager performed that role from strategy formulation in 2008 through early 2012 when the delivery stage was well underway.

The second person assigned to the Business System Manager role was previously the Assistant State Right of Way Manager, leader of the Headquarters Operations unit, and a member of the Right of Way Leadership Team. The third person assigned to the Business System Manager role occurred in mid-2013 as the Project was moving into testing, implementation planning and transition planning and has continued since then. This Business System Manager was appointed to the position of Assistant State Right of Way Manager in 2015.

6.2.5.5 Project Management and Processes

ODOT initially appointed as RITS Project Manager an individual who had performed the same role on the previous RWDMS phase. The intention was to leverage the standard ODOT electronic content management (ECM) toolset and integrate it with a COTS package to manage right-of-way acquisition and property management processes. The Project would therefore benefit from prior project management experience and expertise in the ECM space.

The Project Statement (2008) for the RITS Project defines RITS project management processes as scope, quality, schedule, budget, communication, reporting, procurement, risk and issue management. Tasks included management of the RITS Project entity itself; the review and approval process for deliverables that capture the design, development and implementation of product/solution content; and to some extent, organizational preparations for change impact in each affected program area. Primary responsibility for organizational environment for change dimension was assigned to the Business System Manager.

After it became clear to ODOT that the RITS solution would not be a simple COTS package installation with ECM connectivity, and the supplier did not demonstrate system development capabilities, methodologies, or standards, onus shifted to the TAD Delivery Team to manage supplier performance and contractual adherence. This resulted in the addition of a Project *Process* Manager to focus on the standard project management processes. The incumbent continued to focus on controlling product quality and delivery by the IT supplier and was referred to as the RITS Project *Product* Manager. Both Project Managers reported to TAD's Project Delivery Manager, who "…would break the tie if they didn't agree", based on whether an issue or decision was predominantly product or process.

The Project Plan reflected a composite view of what was needed in the solution content and project processes change dimensions, based on the Macroscope® phases and deliverables. Activities and deliverables for the organizational change environment dimension were added to the Project Plan in 2013, based on the Business Transition Plan.

6.2.5.6 Business Resource Management

Right of Way obtained the services of business resources from across the five Highway Regions to the Project to act as a Working Group to define target business processes, to design, develop and implement the business aspects of the RITS solution as well as to define requirements, to develop test cases, and to perform business user acceptance testing of the integrated information system. ODOT made the necessary organizational commitment and created the capacity to supply on a dedicated basis, several managers and staff with experience on acquisition and property management processes.

6.2.5.7 External Quality Assurance and Risk Assessments

Under State of Oregon Policy, set and administered by Department of Administrative Services (DAS), specified Information Technology projects, especially those which cause change to program or service delivery within State agencies, are subject to periodic, independent, third-party quality assurance (QA) reviews and risk assessments. DAS and ODOT selected Public Knowledge, LLC. to provide periodic quality assurance and risk assessment services for the entire RITS Project lifecycle, commencing with a review of the Project justification, continuing through solution design, applications development, and finally the Implementation phase. During their engagement from early 2009 until November 2015, Public Knowledge produced and submitted QA reports quarterly. Each report contained QA Review findings, assessments of Project risks, discussions of risk factors, recommended mitigations, and an evaluation of Agency risk mitigation response progress. These Quality Assurance Reviews and Risk Assessments used industry, State and ODOT standards for IT-enabled change project performance to address several areas of interest, concern and risk. Business-related risks, such as transition planning, began to receive more attention during 2012 and the Right of Way Business Owner managed the response and mitigation of risks.

6.2.5.8 Business Requirements Management

The change from what was anticipated to be a basic COTS configuration and installation to a custom modification and/or a system development meant that business requirements would need to be defined, documented, and approved by ODOT. These requirements would normally become the basis for system specifications, test cases, and acceptance testing criteria.

In the absence of a formal requirements document, the Project used a Functional Evaluation technique to document and gain agreement with the vendor on functional requirements. This identified marked differences between what the vendor was creating and what ODOT was expecting. Consequences of this requirements management disconnect were several contract disputes and amendments with the product supplier, multiple project change requests for schedule and budget adjustments, and a plethora of defects and variances during system testing.

6.2.5.9 IT Solution Delivery Model

The RITS Project employed an IT component "turn-key" delivery model, with Transportation Applications Development responsible to procure and manage solution delivery. ODOT authorities initially chose FlairDocs – marketed as a Commercial off the Shelf (COTS) package – as the target primary IT solution component, with a requirement for integration with several ODOT legacy systems. Eventually, both the supplier and ODOT recognized that the approach to develop the functionality defined in To-Be process models would require the supplier to build several custom components and features. And, they would need to follow system development lifecycle standards.

6.2.5.10 Systems Delivery Life Cycle Management

The October 2012 QA report covered a targeted review of the Project against a standard System Development Lifecycle (SDLC) model, and system development standards, as it was now apparent that RITS was not a COTS implementation. This evaluation focused on deliverables and outcomes that should have been finalized during the current phase. In addition to Requirements, the SDLC evaluation identified several focus areas going forward: Go/No Go Decision using readiness criteria for each phase; Testing Strategy for system and user acceptance tests; System Design Document; Data Conversion Plan; Test Plan and

process for defect management; and Implementation and Business Transition planning. Public Knowledge used this tool in subsequent QA assessments to track progress and to provide a focus for future Project activity.

6.2.5.11 IT Solution Delivery Methodology

The solution was designed and developed using a hybrid systems delivery lifecycle (SDLC) methodology. This hybrid had a contribution from the phases and primary deliverables from the IT solution provider's preferred "Agile" approach to web-based application development. That was a form of rapid application methodology, which involved evolutionary prototypes and iterative design. TAD managed the overall Project based on deliverables adapted from ODOT's SDLC methodology, standard Macroscope®, which has a sequenced waterfall structure. After several staff, the supplier accepted an approach that met ODOT's deliverable management standards.

6.2.5.12 Business Solution Delivery

The RITS Project was to deliver an integrated business system solution with streamlined acquisition processes and automated back office processes. ODOT expected the RITS Project to deliver new information technology components, new or enhanced work processes, procedures, data management, and skills and knowledge to operate and support the solution. The Project set up organizational structures and mechanisms to review and verify the integrated solution design, to monitor its development, to test the efficacy of the integrated system, and to implement the solution.

6.2.5.13 Testing of the Information System

Testing of RITS was performed at four levels. The primary IT supplier unit-tested components and functions and system-tested the web application. The supplier and ODOT-TAD performed integration tests on the total system including interfaces with ODOT applications that supply or use data or documents from the core application.

Right of Way Working Group members and process subject matter experts (SMEs) conducted business user acceptance tests. Acceptance testers considered and addressed many facets of the change program, by using test cases that covered not only typical RW Projects and Files, but also some situations that would require a creative operational response by RW staff.

6.2.5.14 Information System Implementation

The implementation strategy was a phased approach, wherein the RITS solution was piloted on Right of Way Projects in Region 4 (Central Oregon) for several weeks before the application was enabled for all Right of Way Projects and Files throughout the State. Implementation management covered technical integration of the software and business process aspects of the solution.

6.2.6 ODOT and Right of Way Organizational Environment for Change

This change dimension explores the capability, capacity, and readiness of participating organizational units and their staff to operate, support, and maintain their components of the RITS business solution. It includes preparations needed at the organization level and for recipients of these changes, such as change leadership, education and training, and business transition.

6.2.6.1 Organizational Capacity, Capability and Readiness Assessment

During the implementation phase, an independent assessment reviewed the readiness of each Right of Way organizational unit and their processes to evaluate whether their solution component(s) or support service(s) would be ready. The assessment confirmed the adequacy of preparations for change and/or helped to facilitate necessary actions.

A confidential survey was designed and conducted to gather information to assess the readiness of change recipients to adopt and use the RITS system. It surveyed both individual capacities as well as those of the organization to implement and support the change. Right of Way used the survey findings to prepare a plan to train staff in the Regions and at Headquarters for modifications to processes and procedures created by implementation of RITS. The survey reported aggregate data rather than individual responses, but participants were encouraged to identify specific issues and concerns that they wanted program and project leadership to address.

6.2.6.2 Scope of Organizational Change Management

The survey identified five organizational entities that were to be affected by changes created by the RITS application: (1) Right of Way acquisition agents and managers from Region Technical Service Centers across the State, who were key recipients and beneficiaries of the RITS solution; (2) Right of Way Headquarters Operations staff that would

use RITS in their daily processing work; (3) RITS solution support units in Right of Way Section, who assist the Regions; (4) property management agents; and (5) other stakeholders, such as ODOT Financial Services. As part of the organizational preparations for change, the RITS Business Transition Team determined the stakeholders that would be impacted in some manner by the RITS solution, as summarized below.

Table 6.5: Operational Impact of RITS on Participating Organizational Units

Organizational Unit	Operational Role Summary	RITS Solution Impact
Right of Way Project Managers (Sr. Agents)	RW acquisition & relocation estimates; liaise and negotiate property acquisition with owner(s); assist with re-location; manage project-related acquired property	Standard estimation template; document early contact in Liaison file; create & manage RW Project data & file;
RW Headquarters Acquisition Operations	Obtain RW project authorizations; review agreements, relocation plans, appraisals; perform title and escrow services; contract administration and payments	Electronic file management; electronic reviews and approvals; redesigned workflows using RITS
RW Business Systems Management	Operate, maintain and support RITS processes, information, technical infrastructure, connectivity and security	RITS is mission-critical to most RW processes, documents & technical support.
ODOT Property Management	Maintain property inventory records; marketing and sale of surplus property	RITS Inquiry feature captures first contact;
ODOT Financial Services	Ensure integrity of RW settlement, payment reconciliation, and accounting processes and systems	Settlement, reconciliation, and accounting procedures for RW acquisitions, relocations, compensation, and dispositions

6.2.6.3 Right of Way Business Transition Management

In response to an external QA recommendation, Right of Way leadership initiated business transition planning and developed a Business Transition Plan to prepare Headquarters Operations and Region Technical Centers to absorb and effectively use the completed RITS business system. To accomplish this, the transition planning process evaluated business components of the solution – policy, organization, processes, information, job design, staff knowledge and skills – and the gap to be bridged between the solution and the prevailing conditions in each of these components.

The RITS Business Transition Plan complements the System Implementation Plan that prepared the RITS application and associated technical components to be installed. The Business Transition Plan covers the projected time that it may take for the Right of Way organization to absorb the change and complete the transition to the new business system, not just the period covered by the official RITS Project.

6.2.6.4 Right of Way Change Leadership

Change Leadership defines and delineates responsibilities and efforts required from Right of Way leadership to successfully transition the organization to a new operating model created by RITS. This starts with communicating a vision of the Right of Way Program and how RITS would enable this. Another aspect is a leadership structure that ensures clarity and consistency in decision-making and communication about RITS-enabled business change. Right of Way leadership helps individuals with personal transitions from their current work and decision-making processes to the new ways of working within RITS. Right of Way managers model positive behaviors as leaders of change and convey a sense of urgency and priority to adopt new and universally consistent methods of conducting business. This includes mentoring and professional support to all those undergoing personal transitions.

6.2.6.5 RITS Education and Training

Right of Way developed a program to educate and train Right of Way managers and staff on effective and efficient use of RITS for right-of-way acquisition processes. Methods contained steps that would ensure that users would apply RITS in a consistent and universal manner. A training curriculum was created so that staff could acquire skills to effectively navigate within RITS; gain the proficiency to perform their role within RITS; and become familiar with the standards expected in order to maintain quality of the data in the system.

6.2.6.6 Pilot Implementation and Transition

Readiness and capability were tested via pilot implementation of acquisition processes in Central Oregon Technical Center and functions performed in Headquarters Operations. A goal was to use as much RITS functionality as possible to determine shortfalls and defects before the system would be implemented statewide. A second goal was to refine the processes, procedures and training program for the subsequent rollout.

6.2.7 Results Achieved by RITS Project

6.2.7.1 Evaluation in Relation to Project Purpose and Goals

The purpose of RITS Project covers these three goals in official Project reporting:

- To streamline and automate key Right of Way business processes;
- To electronically capture and manage Right of Way data and documents;
- To replace in-house built applications: RAIN (Right of Way Acquisition Information Network); and PMI (Property Management Inventory).

Attainment of the first goal was verified from RITS solution documents and interviews with Right of Way System Managers, who are responsible for on-going system operation and control. For the Acquisition program, it is reported that RITS has enabled redesign and enhanced automation of most of the 19 processes that acquire property for right-of-way on ODOT Projects. Workflows have been streamlined for acquisition offers and approvals, appraisal review, occupant relocation, and payments. In the Property Management program, it reported that RITS has improved management of inquiries from lease and sale prospects.

For the second goal, RITS solution documents, system test observations, and interviews with Right of Way System Managers confirm that all Acquisition program area documents and data (new and converted files) are now being managed using electronic content management (ECM) and database management (DBMS) facilities of RITS. For Property Management, RITS uses common property location identifiers in a shared file to connect property acquisition and disposition.

On the third goal, the Property Management System Manager stated emphatically, “That infrastructure [RAIN and PMI application systems] is gone!” RITS has replaced and supersede functions of both legacy systems. Project documents corroborate this fact.

6.2.7.2 Evaluation in Relation to Project Objectives

The RITS Project accomplished the following in relation to the Project objectives.

Table 6.6: Comparison of RITS Project Objectives and Results

RITS Project Objective	RITS Project Result
A comprehensive system for right-of-way acquisition, tracking and management of property rights.	Realized through modification and implementation of Commercial off the Shelf (COTS) package.
Streamline key, high-value, and return on investment (ROI) features of RW.	The vast majority of RW business processes have been automated by RITS. ROI remains uncertain.
Efficiencies through reduction of redundant entry by allowing document and data entry close to source, with automated notifications, reviews, and approvals.	Realized through acquisition of the COTS package.
Retire the legacy RAIN, PMI, and other redundant systems.	RAIN and PMI changed to read-only at the statewide rollout and retired within 90 days.
Provide support for ODOT Asset Management goals through real estate asset information.	Realized through acquisition of the COTS package.
Enhance system access for RW consultants to enter their activity data to reduce effort and improve reviews.	Realized through acquisition of a COTS package that enables external access.
Establish Taxonomy for RW content that is integrated into the larger ODOT Taxonomy.	Realized through the Taxonomy subproject.
Provide increased public access to information about ODOT-owned property.	Realized through the ODOT Property subproject.
Improve RW Geographic Information Systems and enhance user-friendly search capabilities.	Realized through the RW GIS Search subproject.

6.2.8 Benefits Realization by ODOT and Stakeholders

The RITS Project was intended to position the Right of Way program and its stakeholders to realize benefits in both the Acquisition and Property Management program areas. At the time of the completion of this study, RITS had been fully operational in the Acquisition program areas statewide for about 18 months. RITS has been implemented on all active files, which can be active for many years during the ODOT Project Delivery lifecycle, so these benefits might not be recognized for some time on ODOT construction projects. Internal Right of Way workflow efficiency outcomes are already becoming evident in several Acquisition program processes and roles.

A RITS business driver was to ensure that Right of Way acquisition processes would be documented and performed statewide using a common information system, to comply with state and federal laws, rules and regulations under the Uniform Act. Federal Highway Administration (FHWA), which administers this Act, undertakes periodic compliance audits and reviews right-of-way acquisition files. FHWA maintains an on-site presence at ODOT Headquarters and has access to RITS electronic files and documents. This has provided an increased level of transparency and could reduce the effort required on future FHWA audits.

RITS became operational for Property Management eight months prior to completion of this study, with benefits anticipated in two areas. First, RITS provides the capability for property agents to record and track inquiries from the public on property leases and sales. RITS is expected to improve service as well as to enhance property agent effectiveness in responding to these inquiries. This will also provide metrics of volumes of inquiries and their impact on workload for the Property Management program, which has previously not been able to track the volumes of inquiries that they have had to respond to.

Property Management expects to realize benefits in access to property lease and sales files, which are being converted into electronic files in RITS. Property agents should become more efficient in matters and processes for these properties and their documents.

6.3 Observations and Synthesis of Findings

The purpose of this research is to discover and understand factors, conditions and practices, which are prevalent during the life cycle of successful IT-enabled public services change initiatives. This research question was advanced:

> ***How are successful information technology enabled public services change initiatives governed, managed and performed?***

This section presents findings from a study of the Right of Way Information Tracking System (RITS) Project for the Oregon Department of Transportation. Findings are derived principally from 25 in-depth interviews and focus group sessions, reviews of more than 40 RITS Project and solution documents, and a series of external quality assurance findings, recommendations and agency responses. These sources are augmented by personal observations of the researcher from his role as a business transition advisor to the Right of Way Program Office in latter stages of the Project. Findings are presented in accordance with the thematic categories derived from the structure of the Conceptual Framework – by change life cycle stage and change dimension.

Table 6.7: Number of Findings for Each Life Cycle Stage and Change Dimension

Chapter Section	Life Cycle Stage or Change Dimension (Identifier)	# of Findings
6.3.1	Right of Way Policy and Strategy (RS)	**Four**
6.3.2	Definition of Right of Way Service Improvement (RI)	**Seven**
6.3.3	RITS Business Solution Content (RC)	**Fifteen**
6.3.4	RITS Project Processes (RP)	**Twenty-Six**
6.3.5	Right of Way Organizational Change Environment (RO)	**Sixteen**
6.3.6	RITS Project Results Achieved (RR)	**Eight**
6.3.7	RITS Benefits Realization (RB)	**Seven**
6.3.8	Multi-Stage Project Findings (RM)	**Three**

Following is a detailed discussion of each of the 86 findings using the concept of "thick description" (Denzin 2001). Findings and discussions are organized according to the lifecycle stages and three change dimensions of the integrated change model, with a final section on findings that extend across multiple stages and/or dimensions.

6.3.1 Right of Way Policy and Strategy

For the past two decades information systems have been important contributors to the program mandates of acquiring and managing property for Oregon State highway right-of-way. Right of Way staff and external contractors have managed delivery of products and services to clients with the aid of various legacy information systems. The Right of Way Information Tracking System Project was a strategic initiative to address the obsolescence of two of these legacy systems. At the same time there was an opportunity to use modern technology to streamline and automate key business processes. This section discusses findings related to that strategy as well as policy for IT investment governance.

6.3.1.1 Vision and Strategy

RS.1 The State Right of Way Manager set the tone for the organization with a vision of innovative use of modern technology in pursuit of business process change.

The State Right of Way Manager during early stages of the initiative created a sense of urgency for change and defined a vision for that change. The vision had emergent features as an aspiration for the organization, with streamlined and automated processes that would position the Oregon Right of Way program as a leader in process execution nationwide.

RS.2 Right of Way clearly defined their ambition to replace obsolete information systems and to streamline and automate key business processes through IT.

The purpose and expected outcomes for RITS express a Right of Way policy goal of efficiency, consistency and legal compliance in performance of acquisition processes. Key stakeholders considered the purpose and expected outcomes to be achievable when forming the Project, and these were reinforced in many communications through out the Project's duration. The Business Case for investment in RITS was based on streamlining and automating key acquisition and property management processes. The ambition extended to the full scope of acquisition processes and included some aspects of process re-design.

RS.3 The future Vision for the Right of Way program was translated into business process models, which expand the Vision through operational solution concepts.

Business process models were developed by knowledgeable RW staff to add substance to the broad vision of technology-enabled process streamlining and automation. Operational concepts that were introduced and became part of the RITS solution were: common models at each stage to estimate costs of right-of-way acquisitions, electronic

liaison files to document project scoping results, electronic diary of contacts, locked down document templates, definitive pre-requisite activities, and occupant relocation plans.

6.3.1.2 Governance of Right of Way Change Initiative

RS.4 This Right of Way change initiative passed successfully through adjudication by several IT governance policy processes at State and Department levels.

Because of the level of IT investment sought from funding authorities, the RITS Project required State CIO approval and was subject to State IT governance policies and scrutiny of that Office. This required ODOT to prepare and submit several planning and initiating documents, which would have exposed any shortcomings in strategy and policy related to this initiative. This initiative was subject to periodic quality assurance reviews and risk assessments by an external IT-enabled change expert.

OODT aspects of the governance structure for IT investments were the *Transportation Community of Interests (COI) Council*, the *Project Steering Committee*, the *Project Executive Sponsor* (State Highway Engineer), and the *Business System Owner* (State Right of Way Manager). All of these entities were active in shaping and approving this initiative.

Successful reviews at each level and the type of information supplied are indications of top management involvement and commitment and alignment of this initiative with ODOT's business strategy. Both are generally considered criteria for successful IT-enabled change.

6.3.2 Definition of Right of Way Service Improvements

This section discusses findings for the second stage of the change life cycle. This is where policy and strategy are translated into objectives, scope, and targeted public service improvements. These are transmitted as terms of reference for a project to deliver a solution.

6.3.2.1 RITS Project Purpose, Objectives and Scope

RI.1 The purpose and objectives of the RITS Project were clearly defined when the Project was formed and remained central to the Project delivery effort.

Initiating documents and progress reports through out the delivery stage consistently reference the following purpose statements for the RITS Project: (1) To streamline and automate key Right of Way business processes; (2) To electronically capture and manage Right of Way information content (data & documents); and (3) To replace in-house built applications: RAIN (Right of Way Acquisition Information Network); and PMI (Property Management Inventory). Although the scope of processes to be streamlined and automated

was to evolve, the central focus remained unchanged: RITS was to deliver enhanced services to its customers and to create internal workflow efficiencies.

RI.2 Business processes that were targeted to be improved were known and understood in some detail before the application system was designed.

When the RITS Project was re-formulated in late 2008, the Project Steering Committee authorized pursuit of a solution that could streamline most processes that are performed to acquire property as construction right-of-way and to manage the resultant property portfolio. This would improve service delivery to the ODOT Project Delivery Business Line, property owners, occupants, and prospective property purchasers. Another emphasis was to improve process and workflow efficiency in the Right of Way organization. Business processes were subject to discovery tasks of identification, definition, "to-be" mapping and textual description.

RI.3 Planning and management of the solution scope was informed and intentional – it evolved from replacing existing RW system functionality to automating the lifecycle of RW acquisition processes and property management processes.

The initial RITS Project scope approved by the COI was extension of the RWDMS Project. It only included RW acquisition processes that were supported by the RAIN system, and excluded property management functions. In researching possible IT solutions, it was learned that property management functionality was a base feature for all known solutions. This inclusion would enable retirement of both legacy RW applications. The Project scope intentionally excluded the RW Accounts Program (RAP), a tool used to manage property-related transactions. When ODOT selected the FlairDocs COTS package as the preferred product, the Agency recognized an opportunity to streamline and automate a number of key acquisition processes. Based on the COTS features that were implied, a decision was taken to expand the purpose, objectives and scope of the RITS Project to reflect that intention.

6.3.2.2 Internal Organizational Environment

RI.4 The RITS Project was initiated with an accepted business case justification, a funded level of IT investment, and approval to proceed by State CIO and ODOT.

RITS Project justification, authorization and initiating documents indicate that the Project met the criteria and thresholds to receive approval by program, departmental and state authorities. Funding sources and a budget, covering all anticipated expenditures, were established at that time.

RI.5 Internal change enablers and inhibitors were identified and understood.

As identified in the RITS Project justification, authorization and initiating documents, anticipated success enablers were the experience of successful RWDMS implementation, availability of key resources from that phase, stability of ECM technology (FileNet) and ODOT experience with that toolset. Potential success inhibitors identified were schedule compression and possible POP expiry, and schedule impact due to a lengthy, consultative process to procure and choose an IT supplier.

6.3.2.3 RITS Project Organization and Coverage

RI.6 The Project to design, develop and implement a RITS solution was established as a temporary organizational entity, as stipulated by ODOT IT Governance policy.

The RITS Project was established as a temporary organizational entity in 2008 to produce and implement the Right of Way Information Tracking solution. The Project structure featured hierarchical levels for governance roles, managerial roles, and performance roles, with distinct, but coordinated, streams of responsibility for project delivery and business process work. Project controls for time tracking, cost accounting and budgeting were set up at that time. The Project entity was active until the state rollout was completed, in late 2015.

RI.7 The RITS Project was defined as an instrument of comprehensive change to the business system for Right of Way Operations.

ODOT IT Project Governance and Right of Way Leadership expected the RITS Project to follow a planned approach to define, design and implement a comprehensive business system solution. This solution would involve not only new technology, but also changes to Right of Way program aspects such as processes, workflows, document management, roles and responsibilities. Project records demonstrate consistent acknowledgement that RITS embodied an entire business system solution, starting with Service Improvement Definition.

6.3.3 Right of Way Information Tracking Business Solution Content

The scope of the RITS solution content is defined by several components that are needed for a complete, integrated business system for property acquisition and management. Findings in this sub-section are organized according to the four *Solution Domains* of the Right of Way Business System*: Organization, Business Process, Information Technology,* and *Job/Performer,* as adapted from Rummler & Brache (1996).

6.3.3.1 Right of Way Organizational Solution Domain

RC.1 No enabling legislation or changes to Oregon Administrative Rules were needed to facilitate streamlining, automation or redesign of Right of Way processes.

The Right of Way Acquisition program in Oregon is strictly controlled under authority of the federal Uniform Act and Oregon Administrative Rules. The RITS solution was designed within these parameters and no enabling legislative proposals were needed at either federal or state levels.

RC.2 Changes were made to Right of Way policy and standards due to RITS impact.

Right of Way policies and standards, many of which are documented in the Oregon Right of Way Manual, were reviewed and adjustments made to several Chapters and Sections. This was needed to recognize RITS as a replacement for RAIN and its utilization in the performance of a broader range of Acquisition and Property Management processes. Standards were revised in areas such as Liaison Files, Estimation, and Diary of Contact.

RC.3 No changes to the Right of Way organization structure or the structures of external stakeholders were designed or implemented in association with RITS.

Authorities granted to Right of Way Program Managers by the State Right of Way Manager were not affected. System authorities under RITS differ from RAIN and are more comprehensive, applying to many more automated processes, as well as providing rigor in who is authorized to perform a task or approve an action. There were no integration issues from modest changes within the organizational domain. Integration with the Process domain was captured by changes to the Right of Way Manual and design of RITS system authorities.

6.3.3.2 Right of Way Business Process Solution Domain

RC.4 In preparation for system design and implementation, models were developed of the Right of Way business processes that were targeted for improvement.

The Right of Way Working Group and process subject matter experts participated in facilitated sessions to develop cross-functional maps and descriptions of “To-Be” Acquisition and Property Management processes. Maps that captured the overall process architecture, key process concepts, and streamlining opportunities were developed with workflow specialist consultants in 2009 as part of pre-Project scope planning. Cross-functional (“swim lane”) maps that elaborated “as-built” information flows, system functions, process roles and responsibilities were informed the Business Transition Plan during implementation in 2013.

RC.5 RITS significantly affected Right of Way procedures and process business rules.

To accommodate RITS, changes were made to Right of Way Procedures and Business Process Rules, which are documented in the Oregon Right of Way Manual, Desk Manuals and other Guides. Some of these changes were needed to document how RITS is used in the performance of Acquisition and Property Management processes. Procedures have been or are being revised in several processes in association with the full implementation of RITS.

RC.6 The integrity and quality of data and documents being stored in RITS were the focal points of specific project activities prior to, and during implementation.

Data quality for RITS was addressed through a combination of automated and manual procedures. As an antecedent to RITS, a Data Management System Project oversaw the centralization of ODOT property information in a database of scanned and imported right-of-way files, maps, contract plans, and related documents. Migration of data from the RAIN and PMI databases during the RITS Project was guided by a Data Conversion Plan that mandated reviews by process subject matter experts, oversight by the Right of Way Working Group, and third-party quality control assessments.

RC.7 Integration of business process components was accomplished by development and use of cross-functional process maps and Business Transition Plan.

The scope of RITS impacts on right-of-way acquisition processes was identified using the ODOT Project Delivery Lifecycle Model, which is a structural summary of all program development, project development, and construction management processes. To prepare to implement RITS, the Right of Way Working Group and subject matter experts participated in consultant-facilitated process mapping events to assess how the flow of work, information, and documentation within Right of Way program areas would be affected by RITS.

These activities first produced a process relationship map, a high-level illustration of the connectivity of information, materials, documents, and services. Then, they developed cross-functional process maps, which describe the work activities performed by various functional roles, interactions with other roles and procedures, and the resources they use and create. Based on these documents, a Business Transition Plan was developed to complement the System Implementation Plan, describing in detail the activities, roles, and resources necessary to realize the “To-Be” business model.

RC.8 Integration of business process aspects of RITS with the technology solution was the focus of Project activities throughout the change lifecycle.

Use of an information technology system to support business process redesign and improvement was central to the Project's philosophy. Concurrent with the information system design and implementation, the RITS Project pursued an ongoing goal of reorganizing the Right of Way section to expand its capacity to support automation and streamlining of workflows. This opportunity was explored in detail through cross-functional "To-Be" process maps developed by the Right of Way Working Group and process subject matter experts, describing the various Right of Way functional roles and their work activities in association with their projected use of RITS resources. In addition to the replacement of RAIN and PMI by RITS in Right of Way business processes, this process redesign anticipated new forms of user engagement with the system, new and modified process and system task authorities, and altered reporting relationships enabled by the new technological resources.

6.3.3.3 RITS Technology Solution Domain

RC.9 Application software and services were customized to meet laws, regulations, policies, processes and standard practices of Oregon Right of Way programs.

Although the RITS software was purchased as a Commercial Off-The-Shelf (COTS) package, it required modification to such an extent that it is essentially custom-designed and developed software for the ODOT Right of Way Program. The Microsoft SQL server-based FlairDocs package was redeveloped to replace the functions of existing in-house applications, capture and manage Right of Way program content, and to streamline and automate Right of Way processes. These goals were pursued through a System Development Lifecycle model with third-party oversight and quality control. The software developer conducted this redesign in an iterative process, aligning the system architecture with technological and business line requirements described in periodic Functional Evaluations. The software provider has committed to sustain the software indefinitely and has contracted to do so for ODOT under a defined maintenance and services agreement.

RC.10 Stakeholder access and connectivity was established to enable collaboration.

The RITS software is designed to enhance information and document sharing across technical disciplines. RITS is accessible to Right of Way Program employees and managers, as well as to external consultants as appropriate to their tasks. The system architecture

allows data entry and retrieval to be performed directly by their associated job roles, cooperative management of data and documents by core and supporting roles, and transparent access to technical resources and tools. Access to secure or confidential information can be assigned to specific roles through custom read and edit permissions, while external parties can be granted provisional access to RITS resources through a secure portal. Stakeholders are connected through RITS to live, networked data and document stores for the Right of Way Program business line.

RC.11 Technical infrastructure complies with State of Oregon architecture standards.

The RITS software is accessed through an Internet browser and hosted on the Right of Way server at the State of Oregon Data Center. RITS applications and databases are based on a modified Microsoft SQL Server package, which authenticates external users through a Virtual Private Network (VPN) system and authorizes their access to various components of RITS. The authentication protocol backed by server bandwidth, allows live access to the appropriate suite of RITS capabilities by authorized job performers in Region Offices and in remote locations.

RC.12 RITS is technically integrated with ODOT databases, applications and tools.

RITS itself replaces and centralizes functions of two disconnected Right of Way applications, the Right of Way Information Network (RAIN) and Property Management Inventory (PMI), and is technically integrated with other ODOT databases, systems, and tools. As a Program-wide information system, RITS joins the Property Acquisition and Management domains in a cohesive information architecture. To coordinate Right of Way activities with ODOT Project Delivery and other business domains, RITS is linked to ODOT's Enterprise Content Management System (FileNet), Project Control System (PCS), Transportation Infrastructure System (TransInfo), Financial System (TEAMS) and Human Resources System (DEHR). Through this, it also benefits from the 2005 Right of Way Data Management System Project (RWDMS), in which paper records were digitized and electronic files migrated into a central database of property information on FileNet.

6.3.3.4 RITS Job/Performer Solution Domain

RC.13 Right of Way recognized and planned the job re-alignment resulting from RITS.

Right of Way Section recognized the need to align its job roles and responsibilities to make full use of RITS functionality early in the Project: the implementation of its information technology components was supplemented with new and enhanced work processes and procedures, data management protocols, and technical skills. Through interviews and consultant-facilitated process design workshops with process authorities and subject matter experts, these new and modified responsibilities were identified and described in cross-functional process maps and documentation.

RC.14 Education and training was developed and conducted on entire RITS solution.

A RITS training curriculum was developed in-house, piloted in one Region, then refined and implemented statewide to present all aspects of business solution content to Right of Way program staff. This week-long program familiarized staff with features of the new information technology and changes to their job roles as determined in the cross-functional business process maps. As staff began to interact with the system, the training was expanded and fine-tuned to account for varying proficiency levels, receptiveness to the content, and further needs identified in the pilot program.

RC.15 Requirements for job-level measures were defined and are under development.

With the transition to RITS complete, job-level metrics for benefits tracking, quality assurance, and performance measures are under development. Process performance measures and targets for completion have been defined in the system, so that time-sensitive tasks in the business line can be monitored and regulated through system alerts. These tools for managing the timely production of deliverables within the system can be aligned with responsibilities and job-level measures in the business domain, a feature that is currently being developed.

6.3.4 RITS Project Processes

The scope of the RITS Project Process solution *domain* is defined by several mechanisms that need to be established and performed well to facilitate delivery and acceptance for a complete, integrated "business system" for the Acquisition and Property Management programs. Findings in this sub-section are organized according to the eight thematic categories of this change dimension; (1) project governance; (2) business solution ownership; (3) project organization, roles and responsibilities; (4) project management; (5) solution delivery model; (6) solution delivery lifecycle methods; (7) solution testing; and (8) system implementation.

6.3.4.1 RITS Project Governance Processes

RP.1 Governance process execution was disciplined and effective in Project phases.

ODOT executive management strongly supported the RITS Project and the business solution that was developed. COI Council was consulted on, and authorized, major changes to scope, budget and schedule. The RITS Project Steering Committee met regularly, usually monthly, throughout the design, development and implementation stages. COI Council and RITS Project Steering Committee received and considered monthly reports on Project progress and status, covering business and IT aspects.

RP.2 RITS Project success can be attributed to an effective quality assurance process that included comprehensive risk assessments and agency responsiveness.

Public Knowledge, LLC. performed periodic quality assurance (QA) reviews and risk assessments during the entire RITS Project lifecycle, commencing with a review of the Project justification, continuing through solution design, applications development, and finally the Implementation phase. Public Knowledge produced and submitted quarterly reports, which contained QA Review findings, assessments of risks, discussions of risk factors, recommended mitigations, and an evaluation of Agency risk mitigation response.

QA reports were discussed in Project Steering Committee and Project Team meetings. The ODOT Project Manager incorporated the risk factors from the risk assessments into a Project Risk Management Plan to ensure visibility and management attention. In a post-completion interview, the System Manager for Acquisitions observed, “If we didn’t have the QA provider looking over our shoulder all the time, I doubt that we would have succeeded”.

6.3.4.2 Business Solution Ownership

RP.3 Right of Way embraced responsibilities of business system ownership and performed the Business System Owner role, with areas of focus in each stage.

The State Right of Way Manager was designated as the RITS *Business System Owner* through out the life cycle of the RITS Project. Three different individuals held the management position and assumed the RITS ownership role during the Project and, according to key informants, each brought different experience, knowledge and skills to the proceedings. The first individual held that position and performed the owner role from the Project's initiation through early 2012. That Right of Way Manager brought visionary leadership and advocacy for a modern technology platform to streamline, automate, and possibly redesign key business processes.

The second State Right of Way Manager appointed in March 2012 focused initially on RITS Project processes to secure more funding and schedule runway and to strengthen relations with the primary IT supplier. Upon acceptance of the QA recommendation in early 2013, a RITS Project focus of the Business Owner expanded to include preparations for change and business transition in the Right of Way organizational environment.

The third appointee, who took on the position and role as the Project prepared for statewide implementation, had extensive Right of Way operations management experience and a strong implementation orientation. Effectiveness in the Business System Owner role by this individual was enhanced by involvement in the RITS Project and solution in various capacities during the life cycle, commencing with development of policy and strategy, and culminating with the statewide rollout.

RP.4 Performance of Right of Way business system ownership met requirements of the ODOT methodology and RITS Project role specifications.

The original State Right of Way Manager championed the vision of a future Right of Way program and organization that would be enabled by RITS. All three individuals who performed this role represented the overall interests of the Right of Way program with a focus on the delivery of a quality solution that would be acceptable to the business. The second Right of Way Manager in the Business System Owner role led the resolution of project and solution issues, and was responsible to lead the mitigation response to external

quality assurance findings and recommendations. The second Right of Way Manager directed development and execution of the Business Transition Plan.

RP.5 Right of Way embraced the responsibilities of business system management and performed the Business System Manager role, with a focus in each stage.

Three different individuals held the RITS Project role of *Business System Manager* during the Project and, as with the Business System Owner role discussed above, it was observed that each also brought different experience, knowledge and skills to the table. The first RITS Business System Manager, who performed that role during the Project's formative years through early 2012, was an advocate for innovative use of technology to streamline processes. That System Manager developed a strong working relationship with the primary IT solution supplier, and was instrumental in expanding the business solution concept to include property management processes.

The second RITS Business System Manager had just retired as the Assistant State Right of Way Manager and was rehired for the RITS Project. This individual was considered a leading authority on the entire life cycle of Oregon right-of-way acquisition processes and the laws, rules, regulations and policies that provide authority and constraints to those processes. The scope of interest, attention, and influence in that RITS Project role became how the technology solution could enable streamlining of the acquisition processes while adhering to, and enhancing staff compliance with, the Uniform Act, other applicable laws, Administrative Rules, and Right of Way policies.

The third assignment to the Business System Manager role occurred in 2013 as the Project was moving into testing, implementation planning and transition planning. This individual also had an operations management background, with particular expertise in process quality assurance and occupant relocation. This included involvement in the RITS Project and solution design in several stages, starting with Joint Application and Design (JAD) sessions and business process modeling.

6.3.4.3 RITS Project Organization, Roles and Responsibilities

RP.6 The Project organization was designed with roles and responsibilities distributed among business and technical teams to cover all change dimensions.

The Project to design, develop and implement RITS was a temporary organizational entity, as defined in ODOT IT Governance policy and processes. As presented in Table 6.8, the RITS Project Organization structure includes at least one role or subunit with primary responsibility or interest in each dimension of change delivery - solution content, project processes, and organizational environment for change. The Project Organization structure also covers the tiers of governance, managerial and performance roles in several capacities.

Table 6.8: RITS Project Structure, Roles and Responsibilities by Change Dimension

Project Role or Sub-Unit	Delivery Stage Change Dimension		
	Solution Content	**Project Processes**	**Organizational Change Environment**
Project Governance Roles:			
Project Executive Sponsor	Primary	Secondary	
Business System Owner	Primary	Primary	Primary
Project Steering Committee	Primary	Primary	Primary
TAD Program Coordinator	Primary	Primary	
Project Managerial Roles:			
TAD Project Delivery Manager	Secondary	Primary	Secondary
Project Process Manager	Secondary	Primary	
Project Product Manager	Primary		Secondary
RW Leadership Team (RWLT)	Primary		Primary
Business System Manager	Primary	Secondary	Primary
Project Performance Roles:			
RITS Working Group	Primary		
RITS Stakeholder Group	Primary		Secondary
RITS Business Transition Coordinator	Secondary	Secondary	Primary
RITS Acquisition Process SMEs	Primary		
Property Mgmt Process SMEs	Primary		
RITS Business Analyst	Primary		
RITS System Analysts/DBAs	Primary	Secondary	

RP.7 Business resources were subject matter leaders for Solution Content dimension

Through out the RITS Project lifecycle there were knowledgeable business resources actively involved in a content leadership capacity (e.g., the Business System Manager). Moreover, there were active subject matter experts (SMEs) associated with each of the acquisition and property management processes that were being streamlined or automated.

RP.8 Right of Way business resources were leaders in the Agency response to requirements of the Organizational Environment for Change Dimension.

The dimension of organizational change environment began to receive sufficient attention at the Managerial and Performance levels of the Project Organization when the State Right of Way Manager accepted and acted upon recommendations from the external Quality Assurance provider to develop a Right of Way Business Transition Plan and to staff that entity with dedicated resources.

RP.9 Processes and responsibilities for managing the RITS Project during the Delivery stage encompassed all three dimensions of change.

The scope of project management processes and Project Manager responsibilities covered the management of the Project entity and tasks to design, develop and implement the solution content. In the later years of the Project, two Project Managers shared this responsibility. The Right of Way Business System Manager managed the organizational preparations for the people side of change, based on the Business Transition Plan. Implementation management covered technical and business process aspects of the solution. The Implementation Plan combined with the Business Transition Plan to present a balanced view of what was needed in all change dimensions.

6.3.4.4 RITS Project Management Processes

RP.10 Processes and responsibilities for managing the scope of the RITS Project and solution were carried out effectively through out the Project life cycle.

When ODOT selected the FlairDocs COTS package as the preferred product, it decided to streamline and automate key acquisition processes using the expected COTS features. At this point, the scope was established and, from an ODOT perspective, remained unchanged for the delivery stage. When ODOT realized that configuration of FlairDocs would not suffice, it became a system development effort to customize software to fit ODOT To-Be processes. Although there was limited system requirements documentation for these processes, they became the envelope within which ODOT managed RITS scope. These processes also provided ODOT with a knowledgeable position from which to refute vendor contentions that their contracted scope of work had changed.

RP.11 ODOT processes and responsibilities for managing the RITS Project schedule, to the extent they were within ODOT control, were carried out effectively during the Project.

The initial estimated completion date for the RITS Project, based on the scope as originally defined to replace RAIN, was June 30, 2009, which was the end of the biennium and expiry date of the original POP that had provided funding. The actual completion date, based on the broader scope of process streamlining and automation was February 28, 2015. The Steering Committee considered and approved eight Schedule Change Requests during that time, most of which were necessitated by the consistent inability of the vendor/supplier to meet dates for quality, approved deliverables. After the system was accepted by Right of Way in March 2014, the schedule was driven by business transition work, which had been a late addition to the Project's responsibilities.

RP.12 ODOT processes and responsibilities for managing RITS Project costs were carried out effectively through out the Project life cycle.

The initial approved budget cost for the RITS Project was $3.66 million. This was based on the scope of replacing RAIN and PMI as well as process streamlining and automation by configuration of a COTS package. The actual Project cost was $7.54 million. The Steering Committee considered and approved a number of Budget Change Requests during that time. Most of these were necessitated by vendor performance shortfalls that led to schedule slippage. This also created additional work for ODOT IT Project Managers, for IT Project Team staff in documentation and tests, and for RW business staff, for example to explain their business processes on many occasions to different vendor staff. There were also increased vendor costs to move from a COTS configuration to a custom system development effort. Costs were tracked and reported to governance authorities each month, with breakdowns by Macroscope® system delivery phase, and by solution component.

RP.13 Processes and responsibilities for managing RITS Project risks and issues were carried out effectively through out the Project life cycle.

The RITS Project was subject to external QA oversight. The quarterly QA reports were shared openly in Project Steering Committee and Project Team meetings. The ODOT Project Manager incorporated risk factors from these assessments into a Project Risk Management plan and process to ensure visibility and management attention. Internally, the

Project tracked project, solution and contractual issues, which were classified by their severity and priority. Issues were reviewed with the Project Team and escalated as needed to the Project Steering Committee for resolution.

6.3.4.5 Solution Delivery Model

RP.14 ODOT recognized the need, then accepted and carried out responsibilities of the overall information systems integrator for the RITS technical solution.

Under their contractual arrangements, the product vendor was the entity with the overall responsibility to design, build, unit test, system test and integration test the software components, which they developed or customized from their COTS. The vendor was also responsible to build interfaces to ODOT systems that contribute to or use data and documents required in execution of Right of Way processes. This generally requires a much more sophisticated set of project management and system development skills and experience than those required to configure and implement a COTS package.

ODOT officials and the external QA advisors judged that these skills and experience were absent from the vendor resources assigned to the RITS Project. A consequence was that the RITS Project organization was required, on behalf of the Agency, to accept overall responsibility as the *information systems integrator* to ensure that all components of the system solution were designed properly, built to specifications, tested in all aspects, and functioning in accordance with the Uniform Act, Oregon Administrative Rules and Oregon Right of Way Policy.

The TAD Project Delivery Manager recognized that *Transportation Applications Development,* rather than the product vendor as primary IT solution component provider, would need to develop the capability and capacity to execute responsibilities of the information system integrator to ensure the fit and compatibility of the technology components. One such strategy was to define separate project management roles for project processes and technical solution content (“the product”) and staff these roles with individuals with requisite and complementary skill sets and experience.

RP.15 Right of Way Section recognized the need, then accepted and carried out responsibilities of the public service (business) solution integrator for RITS.

The RITS Project scope was an integrated business system solution with streamlined acquisition processes and automated back office processes. ODOT commissioned the Project on the basis that it would deliver new information technology components, new or enhanced work processes, procedures, data management, and the skills and knowledge to operate and support the solution. This involved Right of Way Section assuming the role of a *public services solution integrator* - to ensure the fit and compatibility of the technology components with program delivery processes, roles, and organization. This was made possible by leadership from the Right of Way System Owner, extensive participation of Right of Way Leadership Team, detailed process knowledge supplied by process Subject Matter Experts (SMEs), and integrated solution content emphasis from the 'de facto' Business Architect in the role of Business System Owner. This provided the Right of Way Business Team with the capacity and capability to perform as Public Service solution integrator.

6.3.4.6 Solution Delivery Lifecycle Methods

RP.16 Solution delivery methods evolved from basic COTS configuration to a hybrid combination of "Agile" and "waterfall" application development approaches.

Based on selection of a COTS package, the RITS Project intended to employ an IT solution component "turn-key" delivery model, with Transportation Applications Development responsible to manage solution delivery by the vendor. Eventually, ODOT recognized that the approach to develop RITS, as defined in "To-Be" process models, would require a supplier to build several custom components and follow system development standards.

In essence, the solution was designed and developed using a hybrid systems delivery lifecycle (SDLC) methodology. The IT provider's preferred "agile" approach to web-based application development contributed to the phases and primary deliverables. This appeared to be a form of rapid application methodology, which involved evolutionary prototypes and iterative design. TAD managed the overall Project, based on deliverables adapted from their standard SDLC methodology, Macroscope®, which is a sequenced waterfall structure, with six phases. After much debate, ODOT and the supplier finally agreed on an integrated approach that met ODOT development standards and the supplier's agile delivery practices.

RP.17 Requirements management was not understood and mostly absent from RITS.

The change from what was anticipated to be a basic COTS configuration and installation to a custom modification and/or a system development meant that business requirements would need to be defined, documented, and approved by ODOT. These requirements would normally become the basis for system specifications, test cases, and acceptance testing criteria.

In the March 2009 QA report, Public Knowledge stated (p.5) that,

> "It is unclear if there has been a formal requirements gathering process, what those specific requirements are and to what extent stakeholders have been involved in the requirements gathering process."

A follow-up report one year later (April 2010) identified several on-going issues related to documentation and the management of requirements gathering. It was reported that,

> "JAD [Joint Application Development] session facilitation and requirements gathering process…are not consistently well-managed or facilitated…There are multiple usages of terms and ODOT and the vendor need to be consistent about their usage to ensure that translation of requirements and business rules are correct and accurate." (p. 10-11)

The May 2012 report evaluated a decision by ODOT to use a Functional Evaluation technique to document and gain agreement with the vendor on functional requirements. The report stated,

> "The Functional Evaluation did not result in functional requirements for RITS…it resulted in a list of functionality that the vendor must fix for the system to meet basic needs, but these are not traceable through testing." (p.12)

The February 2013 report included a review of the Functional Evaluation documents, which found (p.5) that, "Requirements were not sufficiently documented during the Specification/Acquisition phase and there continue to be disagreements…on the requirements." Public Knowledge concluded (p.2), "The lack of documented requirements and [system] design documentation will likely continue to strain the relationship [between ODOT and the vendor]." The concluding recommendation (p.2) was, "Prior to entering system test, ODOT and [the vendor] should agree to the definition of a *defect* versus a *change (variance from requirements…)."*

Consequences of the requirements disconnect were several contract disputes and

amendments with the product supplier, several project change requests for schedule and budget adjustments, and a plethora of defects and variances during system testing.

RP.19 Stage and/or phase decision gates were acknowledged at times but were not used to control development with the rigor that the RITS Project required.

Public Knowledge repeatedly reported on the need for project leadership to enact and adhere to decision gates at suitable junctures in the Project. This would control schedule and expenditure commitments. This remained an outstanding issue and risk factor until ODOT IS insisted that the Project adopt ODOT's standard SDLC methodology and phase gates.

6.3.4.7 Solution Testing

RP.20 Unit and system tests were not performed on formal requirements; rather, the system was tested against agreed objectives.

Prior to software design, Right of Way articulated a set of objectives for the information technology system. These priorities were addressed with the software developer on an ongoing basis through Functional Evaluations of system components. Following implementation of the RITS technology and the Right of Way business transition, Project Managers and the Project Steering Committee conducted a detailed evaluation of the system and program against the Project objectives; they reported that all objectives were achieved.

RP.21 Multi-faceted integration tests were performed against comprehensive metrics.

The RITS software was tested multiple times before and during system implementation. During development, design variances and quality issues were identified and resolved with the software developer. To prepare for decommissioning existing information systems, RITS was tested against a series of metrics, including data migration integrity, acceptance of FileNet components, system functional requirements, support of the Right of Way enterprise data model, oversight of information conversion, and integration with other ODOT systems.

RP.22 Business owner and user representatives performed successful acceptance tests against business requirements.

Acceptance tests for the overall RITS solution were performed according to criteria derived from business requirements identified in a series of Functional Evaluations. These criteria were evaluated internally by the Project Solutions Team and Leadership Team and externally through quality assurance reviews conducted by Public Knowledge, LLC, who assessed elements of solution design, application development, and implementation.

P.23 Defect management ensured resolution of software and business change issues.

Software development was guided by a Systems Delivery Lifecycle model in which defects and design variances were identified, reported, and resolved in an iterative process. The Solutions Team and Leadership Team identified priorities, while Product and Process Managers provided oversight and determined whether an issue was best addressed through business process or system design. The software developer resolved software issues presented in periodic Functional Evaluations and continues to provide support for system changes identified after implementation.

6.3.4.8 System Implementation Strategy and Plan

RP.24 Implementation of the system was carried out initially under pilot conditions and lessons learned were used to facilitate the full scale roll-out.

A pilot implementation was conducted in Region 4 (Central Oregon) for several weeks before the RITS solution was introduced statewide. This involved release of the RITS technology, education and training for the new system and changes to job roles. An external consultant performed an organizational capability, capacity, and readiness staff survey and assessment. Findings from these events were used to refine the education and training curriculum, to prepare supporting technical material, and to address issues raised by staff.

RP.25 User support mechanisms were established for RITS and business processes.

A Business Transition Team planned and provided support for the business transition and system implementation by assessing the impacts that were likely to be experienced by each organizational unit. These preparations were codified in a Business Transition Plan, and executed through various services and technical roles both during and after the transition. This included mentorship and professional support at the management level; educational material and training programs targeted to specific roles; user support by systems administrators; and help facilities to address ongoing issues.

RP.26 System implementation and business responsibilities were clearly defined, appropriately assigned and effectively managed.

Right of Way and Transportation Applications Development planned the RITS Project within an organizational framework of governance, managerial, and performance roles. This assigned specific responsibilities for implementing and managing the system and its

underlying business processes. The ODOT information systems management standard (Macroscope®) guided system production and administration. In addition, a System Implementation Plan and Business Transition Plan defined the responsibilities and activities for adopting technical and business aspects of the RITS solution, respectively. The Right of Way Leadership Team oversaw execution of these Plans and coordinated areas of expertise required to put them both into effect.

6.3.5 Right of Way Organizational Environment for Change

The scope of findings in this change dimension address the organizational capacity, operational capability, and readiness of participating organizational units and their staff to operate, support, maintain and sustain their components of RITS. It includes an analysis of the preparations made by Right of Way at the organizational level as well as for individual recipients of these changes. Findings in this sub-section are organized according to the seven thematic categories of this change dimension; (1) organization commitment to change; (2) organization operational absorptive capacity; (3) organization operational capability; (4) organization readiness to change; (5) change leadership; (6) organization culture; and (7) business transition preparations.

During the implementation phase, an independent assessment explored the readiness of each Right of Way organizational unit and their processes to ensure that the solution component(s) or support service(s) would be ready. The assessment confirmed adequate preparations for change in some areas and helped to facilitate additional preparatory actions in other areas.

Right of Way used the findings to prepare a plan to train staff in the Regions and at Headquarters for modifications to processes and procedures created by implementation of RITS. The survey reported aggregate data rather than individual responses, but participants were encouraged to identify specific issues and concerns for program and project leadership to address. These findings are informed by the results from the survey of change recipients, the Business Transition Plan document, individual interviews, and project and solution documents.

6.3.5.1 Organization Commitment to Change

RO.1 The Right of Way organization demonstrated a commitment to change in successive stages of the lifecycle and across multiple dimensions of the organizational hierarchy.

Many interviewees commented favourably on on-going commitment by senior managers during early planning stages as well as during system design and development. Leadership continually emphasized the importance of the business system changes to the future of the Right of Way program. While the RITS solution was being finalized, and prior to implementation, change participant survey results provide evidence of an elevated level of commitment to change across all functional roles, program areas, Regions, and business processes. Change commitment is measured by the level of value that RITS could supply to individual roles and to the organization.

RO.2 Most people within the Right of Way organization anticipate moderate value from the changes that RITS is expected to bring to their personal job circumstances.

Findings from the change participant survey were that workers and managers collectively held a slightly positive anticipation that RITS would improve their personal job conditions, although many had a limited understanding of the RITS solution at that time. Among most functional roles, there was consistently positive anticipation of personal benefit, although Headquarters specialists were less optimistic. Among program areas, the belief that the change would be beneficial was not as strongly held by participants from the Region with the most complexity (Portland) and distance from Headquarters (La Grande). Most respondents reported that they had “no objection to the change”.

6.3.5.2 Organization Operational Absorptive Capacity

RO.3 Right of Way recognized and understood its change absorptive capacity and minimized other changes within its control while the RITS Project was underway.

Right of Way effectively minimized the likelihood of change saturation, which could result from too many concurrent operational, organizational and/or technical changes that might inhibit RITS adoption due to limits on the organization’s capacity to assimilate, transform and apply knowledge. While the RITS Project took place over an extended period of time, Right of Way did not introduce other significant organizational, operational, or technical changes while the Project was underway.

RO.4 Right of Way explored the capacity of individuals whose work processes and environment RITS would affect and used findings to inform change preparations.

The capacity of each individual to assimilate, transform and apply new knowledge is factor in the realization of value from innovation performance by an organization. Right of Way used the staff survey and follow-up interviews to explore individual perceptions of their own capacity to absorb the knowledge required to effectively apply RITS in their daily operations. Right of Way utilized the insights from this research to inform the RITS education and training curriculum, the Business Transition Plan, and on-going communications with staff and managers.

6.3.5.3 Organization Operational Capability

O.5 Right of Way used cross-functional process mapping and business components gap analysis techniques to define the organizational capabilities that the system required.

Right of Way applied detailed business process analysis techniques to understand the scope of operational change at the organizational level, and the aggregate capabilities that would be needed. Right of Way mapped the RITS-enabled design of major property acquisition processes to understand the impact of RITS on various organizational roles. Right of Way analyzed the gap between existing processes, based on RAIN and PMI, and the RITS design for each solution component. Operational barriers to specific changes associated with RITS were also identified.

RO.6 Right of Way used a comprehensive assessment of skills and knowledge required by various roles that perform property acquisition and management processes using RITS.

Right of Way used the staff survey and follow-up interviews to explore individual perceptions of their capabilities to effectively apply RITS in their daily operations. The survey questions explored the skills and knowledge needed to support the change, both during and after the transition. Survey respondents were also asked to assess their overall ability to implement the change and to identify the challenges that they anticipated. Development of the Business Transition Plan included an assessment of the training needs for each major role in the new system and redesigned processes.

6.3.5.4 Organization Operational Readiness

RO.7 Right of Way assessed the level of readiness in the organization where RITS would affect work processes and environment and used this to prepare for change.

Change management experts emphasize the importance of establishing organizational readiness for change and recommend various strategies for creating it. Organizational readiness for change is a multi-level, multi-faceted construct. At the organization level, readiness for change refers to organizational members' shared commitment to implement a change and shared belief in their collective capability to accomplish it. Organizational readiness for change is a function of how much organizational members value the change and how they appraise three determinants of implementation capability: task demands, resource availability, and situational factors.

The Right of Way staff survey was designed and conducted to gather information to assess how change recipients valued the features of RITS and their assessment of Right of Way implementation capability. The collective results informed the assessment of readiness for the overall organization to implement and support the change.

RO.8 Right of Way assessed the level of readiness of persons whose work processes and environment are affected by RITS to inform individual transition planning.

The Right of Way staff survey was also designed to gather information to assess the readiness of individual change recipients to adopt and use the RITS system. Questions were posed to ascertain the level of understanding of the need for change, the nature of the change and its value to the individual. Questions explored the impact of RITS on the level of change to individuals' work processes and environment, as well as their perception of overall organizational level of support.

6.3.5.5 Change Leadership Capability

RO.9 Right of Way developed and implemented a change leadership model based on three distinct roles and associated expertise.

Right of Way defined and delineated roles and responsibilities to lead the organizational and process change to a new operating paradigm created by RITS. The Right of Way Manager was seen as the advocate and champion of the change in addition to the defined roles of initiative executive sponsor and business solution owner. Responsibility for

managing design and development of the business solution content, and the technology needed to enable this solution was a second distinct role. And, as the Project advance towards implementation, a distinct business transition leader role was defined and established to manage the organizational environment for change. This change leadership structure helped to ensure clarity and consistency in decision-making and communication about the content of the business solution as well as the processes by which change would be enacted.

RO.10 Change leadership preparations commenced with articulation of a vision, the conveyance of a sense of urgency and the need for change, and responsiveness to the need to facilitate organization-level and personal transitions.

Change leadership within Right of Way started with communicating a vision of the future Right of Way Program and how a new, comprehensive information system would enable this vision. Right of Way managers modeled positive behaviors as leaders of change and conveyed a sense of urgency and priority for adoption of new, universally consistent methods for conducting business. During implementation, Right of Way managers assisted individuals with personal transitions from their previous work and decision-making processes to the new ways of working within RITS. This included mentoring and professional support provided by early adopters of the new environment.

6.3.5.6 Organization Culture and Change

RO.11 Diversity in change culture was anticipated due to ODOT's decentralized operating model, informed by the staff survey, and recognized in the pilot.

Right of Way processes are performed and services are delivered at Section Headquarters in Salem and in Region and District Offices distributed across Oregon. The diversity of transportation projects, population density, distinct geography, and staffing levels combine to create varying cultures under ODOT's decentralized organizational model. The Right of Way staff survey was designed, in part, to identify variances in the change environments and in change management practices. The diversity in these factors was recognized in the system implementation and business transition plans and activities for each Region. Moreover, it emphasized the importance of the pilot to explore the change culture at Headquarters and in a typical Regional setting.

RO.12 The RITS business system has transformed Right of Way operations; however, core assets were preserved or remained unaffected.

Although significant, widespread changes were made to Right of Way property acquisition and management processes, many core aspects remained unchanged. The Right of Way organizational structure, governing laws, rules, regulations, most policies, and the content of existing products and services were largely unaffected by RITS.

6.3.5.7 Business Transition Preparations

RO.13 Right of Way developed a business transition planning process, which produced a Plan to deliver and establish the business solution components.

The October 2012 Quality Assurance report was pivotal in highlighting the timing, importance and scope of Business Transition Planning. Public Knowledge recommended (p.9-10) that,

> "Business transition planning should begin immediately…should be treated as a discrete effort within the RITS Project…[and] a comprehensive business transition plan should include the following components: Identification of Affected Business Units; Business Processes; Staffing; Forms, Publications and Policies; Training; Communication; Organizational Change Management; Sustainment and Ongoing User Support."

These recommendations directed Right of Way and TAD to set terms of reference for the recruitment and selection of an external consultant to lead and facilitate development of a Right of Way Business Transition Plan for RITS, commencing in February 2013. Right of Way leadership worked with SPT Consulting to develop and carry out this Business Transition Plan. This Plan addressed multiple components and elements of the business solution, by first determining the gap between solution design and existing operations, and then adapting the organizational *change kaleidoscope* (Hope Hailey & Balogun) to define and manage the change. Execution of the Transition Plan was supported by frequent, multi-faceted communications about the nature and importance of the business change to all Right of Way staff and other stakeholders.

RO.14 Responsibilities for Plan development and execution were assigned primarily to dedicated resources within the RITS Project structure.

Right of Way Leadership Team assumed ownership of the Business Transition with primary responsibility for Plan development and execution. They appointed a member of that Team as the Business Transition Manager and later added a Business Transition Lead to

coordinate training and procedure updates. The Plan emphasized Region staff involvement by adapting Plan delivery to each Region's unique circumstances and conditions. Transition Plan activities and responsibilities were integrated with the RITS System Implementation Plan, within the overall RITS Project Plan.

RO.15 The Business Transition Plan was carried out initially under pilot conditions and lessons learned informed the full-scale rollout of the business components.

Right of Way conducted a pilot execution of the Business Transition in Region 4 (Central Oregon) for several weeks before the RITS solution was introduced statewide. This included release of the RITS technology, education and training for the new system and associated changes to job roles. Findings from this pilot were used to refine the education and training curriculum for the other Regions, to prepare supporting technical material, and to address issues raised by staff.

RO.16 Business support mechanisms were designed, developed, and installed, using the pilot to test their efficacy.

The Business Transition Plan emphasized establishment of long-term Right of Way business system management processes and standards. This included creation or revision of Desk Manuals, "Help" facilities, and training targeted to encourage adoption of RITS. Findings from the Region 4 pilot were used to shape content and delivery of these services.

6.3.6 RITS Project Results

Findings for this stage cover production of results by the RITS Project, based on themes of business acceptance of the system, its operability and maintainability, program and service features delivered, goals and objectives attained, and positioning the organization to realize benefits.

6.3.6.1 Business Acceptance of Solution Content

RR.1 The RW business owner accepted the information system from the supplier in March 2014 at the satisfactory conclusion of business user acceptance tests.

After the system was accepted by the business, Right of Way resources were re-directed from testing to carrying out the Business Transition Plan. The Project was extended by several months to allow time for completion of business transition activities prior to the statewide rollout.

RR.2 The RITS solution has been in full operation in the Acquisition program areas since early 2015 and in the Property Management program since early 2016.

Reports indicate that most recipients have adopted RITS and the modified processes with enthusiasm and with a much lower than typical level of resistance. ODOT has retired the RAIN system that supported Acquisition processes and PMI that supported Property Management.

6.3.6.2 Mechanisms to Measure Project Results

RR.3 RITS contains planned acquisition and property management product and service features.

The RITS Project met its target of streamlining or automating the entire life cycle of right-of-way acquisition processes, starting with preliminary scoping during preparation of the STIP. RITS is active during STIP development with features such as Liaison Files, Diary of Contact and Project Scoping Cost estimates. The acquisition cycle proceeds for many years until construction is complete, which involves RITS features across some 20 acquisition processes. Acquired property is then transferred to the Property Management program, which uses RITS to share information electronically and to record inquiries concerning the potential lease or sale of property that is considered excess to highway needs.

RR.4 RITS has achieved the full slate of original Project goals and objectives.

The purpose of RITS Project was expressed as three goals and all have been achieved. Key Right of Way business processes have been streamlined and automated (and some redesigned). Right of Way information data and document content has been, and continues to be, captured and managed. RITS has replaced in-house built applications: RAIN and PMI. The ODOT Project Completion Report confirms that Project results met each of the nine original Project objectives.

RR.5 There was no legal deadline for RITS activation; however, the Project was able to comply with other administrative deadlines.

Although there was no legal imperative to implement RITS to meet an effective date of new laws or rules, the Project was initially constrained by the potential expiration of the initial funding package. RW was able to secure funding with extensions to the POP expiry date as well as to utilize other funding sources. A later constraint was a loss of support for the technical environment for RAIN and PMI in June 2015. RITS was operational prior to that deadline and both systems are decommissioned.

6.3.6.3 Solution Maintainability

RR.6 A fully implemented RITS solution is ready to be maintained and responsibilities have been assigned.

It is reported that the product vendor has executed a system maintenance agreement with ODOT that covers the web application. ODOT TAD Maintenance would be responsible for any changes involved ODOT systems such as FileNet, TansInfo or PCS. Right of Way would be responsible to make changes to their policies, process models, and procedures that result from changes to laws and rules.

6.3.6.4 Positioning for Benefits Realization

RR.7 The implemented RITS solution positions recipients to generate benefits directly or to enable benefit realization by stakeholders.

With all of its features across the spectrum of Acquisition processes, it is expected that the RITS solution will eventually improve service delivery to the ODOT Project Delivery Business Line, property owners, occupants, and prospective property purchasers. Process and workflow efficiency within the Right of Way organization has already improved.

RR.8 No contributing initiatives or factors outside RITS should affect Right of Way benefit realization; however, two additional features would enhance the return.

There do not appear to be any other initiatives identified outside the scope of RITS, which Right of Way would need to reply upon to realize benefits from RITS. Within the scope of RITS going forward two significant capabilities are now being planned or developed. The first is to provide full access to RITS workflows and documents for RW consultants and contractors. The second is the automation of conveyance workflows and documents. Both are seen to enhance the productivity and efficiency payback from the initial RITS investment.

6.3.7 Right of Way Benefits Realization

Findings for this stage discuss the benefits that the RITS solution is capable of providing to the Right of Way program, its business operations, and its clients. As RITS has been in place for less than two years, whereas the ODOT Project Delivery lifecycle usually spans several years, benefits from more effective and efficient acquisition processes would not yet be visible in most project situations. However, operational performance using RITS over this period provides early indications of value along a number of trajectories.

6.3.7.1 Potential Value to the Public

RB.1 Enhancements to Right of Way acquisition processes are expected to generate value for travelers and industry by expediting ODOT highway project delivery.

Right of Way property definition, appraisal, negotiation, appeal, and acquisition during highway project development demand significant investment of time, resources, and coordination. By streamlining, automating, and enhancing the output quality of property acquisition processes, delays and constraints in acquiring right of way should be minimized, and the benefits of highway construction projects can be more quickly realized. These projects can increase road safety, reduce traffic congestion, and improve the highway travel experience for the traveling public and the transportation industry. Although the project delivery lifecycle occurs over a substantially longer timeline than the RITS solution has been in place, there is early evidence that streamlined and enhanced acquisition processes are already having beneficial impact on highway project delivery.

RB.2 Engagement with property owners and occupants on right-of-way acquisition and relocation is better coordinated and provides more process certainty.

Liaison Files and Diary of Contacts in RITS capture Right of Way communications with property owners and occupants from the initial point of contact onwards, providing the basis for greater consistency and clarity of engagement during property acquisition and potential relocation. These records collect relevant documentation and coordinate in-office and client communication, so that owners and occupants can be clearly apprised of project status and their legal rights, even if the Right of Way Agent assigned to their case changes. Legal templates that are maintained electronically and are accessible via RITS support formal communication. This functionality is expected to remove uncertainties and reduce miscommunications with owners and occupants during project development.

RB.3 RITS supports more efficient disbursement of ODOT-owned properties and more effective engagement with potential buyers.

RITS records infrastructure greatly enhances the Property Management Unit's capacity to manage its real estate assets and respond to use or purchase requests. With property management records readily accessible through the RITS database and automatically supplemented by property acquisition files, the office can provide a higher level of public access to information regarding its holdings with greater reliability and can process offers

more efficiently. Further, its new "PM-Inquiry" system automatically generates case files for real customers, collecting communications records and supporting Right of Way staff in engaging with potential property buyers. A system for increasing connectivity of this process, from initial casual inquiries through to sale of property, is being investigated by the Property Management Unit and would further enhance its level of service to potential customers.

6.3.7.2 Potential Value to Government

RB.4 Implementation of RITS has resulted in universal adoption of its functions, a high general level of requisite proficiency, and exceptional receptivity.

In its early years of operation, the RITS solution has been fully implemented in the Right of Way Program. There is evidence of widespread adoption and effective use of the array of RITS components and a remarkably low level of resistance to the work process and role changes. In the Property Management Program it is reported that RITS has them "going back to the point of actually doing our work in the context of a system…", which is in contrast to the instability and overall disuse of the PMI software. A similar assessment from Right of Way Operations is their finding of near-universal acceptance of RITS as the successor to RAIN. Further opportunities for improvement using RITS are being explored, such as additional digitization of documents and expanded database capabilities.

RB.5 RITS has the potential to generate value to ODOT through efficient right-of-way acquisition, property management, information retrieval, and FHWA reporting.

The first year of RITS solution in use indicates that anticipated benefits should be realized through shorter turnaround times in Right of Way processes, notably improved access to necessary information and documentation, and streamlined management of legal obligations. It is reported that operations are more efficient using RITS features: collaborative electronic document generation and review, automated tools and utilities, enhanced data retrieval and maintenance, and comprehensive electronic case files. Document migration into RITS allows the Property Management Unit to take better stock of the extent of their holdings and positions them to engage potential buyers more effectively. Electronic file management supports greater coordination of property acquisitions and substantially expedites periodic FHWA quality control reviews, facilitating compliance with federal and State laws and regulations – a significant business driver for the RITS Project. Because of these features, RITS has been reviewed as a potential solution by other jurisdictions.

6.3.7.3 Mechanisms to Recognize Additional Value

RB.6 In addition to achieving its expected outcomes, the RITS solution offers new means of delivering value to the Right of Way program and its clients.

Although the return on investment from RITS solution is still being assessed, the initial period of operation has seen RITS achieve its design objectives and generate improvements to Right of Way program processes. In replacing the RAIN and PMI systems, RITS has facilitated increased use of information technology resources in daily operations, reversing the evident decline in use of these legacy systems in performing this work. This use could enable additional benefits from continuous process improvement as new electronic tasks are discovered, as well as reduction in redundant tasks, increased process transparency, and improved coordination between the acquisition and property management domains.

RB.7 RITS features are being considered for adoption as performance measures.

With the RITS solution in place, several features are being studied as a basis for more robust criteria for performance measures and benefits tracking. Since RITS technology is embedded into Right of Way business processes, its system alerts and information tracking tools have potential to be formalized as new process performance metrics. Task-based alerts are coded into RITS and could be used to gauge performance of processes or procedures, while improved oversight of data and document integrity could become quality standards. For Property Management, the subsystem that catalogues inquiries from prospective buyers provides the Property Management Unit with details on volumes and workload that would enable them to articulate the service commitments and contributions of their program.

6.3.8 Multi-Stage Findings

RM.1 ODOT executed the RITS Initiative as a planned change using a modified life cycle planning and delivery model with deliverables for all change dimensions.

The Steering Committee mandated that the RITS initiative follow a change life cycle framework with decision gates at specified points of knowledge and progress, based on the ODOT standard System Delivery Lifecycle (SDLC) methodology, Macroscope®. Early deliverables that led to decisions on scope and investment included business cases, feasibility studies, and an Opportunity Evaluation (OE). Approval of the OE channeled subsequent project initiation work into the standard SDLC methodology, which prescribed

sets of deliverables for analysis, design, development and implementation of the system and for project management. Right of Way established management checkpoints and approvals after each SDLC phase, which the Steering Committee governed. Additional documentation covered process workflows and organizational change preparation instructions.

RM.2 Right of Way acknowledged and responded effectively in many situations to findings of potential quality deficiencies and risks in quality assurance reports.

Under State Policy, certain information technology projects are subject to independent, quality assurance (QA) reviews and risk assessments. For RITS, this began with a review of the RITS Project justification, continued through solution design, applications development, and implementation, with reports submitted quarterly. Each report contained QA review findings, assessments of risks, discussions of risk factors, recommended mitigations, and an evaluation of risk mitigation response progress. QA reviews and reports during the delivery stage covered factors, conditions and practices associated with all dimensions of change.

QA services appear to have strongly influenced the RITS Project in Requirements Management, System Delivery Life Cycle Management, and Business Transition. In general, RITS Project leadership eventually began to respond suitably to the findings and recommended risk mitigations from the QA reports, albeit sometimes with significant time lags. The QA reports were shared openly in Steering Committee and Project Team meetings. The ODOT Project Manager incorporated risk factors from these assessments into a Project Risk Management Plan and process to ensure visibility and management attention. Business-related risks, such as transition planning, began to receive more attention during 2012 and the Right of Way Business Owner managed the risk mitigation responses.

RM.3 Right of Way was cognizant of the organizational and technical risks and challenges, albeit in some cases, much later in the process than optimal.

Informants and initiating documents indicate that Right of Way initiated the RITS Project with some understanding of the operational and organizational challenges posed by their future vision. However, both Right of Way and the product supplier seriously underestimated the technical challenges of creating a system for the entire lifecycle of the Acquisition process. The proposed product on which the RITS solution was to rely was at a much earlier stage of development (i.e., at best a prototype) than was originally understood.

Right of Way strived to foster a culture of risk tolerance and optimism about IT-enabled process change, building upon the successful RDMS conversion project. They recognized the lack of flexibility inherent in the RAIN and PMI databases and applications that hindered process efficiency, customer service and consistent compliance with regulations.

Right of Way applied this knowledge to inform its decisions and, where possible, translated these challenges into actions in the design, development and implementation of RITS. This also required adjustments to the processes needed to deliver the solution, as well as some organizational preparations needed for staff to accommodate the change.

6.3.9 Summary of Findings

This Section summarizes the eighty-six findings that are organized and presented according to the dimensions and stages of the ICLM. They provide a longitudinal perspective starting with policy and strategy for innovation and change through to implementation and activation of the solution. Findings are derived from participant-validated transcripts from individual interviews; descriptive and explanatory documents from the Project and/or the RITS solution; independent assessment reports from external quality assurance reviews and risk assessments; and researcher notes both as a participant-observer during a one year assignment with the Project, and as independent observer while conducting this case study.

The first area of findings pertains to the policy and strategy for envisioning the innovative use of information technology to reshape right-of-way processes and setting up the governance structure for the strategic change initiative. The State and ODOT had previously established an Information Technology Governance model and processes, which they applied to the RITS Project. Within this structure, IT Project Governance roles and responsibilities were defined for the Transportation COI Council, a Project Executive Sponsor, Project Steering Committee and Business System Owner.

Right of Way expanded its ambition of what it could achieve in terms of process improvements when a new information technology concepts were unveiled. This occurred after the Transportation Community of Interests Council commissioned the Project and Right of Way formed the Project Team. The Project entity did, however, assume responsibility for producing a comprehensive public service program solution, not just a technology solution.

Findings pertaining to solution content are that the core RITS application integrates a number of technical solution components, each of which is supplied and supported by a different ODOT unit. Non-technical components of the solution are policies, processes, and procedures for acquisition, relocation and property management; back-office conveyancing and financial administration; and user support.

Several findings cover processes used to design, develop and implement the integrated solution. Most notably, Right of Way designed management processes, roles and responsibilities for all dimensions of change. ODOT assigned accountability to the web developer to act as an overall *information systems integrator* for RITS technical components. ODOT assigned to Right of Way responsibility as *public services solution integrator*.

For the organizational environment for change dimension, the external Quality Assurance provider recognized early in the lifecycle that there might be issues with the readiness, capacity and capability of participating Right of Way organizational units and individual roles to handle the change. Right of Way leadership responded to the identified potential organizational change impediments and was proactive in mitigating these risks through a staff survey and Business Transition Plan. Right of Way addressed concerns of change recipients through a pilot implementation in one area of the State. This tested the entire RITS solution, the training program and process-centric information and support.

In terms of results, Right of Way considers the RITS Project to have attained the goals and objectives for the property acquisition domain. Staff adoption of RITS has been universal and efficiency gains are starting to emerge as use of the system matures.

Three findings extend across all lifecycle stages and change dimensions. First, the Project followed a planned change model that required specified management decision gates, incremental knowledge assembly, and deliverables for all change domains. Second, Right of Way accepted and responded effectively to findings from external assessments that highlighted potential quality deficiencies and risk factors. And third, while Right of Way initiated the Project with some understanding of operational and organizational challenges posed by their future vision, they, and the product supplier, seriously underestimated the technical challenges of creating a system for the entire lifecycle of acquisition processes.

7. Discussion

7.1 Introduction

This Chapter documents the advanced design of a theoretical and empirical model that integrates multiple dimensions throughout the lifecycle of IT-enabled public services change. This Integrated Change Lifecycle Model (ICLM) features an extensive set of characteristics - factors, organizational conditions, and managerial practices - that should be considered by public sector leaders and organizations as they govern, manage, and perform IT-enabled change initiatives.

The preliminary ICLM introduced in Chapter 4 has been demonstrated, evaluated, refined, and elaborated empirically using the Oregon DMV e-Government Applications and ODOT Right of Way Information Tracking System (RITS) initiatives as case studies. In Chapters 5 and 6, the advanced ICLM is used to organize findings and supporting data by change dimension and lifecycle stage and to produce a series of descriptive narratives on how the change initiatives were governed, managed and performed.

This Chapter interprets these findings and contributes to a thorough understanding of the cases studied and IT-enabled change generally. The interpretation examines connective threads among the dimensions of change and between the governance and managerial roles and the change dimensions. It examines case findings for consistency or inconsistency with the extant literature and ways by which the findings could enhance the body of knowledge.

Section 7.2 documents the empirically evaluated Integrated Change Lifecycle Model, listing characteristics that are associated with successful IT-enabled public services change initiatives, as discovered in each of the three change dimensions and five lifecycle stages. It summarizes major changes that were made to the preliminary Model, which are a result of case study conclusions.

This section defines the knowledge contribution of the ICLM as an improved solution to the problem of change initiative failure using the *design science knowledge contribution framework* from Gregor & Hevner (2013).

Section 7.3 explores differences and similarities in characteristics between the DMV e-Government and Right of Way Information Tracking System initiatives using the stages and dimensions from the advanced ICLM to organize a comparison between these cases.

Sections 7.4 through 7.10 discuss seven overall *themes* that were synthesized from case study findings. This discussion includes underlying theory for the theme, a comparison between the two case study organizations related to the theme, and the possible contribution to the theoretical body of knowledge for the theme.

Section 7.4 reviews the levels of change ambition for each of the case study organizations by applying the framework introduced by Venkatraman (1994) to explore the scope and impact of different levels of public services change.

Section 7.5 discusses the design of an integrated public services system solution adapted from the Rummler & Brache (1995) performance improvement and management framework, which represents the content of IT-enabled change.

Section 7.6 discusses the project governance policy, structures and processes employed by the case study organizations to oversee and direct their respective initiatives.

Section 7.7 reviews leadership aspects, managerial roles, and responsibility assignments within the change initiative that are specific to each change dimension for each case study organization.

Section 7.8 discusses change preparations undertaken by each case study organization for the internal environments in which the change would occur.

Section 7.9 leads with a discussion of what constitutes success in a change initiative from the perspectives of various stakeholders in each of the cases.

Section 7.10 reviews the prospects for realization of benefits in each of the cases through the diffusion of technology into the respective organizations and among customers.

7.2 Integrated Lifecycle Model for IT-Enabled Public Services Change

7.2.1 Summary of Model Changes from Case Studies

The preliminary Model introduced in Chapter 4 has been demonstrated, evaluated, refined, and elaborated first using the Oregon DMV e-Government Applications initiative, as documented in Chapter 5, and then using the ODOT Right of Way Information Tracking System (RITS) initiative, as documented in Chapter 6.

The following summarizes major changes that were made to the preliminary Model, which are a result of deliberations during these case studies.

(1) In each lifecycle stage, the term *Business* is replaced by *Public Services.* This latter term recognizes the unique characteristics of public sector organizations and their change initiatives.

(2) *Formulation of Public Policy and Strategy* has fundamental characteristics that warrant its addition as the first stage *within* the change initiative and ICLM.

(3) The *Design and Implement Change Stage* has been renamed the *Change Delivery Stage.* It includes various activities that are performed to design, develop, and implement a public services solution. The case findings were that *development* of the solution is a distinctive phase from *implement* the solution in these settings.

(4) The *Solution Content* dimension is characterized as a *public services system*, rather than as a *business system* to ensure clarity of purpose and scope and as a baseline for the assessment of transferability of the ICLM to other contexts.

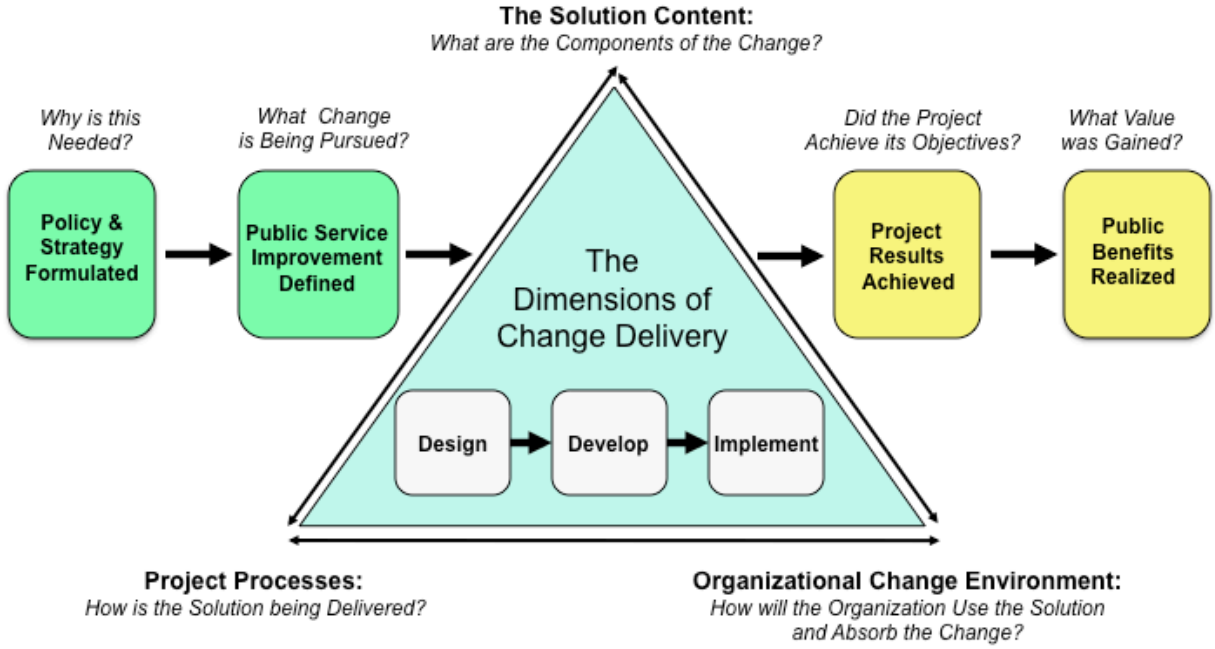
(5) The Organizational Context dimension is renamed *Organizational Environment for Change*, which better reflects the scope of this dimension as the organizational conditions in which change will be accommodated, the transitions needed by individual change recipients, and the change leadership and managerial practices required to absorb the change.

(6) Separate lifecycle stages are defined for *Project Results Achieved* and *Public Benefits Realized*. In the case study situations, change initiative (project) results are equated with the achievement of project and solution objectives, which are generally known shortly after the project is completed. In contrast, public benefits may not be immediately measureable or realizable for a number of years after project completion.

7.2.2 An Advanced Integrated Change Lifecycle Model

Figure 7.1 illustrates the advanced Integrated Change Lifecycle Model, which reflects the changes discussed above. Each stage of the ICLM represents a plateau of achievement. The first stage of the Model is the formulation of the public policy and strategy to provide the rationale and guidance to launch the change and to forecast the level of IT investment. The improvement definition stage is where the intention to change an existing public service system is expressed as improvement objectives, a business case is accepted, and a change initiative organizational entity is formed. The change delivery stage, comprising design, development, and implementation phases, is where the three dimensions of change are managed explicitly: the solution content, project delivery processes, and the organizational environment for change. The results stage is where a new or redesigned process, service, or program is in operation and results are measured in relation to objectives. The final stage is where benefits from the change are realized and the initiative value is determined.

Figure 7.1: An Integrated Change Lifecycle Model for IT-Enabled Public Services Change



Elaboration of each stage and dimension into detailed, observable characteristics reveals the fundamental nature of a particular change initiative and validates the utility of the Model as a valuable artifact. This elaboration took place when the ICLM was demonstrated and evaluated empirically, as reported in Chapters 5 and 6.

7.2.3 Definition of the Advanced Model Stages and Change Dimensions

Table 7.1 expands the graphic representation of the ICLM to include a purpose statement for each stage and change dimension plus characteristics of a successful change initiative that were discovered, evaluated and demonstrated by the case studies. The ICLM stages and dimensions are multiple lenses to identify and understand these characteristics - *factors*, *organizational conditions*, and *managerial practices* - which appear in successful public services change initiatives.

Table 7.1: Characteristics of the Integrated Change Lifecycle Model for Public Services

Life Cycle Stage & Change Dimension	Purpose	Characteristics: Factors, Organizational Conditions and Management Practices
Planning Stages		
Public Policy & Strategy Formulation Stage	Identify and plan initiatives to improve public service delivery, program effectiveness and/or government efficiency in response to a legislated mandate or societal expectations.	*External Environment Assessment:* • Driving forces for change identified • External change inhibitors understood *Innovative Change Opportunity*: • Opportunity evaluated against policy goals • IT-enabled change ambition defined *Strategic Direction:* • Strategic vision for success articulated • Strategic purpose and outcomes defined *Resource Allocation:* • Top management commitment confirmed • Projected investment recognized *IT Investment Governance:* • IT governance policy developed & applied • External QA & risk assessment needs
Public Service Improvement Definition Stage	The targeted improvement to public service delivery, government efficiency or legislated program change to be pursued by the initiative.	*Targeted Program & Service Improvement:* • Aligned to public policy & strategy goals: ○ Public service delivery, and/or ○ Government workflow efficiency and/or ○ Legislated program change *Initiative Objectives & Scope Definition:* • Defined and achievable objectives • Planned and manageable scope *Business Case Justification:* • Level of technology investment estimated • Business case justification accepted • Initiative funded and approved to proceed *Internal Environment Assessment:* • Internal change enablers understood • Internal change inhibitors understood *Organizing the Change Initiative:* • Temporary Initiative/project entity formed • Initiative governance structure established

Life Cycle Stage & Change Dimension	Purpose	Characteristics: Factors, Organizational Conditions and Management Practices
Delivery Stage: Design, Develop and Implement		
Delivery Stage: Solution Content Dimension	An effective "public service system" solution that integrates technical and agency program components to meet substantive requirements of all change domains.	*To-Be Organizational Domain:* • Enabling legislation & administrative rules • Policies and standards reviewed • Organization and stakeholder impacts • Integration within organization domain • Integration with process domain *To-Be Business Process Domain:* • Process/workflow maps and descriptions • Procedures and business rules revised • Data and document integrity and quality • Integration within process domain • Integration with technology domain *To-Be Information Technology Domain:* • Customer access and connectivity • Infrastructure • Software and services • Integration within technology domain *To-Be Job/Performer Domain:* • Job re-alignment recognized and planned • Education and training on full solution • Job-level performance measures defined
Delivery Stage: Project Processes Dimension	The governance, management and technical processes needed to design, develop and implement the solution according to scope, schedule and specification, and within budget.	*Project Governance Processes:* • Project governance process execution • Effective quality assurance process *Program Ownership of Solution Domains:* • System owner role performance • Program area ownership demonstrated *Project Organization:* • Project change dimension coverage • Project communication mechanisms • Program area & IT resource assessment *Project Management Processes* • Project scope managed effectively • Schedule managed via change requests • Costs managed by phase and component • Program area & IT resources available *Solution Delivery Model* • Delivery model understood and agreed • System integrator role assigned *Solution Delivery Lifecycle Methods* • Solution delivery methods in place • Requirements managed through-out • Stage and/or phase decision gates *Solution Testing* • Multi-faceted integrated system tests • Business owner/user acceptance tests • Defects managed and resolved *System Implementation Strategy and Plan:* • Pilot implementation & lessons learned • User support mechanisms in place • Implementation responsibilities clear

Life Cycle Stage & Change Dimension	Purpose	Characteristics: Factors, Organizational Conditions and Management Practices
Delivery Stage: Organizational Environment for Change Dimension	The organization is suitably prepared for the change, with managerial leadership, employee commitment, motivation, and skills needed to accept the change content and to make effective use of capabilities offered by the solution.	*Organization Commitment to Change:* • Top management commitment • Organization collectively values change *Organization Change Capacity:* • Operational absorptive capacity understood • Individual absorptive capacity determined *Organization Operational Capability:* • New organizational capabilities defined • Staff knowledge & skills defined • Education and training program activated *Organization Operational Readiness:* • Organization-level readiness assessed • Individual readiness preparations made *Change Leadership Capability:* • Change leadership model established • Change leadership preparations made *Organization Culture for Change:* • Change culture diversity understood • Valued existing assets preserved *Organization Operational Readiness:* • Business transition plan established • Transition responsibilities assigned • Pilot transition and lessons learned • System support mechanisms in place
Demonstration Stages		
Project Results Achievement Stage	The program, service and organizational objectives successfully achieved by the change initiative (project) through customer and agency staff use of the solution.	*Acceptance of Solution Content:* • System owner accepts quality solution • Solution adopted by customers & staff *Mechanisms to Measure Results:* • Delivers needed program/service features • Meets defined project objectives • Meets legislated or completion date *Solution Maintainability:* • Solution is transitioned to maintenance *Positioned for Benefits Realization:* • Positions solution recipients for benefits • Identifies contributing initiatives & factors
Public Benefits Realization Stage	On-going value realized by citizens and government, from sustained diffusion and adoption of solution delivered by the change initiative.	*Value to Citizens, Customers & Clients* • Diffusion of solution use by citizens *et al* • Enables citizens *et al* to realize value *Value to Government* • Inculcation of solution within organization • Solution produces value to government *Mechanisms to Measure Value* • Measured against expected outcomes • Contributes to attaining organizational performance measures

7.2.4 Knowledge Contribution from Integrated Change Lifecycle Model

The advanced Integrated Change Lifecycle Model defined herein contributes to the lifecycle theory of organizational development and change (from Van de Ven & Poole, 1995). It applies to planned change where a single change entity follows a sequence of prescribed development stages to produce a series of deliverables that are cumulative in knowledge acquisition and achieve a specific end state, while being regulated by underlying rules.

The Integrated Change Lifecycle Model is defined, elaborated, and evaluated with numerous characteristics identified throughout the lifecycle stages of successful IT-enabled change in a public sector context. This expands the range of considerations that have been proposed in IT-enabled change frameworks, concepts, and models, such as those offered by Manwani (2008), Kotter (1996), Cooper & Zmud (1990), and Kettinger *et al* (1997).

The Integrated Change Lifecycle Model extends the scope of the theoretical change dimensions of content, process, and organizational environment (from Pettigrew, 1987) to cover the solution content and project delivery processes of IT-enabled change in a public sector context. The ICLM also expands the use of the original three-dimensional framework beyond strategy formulation to include solution design, development, and implementation, and to measure the operational results achieved by an IT-enabled change initiative.

The Integrated Change Lifecycle Model can be used to facilitate a comprehensive examination of factors, organizational conditions, and managerial practices across all change dimensions in the design, development, and implementation of an IT-enabled solution. It should provide a stronger argument for what is needed to set up a new initiative and thereby increase the probability of success.

The characteristics of the Integrated Change Lifecycle Model could be used as a basis for qualitative studies that compare successful and failed change initiatives.

7.3 Summary of Cross-Case Comparisons

Table 7.2 summarizes differences and similarities in findings from the DMV e-Government and Right of Way Information Tracking System initiatives. This uses stages and dimensions from the final ICLM to compare the cases, as described the following narrative.

Table 7.2: Cross-Case Comparison by Change Lifecycle Stage and Dimension

Stage / Dimension	DMV e-Government	Right of Way RITS
Policy & Strategy	• Government to Citizens (G2C) • DMV from Home vision for public service delivery innovation • Budgetary constraints • Potential for political visibility	• Government to Government (G2G) • No direct benefit or impact intended for general public • Budget flexible for funding source • Low political profile
Improvement Definition	• New service delivery channel for existing products • Scope was carefully managed • Filtered focus on two services • External customer service focus	• Started as system replacement • Evolved to program transformation • Scope intentionally expanded to cover entire acquisition lifecycle • Internal administration emphasis
Change Delivery - Project Processes	• DMV / DAS IT Governance policy & processes • Integrated project organization with well-defined roles & responsibilities • Headquarters process driven • Primary vendor supplied solution components from existing artifacts • ODOT IS was system integrator • DMV Service Groups performed role of public services integrator	• ODOT / DAS IT Governance policy & processes • Layered project organization with evolving roles and responsibilities • Emphasis on Regional process • Vendor custom-developed web application • Vendor was 'de facto' integrator • RW Operations performed role of public services integrator
Change Delivery - Solution Content	• Solution guided by existing State laws & regulations • DMV used State e-Commerce policy, standards & solution • Integration with DMV legacy core applications & data bases	• Solution determined by Federal Uniform Act requirements • Integrated property acquisition & management applications • Integration with ODOT legacy core project delivery systems
Change Delivery - Organizational Change Environment	• Early preparations for change management and transitions • Line management responsibility • Very receptive change context	• Delayed preparations for change management and transitions • Staff specialist responsibility • Variable receptive change contexts
Project Results	• Achieved target customer volumes within 5 years • High level of customer satisfaction • Minimal disruption to DMV operations • Smooth adoption & diffusion of technology by citizens & staff • Consensus is that e-Government is successful – it achieved objectives	• Replaced legacy systems with expanded functionality • Region & Headquarters staff adopted RITS features • Process improvements throughout acquisition & property management • Consensus is that RITS has already achieved most objectives
Benefits Realization	• Customer adoption & DMV benefits limited by other delivery channels	• Early indications of efficiencies that will improve highway projects

7.3.1 Case Comparison of Final Integrated Change Lifecycle Model

7.3.1.1 Summary

Both initiatives explored as case studies demonstrate the successful application of a lifecycle model with customization to reflect the nature of the solution as well as the organizational environment within which to deliver and manage planned change.

DMV and Right of Way each applied a lifecycle model to govern, manage, and perform their change initiative, although Right of Way adopted the model later in solution development when mandated due to scope changes. Both initiatives were structured according to the ODOT standard Systems Delivery Lifecycle (SDLC) methodology – Macroscope® - with processes and deliverables that incorporated the application development methodology of their chosen IT providers. Macroscope® is a sequenced waterfall structure for information systems management that defines specific phases with deliverables, decision gates, and delivery responsibilities. The information system content and processes were complemented by deliverables and responsibilities for business process solution components and organizational change management.

As a model for planned change, the ICLM organizes project activity in terms of change content; processes by which the change is governed, managed, and performed; and the external and internal organizational environment (context) in which the change occurs (based on Pettigrew, 1987). This provides structure and rationale for the work done and deliverables produced by each project organizational unit, guiding them through cumulative sequence of objectives in planning, solution delivery, and demonstration stages. DMV and Right of Way each adopted the ODOT standard methodology for information systems content, integrated features of application development methods of their primary IT provider, and augmented this with deliverables and responsibilities for business process solution components and organizational change management.

7.3.1.2 Planning Stages

Comprehensive public services change planning expresses the vision, purpose, and desired outcomes for change in the context of drivers and inhibitors; aligns the change intention to strategy goals; defines the change initiative scope and objectives; and forms a temporary organizational entity to design, develop, and implement the change.

DMV planned the e-Government (G2C) solution in the context of an organizational environment that had been disrupted by an unsuccessful Licensing Re-engineering Project, but had since successfully delivered several incremental projects. Guided by the *DMV from Home* vision, informed by several preliminary and preparatory studies, and constrained by funding limitations, DMV commissioned the e-Government Project with a conservative scope, with clearly defined objectives, targeted improvements, and potential benefits. The deliverables defined in the lifecycle model enabled DMV to launch its initiative with a clear understanding of the technological and operational challenges it faced and with measured ambition for what it could accomplish.

In contrast, Right of Way originally intended only to replace the existing functionality of legacy systems. An introduction to an IT innovation during solution design encouraged Right of Way to broaden the scope of their ambitions for RITS to encompass streamlining of acquisition and property management processes (G2G). Flexibility in funding sources, low visibility, and an internal administrative focus were organizational environment conditions that facilitated this expansion.

7.3.1.3 Solution Delivery Stage

DMV and Right of Way developed and applied a hybrid methodology to design, develop, and implement an IT-enabled public services solution in collaboration with an IT provider. The lifecycle model defined deliverables for solution content; processes to govern, manage, and deliver a solution; and preparations for the organizational change environment.

Solution content deliverables were structured to ensure that all components were integrated and met the substantive requirements of each solution *domain*. Both cases show prescribed sets of deliverables for each service and IT components of the solution, as well as for project management across all change dimensions.

In the RITS Project, adoption of the full lifecycle model began during solution design. This was characterized by a series of content elements that were necessary to deliver the solution successfully, ranging from a concrete system design document to system implementation and business transition plans. In both cases, those elements established decision gates, benchmarks and accountabilities for each solution component.

In both initiatives, the governance and management processes were structured to deliver the solution in accordance with an approved scope, schedule, and budget. These processes included managing scope, delivery methods, decision-making, solution testing, and implementation planning. The applied Model defined ownership and responsibility across change units for each of these processes, linking them with content deliverables and organizational change aspects.

For Right of Way, the model helped to control cost and schedule commitments, as each deliverable was associated with a specific solution delivery phase and change component. In both cases, the model provided structure for managing the development of system functions and process workflows to meet the service needs.

Products and processes in the change delivery stage covered the organizational change environment both by informing the context and by becoming an avenue for delivering the change. Both initiatives used an organizational capacity, capability and readiness assessment to gauge change solution receptivity of each affected unit. Using assessment findings, managers were engaged as advocates and leaders of change and pilot deployments were launched to refine solution implementation methods and transition plans, which encouraged the change recipients to accept the change and adopt the new system.

7.3.1.4 Demonstration Stages

Demonstration of an implemented solution involves operating the solution in a production setting, determining results achieved, and measuring the solution performance against expected outputs. In both initiatives, the implemented solution was evaluated against goals, expected outcomes, and objectives defined in the ICLM planning stages.

The DMV e-Government solution has achieved its objectives, customers have realized benefits from the solution ease of access and use, and there has been displacement of higher-cost transactions with customer self-service tasks.

Right of Way has de-commissioned its legacy systems with RITS having been accepted internally by all affected organizational units and is on a path to achieving all objectives of its initiative. There are early indications that right-of-way acquisition process streamlining will improve the delivery of ODOT highway projects.

7.3.2 Case Comparison By Theme

7.3.2.1 Summary

Table 7.3 summarizes differences and similarities in findings from the DMV e-Government and Right of Way Information Tracking System initiatives. This Section explains the seven themes derived from the case thematic analysis as the basis for this comparison.

Table 7.3: Cross-Case Comparison by Theme

Theme for Discussion	DMV e-Government	Right of Way Tracking System
Change Ambition (7.4)	• Mission-critical systems • Customer self-service option • New processes designed • Some integrated network features • Amenable to process innovation	• RITS will become mission-critical • Internal work simplification & standardization • Some integrated network features • Process streamlining & automation
Integrated Public Services Solution (7.5)	• Oregon statutes & regulations • Aligned with State-wide systems • DMV delivery channel designed for vehicle registration & addresses • Capability for new work processes • Enhanced customer support	• Federal & OR statutes & regulations • Integrated with ODOT Project data • Enhanced RW acquisition process across entire lifecycle • Replacement of RW legacy systems • Enhanced support for RW staff
Governance of IT-Enabled Public Services Change (7.6)	• IT investment threshold attained • State IT governance policies, deliverables & scrutiny • Business line IT governance policy & standards • Multi-level decision hierarchy carried out in line with policy • Active, involved Executive Sponsor • eGov delivery channel Manager active as System Owner • Recognized contribution of QA provider to actions for success	• IT investment threshold attained • State IT governance policies, deliverables & scrutiny • Department IT governance policy & standards • Multi-level decision hierarchy evolved • Passive Executive Sponsor • State RW Manager as System Owner for all change dimensions • Recognized contribution of QA provider to steps leading to success
Managerial Roles & Responsibilities (7.7)	• Distinct managerial roles defined for each change dimension • DMV Information Services Manager held managerial role for solution • DMV Project Manager role for project processes • DMV Processing Services Manager led organizational change preparation • External e-Government developer performed as IS integrator • DMV Business Team performed role of public services integrator	• Distinct managerial roles defined for each change dimension • Former RW Operations Manager assumed manager role for solution • Project Product Manager reviewed and approved solution deliverables • Project Process Manager role for project processes • State RW Manager & Business Transition Mgr. led organizational change preparation • ODOT IS TAD was IS integrator for RITS application & access to ODOT Project Delivery systems • DMV Business Team performed role of public services integrator

Response to Organizational Change Environment (7.8)	• Organization capacity, capability & readiness assessed & remediated • Individual capability, readiness & transition needs addressed • Recognized implications of customer self-service model • Pilot implementation in Deschutes County tested solution effectiveness	• Organization capacity, capability & readiness assessed & remediated • Individual capability, readiness & transition needs addressed • Recognized implications of RITS as a mission-critical system • Pilot implementation in Region 4 & HQ tested solution effectiveness
Success as a Social Construction (7.9)	• Interests and expectations of eGov differ by roles and stakeholders • Opinions vary on what constitutes a successful change initiative • Perspectives are consistent within each DMV eGov role	• Interests and expectations of RITS roles and stakeholders • Opinions vary as to what constitutes a successful change initiative • Perspectives are consistent within each RITS role
Realization of Benefits through Technology Acceptance and Diffusion (7.10)	• Vehicle owners control the means of registration & payment • Process efficiencies within DMV • Transactions diverted to lower unit cost delivery channel	• Minimized right-of-way delays & constraints on project delivery • Long-term benefits to travellers from streamlined construction projects • Assurance of process compliance with applicable laws • Improved relations with property owners, occupants & purchasers • Property management effectiveness

7.4 Public Services Change Ambition

This theme describes the level of change ambition targeted by management when launching an initiative and on-going containment of solution scope in relation to this ambition.

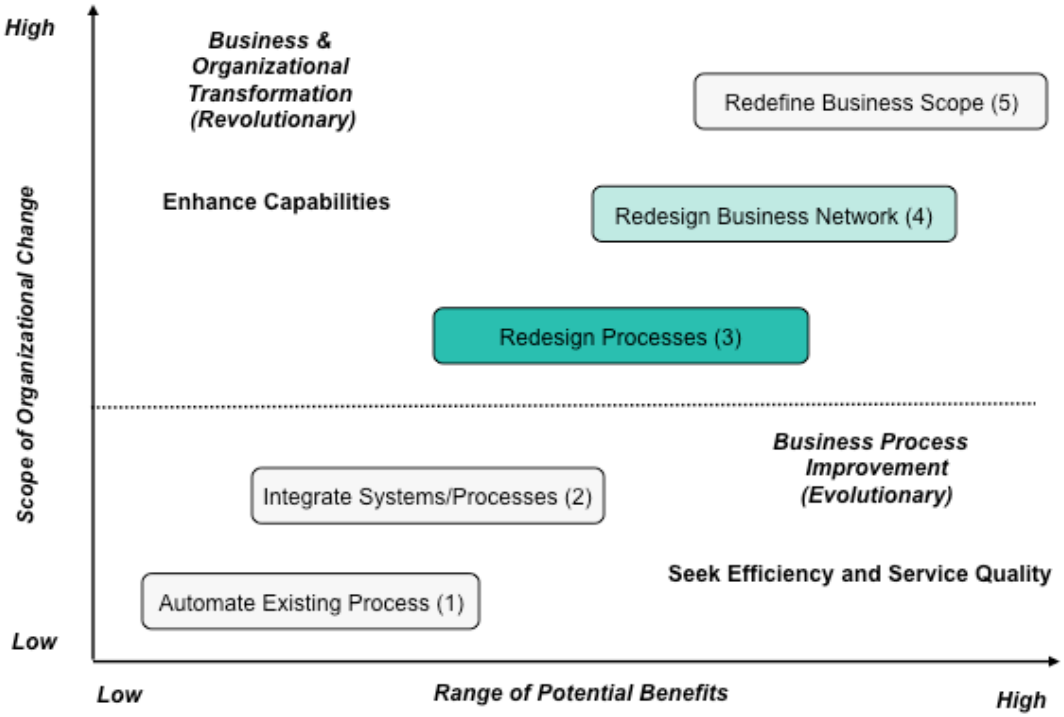
7.4.1 A Theory of Change Ambition

Figure 7.2 presents a framework for understanding IT-enabled organizational change, based on Venkatraman (1994). This framework originated with MIT's *Management in the 1990s* research project (Scott Morton, 1991). It has been applied in public agencies (e.g., Homa, 1998) to understand the aspirations and experiences of senior managers of these organizations. Evidence suggests that understanding the level of change ambition that management seeks is a characteristic of a successful initiative.

The framework is based on two dimensions: (1) the range of potential benefits from the innovative application of information technology; and (2) the degree of organizational change that is required to produce the benefits. The central proposition is that the benefits from IT investment are marginal if superimposed on existing organizational conditions (especially strategies, structures, processes, and culture). In contrast, benefits accrue in those cases where investments in IT functionality accompany planned adaptations in

organizational characteristics. A related assertion is that the range of potential benefits increases from the first level — localized IT exploitation for existing processes — to the highest level — redefinition of the business scope.

Figure 7.2: Levels of Business and Organizational Change Ambition



7.4.2 DMV Service Delivery Ambitions

Like banks, airlines, and retailers, DMV information systems are critical to its mission (McFarlan, 1984). Historically, State staff has delivered most DMV products and services with the aid of various legacy systems. The DMV e-Government Applications Project was intended to extend the reach of its service delivery channels by introducing a customer self-service option that would provide the capability and the convenience of access at any time and from anywhere.

Initiating documents and interview responses suggest that the DMV e-Government service delivery initiative was intended to be a *process redesign* effort with ambitions at Level 3 of the IT-enabled change hierarchy (Venkatraman, 1994), but with elements of *business network re-design* (level 4 considerations). As a consequence of an unsuccessful large-scale change effort in the mid-1990s, DMV management was not receptive to *radical process re-engineering* (Hammer & Champy, 1993), but was amenable to selective *process innovation* (Davenport, 1993) to enhance its service.

7.4.3 Right of Way Administrative Process Change Ambitions

Information systems are important contributors to the processes needed to acquire and manage property for State highway right-of-way. Right of Way leadership recognized the potential to use information technology to streamline and automate many of its administrative processes.

As illustrated in Figure 7.2, the original scope of change for RITS was *process improvement* ambitions to automate or streamline processes, actions defined by level 1 or 2, respectively of the IT-enabled organizational change hierarchy (Venkatraman, 1994). As Right of Way leadership became aware of potential advantages from information technology innovations, the RITS change ambition and scope expanded to include *process re-design* opportunities (level 3), with some aspects of *business network redesign* (level 4); such as to provide external consultants with full system access capabilities. As Right of Way processes are governed by the federal Uniform Act, State laws, and regulations, ODOT management did not have freedom to pursue *radical process re-engineering* (Hammer & Champy, 1993), but did pursue the goal of *process innovation* (Davenport, 1993).

7.4.4 Knowledge Contribution to IT-Enabled Change Theory

The knowledge contribution to organizational change and management theory from this theme is extending the relatively mature model of IT-induced configuration (from Venkatraman, 1994) to the delivery of public services system change. In particular, there are complex aspects of public services solutions, such as: inter-organizational information systems integration, (a level 4 design consideration); and the laws, regulations, and policies that constrain process redesign (a level 3 consideration). Government procurement rules can also limit the solution choices available to public sector managers and, therefore, curb their ambition for broad public services system change.

7.5 An Integrated Public Services System Solution

Findings from the case studies confirm that an IT-enabled change solution consists of many domains of content. This Section discusses the theme of the ICLM content dimension as a *public services system*, which integrates multiple solution domains and components.

7.5.1 A Framework and Theory for Solution Content

Based on decades of research and application, Rummler & Brache (1995) offer a theoretical framework for understanding change content in an organization as an integrated, adaptive system. The framework provides managerial guidance on three levels: (1) The *Organization Level*, which emphasizes the organization's strategic direction, its relationship with its market, its major functions, its policy and regulatory constraints, its organizational structure, and resource allocation; (2) The *Process Level*, which is the means for efficiently producing effective outputs through myriad cross-functional work processes that are shaped by requirements of customers and the organization and that may be enabled by information technology; and (3) The *Job/Performer Level*, in which individuals in various roles perform and manage process responsibilities according to standards and measures, facilitated by training. The current research has studied the adaptation of the Rummler & Brache three-level framework and performance improvement methodology to a public sector setting with an emphasis on information technology as a primary design factor at the Process Level.

7.5.2 Comparison of Public Services Solution Content

The scope of the solution content is defined by identical solution domains for both initiatives, a number of similar components, and several different elements that were needed for a complete, integrated public services system for the targeted program and service delivery improvements.

7.5.2.1 DMV e-Government Service Delivery Channel Solution

The DMV e-Government service delivery channel solution includes organizational, process, and performer components of an integrated *public services system* for vehicle registration renewals and changes of address for individuals. This Internet-based channel has been functioning well for over a decade and has attained its *mature state* transaction volume targets.

Oregon DMV operates primarily under the aegis of Oregon Revised Statutes (ORS) and agency regulations. This provides a degree of freedom for DMV to modify its practices, such as enabling customer self-service, by requesting amendments to applicable State laws and regulations. For e-Government applications, the solution had additional integration requirements: compliance with State e-Commerce policy and standards, including mandated use of a specific payment system; and compliance with State and ODOT financial standards and processes. Although the e-Government delivery channel introduced several new and modified processes, the existing DMV organizational structure was able to accommodate the changes within its Customer Services, Information Services, and Processing Services units. Some internal DMV policy changes were needed to govern these processes.

At the process level, the new delivery channel required content integration among applications and databases for: (1) DMV's legacy customer and vehicle systems; (2) the state-wide e-Commerce payment manager; and (3) the custom-developed DMV e-Government web-based vehicle registration renewal and customer address applications. As will be discussed in Section 7.6, this required coordination among three different organizations involved in the design, configuration and implementation of the DMV e-Government information technology solution components.

At the job/performer level, the DMV e-Government applications required modest skill development in the DMV Processing Services Group and additional capabilities in customer support via on-line and telephone methods. Training was focused on ensuring the best possible experience for DMV customers using the Internet-based channel.

7.5.2.2 Right of Way Information Tracking Solution

The RITS solution contains organizational, process, and performer components of an integrated *public services system* for the administration of right-of-way property acquisition, property management and occupant relocation. In contrast to DMV, which is governed primarily by State of Oregon laws, the Right of Way program is governed primarily by the U.S. Federal Uniform Act and regulations. This limits the freedom available to ODOT for redesign of these processes.

ODOT procured FlairDocs – marketed as a Commercial off the Shelf (COTS) package – as the primary IT solution component, with a requirement to integrate this with several existing ODOT Project Delivery systems. This supported the Right of Way vision of a completely automated and integrated system for right-of-way property acquisition, property management, and occupant relocation services. As with DMV, this required coordination among multiple IS organizations.

At the job/performer level, utilization of RITS is required of virtually all staff and managers in the Right of Way program areas. RITS is mission critical for Right of Way and requires considerable knowledge about how the system functions and supports the underlying business processes. Unlike DMV e-Government, which directly affected only localized Service Groups, RITS has widespread impact on the entire Right of Way program. This is reflected in the breadth and depth of organizational change preparations that were required, which are discussed in Section 7.7.

7.5.3 Knowledge Contribution to Organizational Performance Theory

DMV e-Government and RITS both represent complete system solutions based on information technology innovation. The Rummler-Brache (1995) process management model assists with understanding, designing, and measuring organizational performance on three levels within an integrated system. Case study findings reveal the content of DMV e-Government and RITS as integrated public services system solutions that cover all levels and many components of change. Modification and elaboration of components within the three performance levels in the Rummler-Brache framework are proposed to recognize the unique environments in which public services systems are designed and operate.

The Rummler-Brache framework helps to improve the understanding of a procurement challenge faced by both case study organizations as well as by many public agencies. For common U.S. state program areas, such as transportation, external solution providers often propose that they can easily transfer proprietary technologies and, with minor customization, use them as foundations of an exported solution. Unique state laws, rules, regulations, and policies, however, inhibit application of such IT solutions, which usually are designed from and imbed laws, rules and policies of other jurisdictions.

7.6 Governance of IT-Enabled Public Services Change

This Section discusses the theme that successful IT-enabled public services change requires an effective *governance policies, structure and processes* to oversee, direct, and integrate the management and performance of all change dimensions. It compares the IT governance policies, structure, and processes applied to the DMV e-Government Applications and Right of Way Information Tracking System initiatives. This includes change leadership roles and responsibilities of the Executive Sponsor and System Owner. It discusses and compares the role of external quality assurance consultants and their contributions to the success of the initiatives.

7.6.1 Theory of IT Project Governance

Hazard & Crawford (2004) define project governance as a set of formal principles, structures and processes for the execution and management of individual projects, programs or portfolios of projects. These structures and processes include appointment of a project governor or governing body; definition and regulation of roles, responsibilities, decisions and boundary management; and coordination of project relationships, planning and control.

Governance of IT-enabled change is a special case of project governance. For such projects, various role definitions are advanced for the capacity of project governor, or owner representative, such as executive, project or business change sponsor (Crawford & Cooke-Davies, 2005; Earl, 1992; Manwani, 2010; Reich et al., 2008; Turner & Keegan, 2001); senior responsible owner (OGC, 2011); process owner (Davenport, 1993; Harmon, 2007; Keen & Knapp, 1996; Smith & Fingar, 2003); and system owner (Fujitsu Consulting, 2009).

7.6.2 State of Oregon IT Project Governance Policy

Both DMV e-Government Applications and RITS initiatives progressed successfully through adjudication under several IT governance policies at State and Department levels. Because of the amount of IT investment sought from funding authorities, each initiative required approval of the State Chief Information Officer (CIO) and was subject to IT governance policies and scrutiny of Department of Administrative Services (DAS). This required DMV and ODOT to prepare and submit several planning and initiating documents, which would have exposed any shortcomings in strategy and policy. DAS IT governance

policy also stipulates that regular quality assurance reviews and risk assessments of an initiative and solution be performed by an external IT-enabled change expert.

7.6.3 Governance of Oregon DMV e-Government Initiative

7.6.3.1 DMV IT Project Governance Structure and Processes

Oregon DMV planned and executed the e-Government initiative within an established framework for governing, managing and carrying out investments in information technology that enable process change (Oregon DMV IT Governance, 1999). Key governance roles in this structure are the *DMV Management Team*, *DMV User Council* (an ODOT Community of Interests), *Project Steering Committee, Project Executive Sponsor*, and *System Owner*.

DMV Management Team was involved in key decisions throughout the initiative. User Council was consulted on and authorized major changes to scope, budget and schedule. Steering Committee met frequently during design, development and implementation stages, and delegated its deliverable approval role to managers and expert staff on the Project Team. User Council and Steering Committee took action based on monthly progress reports.

7.6.3.2 DMV e-Government Executive Sponsorship

Following their IT Governance policy, DMV User Council appointed a member of their Management Team – the Information Technology Services Group Manager - as *Project Executive Sponsor.* Responsibilities began when the Project was commissioned and included: forming a Project Steering Committee and chairing its meetings; acting as a Project advocate and champion; mentoring the Project Manager; monitoring the Project; providing guidance to the Project Team; and supporting requests for resources and funding. User Council was consulted on, and authorized, major changes to scope, budget and schedule.

7.6.3.3 DMV e-Government System Ownership

As defined in the ODOT Information Systems Delivery standard – Macroscope® - the *System Owner* is a foundational role in the governance and management of an IT project. For DMV e-Government, the Customer Services Group Manager was the ‘de facto’ *System Owner*, supported by the Processing Services Group Manager, whose work processes and people were most affected by the e-Government solution. Both Service Groups had knowledgeable managers with roles on User Council and Steering Committee. As System Owners, they were involved in solution design detail and organizational change preparations.

7.6.3.4 DMV e-Government Quality Assurance and Risk Assessments

Under State of Oregon Policy, administered by Department of Administrative Services (DAS), specified information technology projects, especially those which cause change to program or service delivery within State agencies, are subject to periodic, independent, third-party quality assurance reviews and risk assessments. These studies apply industry, State and ODOT standards for IT-enabled change project performance to address several areas of interest, concern, and risk.

Quality assurance and risk assessment services for the DMV e-Government Applications Project lifecycle began with a review of the Request for Proposals for applications development, proceeded into solution design and development and concluded after the Implementation stage. Reports contained Quality Assurance (QA) Review findings and Assessments of Project Risks and DMV Risk Management Progress. These reviews and assessments addressed four main areas of interest, concern and risk: (1) What did DMV set out to accomplish? (i.e., purpose, expected outcomes, scope, and objectives) (2) How did DMV and Information Systems (IS) carry out the Project? (3) What was the level of organizational preparedness to implement, operate, support and maintain the e-Government solution? (4) What did the Project actually accomplish?

DMV responded in writing to the findings and suggested mitigations from the QA reports. The reports were shared openly in Steering Committee and Project Team meetings and with the primary IT solution provider. The DMV Project Manager incorporated risk factors from the assessments into the Project Risk Management Plan and process to ensure visibility and management attention. In the e-Government Applications Project Closing Report (2004), DMV acknowledged the positive contribution of the Quality Assurance Reviews and Risk Assessments, process and service provider to the success of the Project.

7.6.4 Governance of ODOT RITS Initiative

7.6.4.1 ODOT Right of Way IT Project Governance Structure and Processes

For the RITS Project, ODOT was the second tier in the governance structure for IT investments. Roles were defined for the *Transportation Community of Interests (COI) Council*, *Project Steering Committee*, *Project Executive Sponsor* and *System Owner*. Each was active in shaping and approving the initiative and was similar to DMV governance roles.

The Transportation COI strongly supported the RITS Project and the business solution that was developed. The COI was consulted and authorized major changes to scope, budget and schedule. The RITS Steering Committee had a Project oversight role, reviewed Project status, resolved outstanding issues, provided overall direction for the Project, and is overseeing realization of benefits. The Project Steering Committee met regularly throughout the design, development and implementation stages. COI Council and RITS Project Steering Committee received and considered monthly reports on Project progress and status, covering business and IT aspects.

7.6.4.2 RITS Executive Sponsorship

The State Highway Engineer performed the Executive Sponsor role for RITS with responsibility to provide strategic direction, advise on scope and IT investment decisions, and help to secure Project funding. The RITS Executive Sponsor was less involved in project execution than the DMV Executive Sponsor was for the e-Government initiative.

7.6.4.3 RITS System Ownership

As defined in the ODOT Information Systems Delivery standard – Macroscope® - the *System Owner* is a foundational role in the governance and management of an IT project. For RITS, the State Right of Way Manager was designated as the RITS *System Owner* throughout the lifecycle of the RITS Project. The RITS System Owner championed a vision of a modern technology platform to streamline, automate, and possibly redesign key Right of Way processes. The System Owner represented overall interests of the program by ensuring delivery of a quality solution by the IT provider that the business accepted. This role led issue resolution within the Steering Committee and was responsible for mitigation of risks in response to external quality assurance reports. The System Owner also directed development and execution of Right of Way Business Transition Plan.

7.6.4.4 RITS Quality Assurance and Risk Assessments

For the RITS Project, DAS and ODOT selected Public Knowledge LLC to perform quality assurance and risk assessment services over the RITS Project lifecycle, commencing with a Project justification review, continuing through solution design, application development, and implementation. The QA provider submitted quarterly reports, which contained QA Review findings, assessments of Project risks, discussions of risk factors,

recommended mitigations, and an evaluation of ODOT risk mitigation progress. Organization related risks, such as transition planning, began to receive more attention during 2012 and the Right of Way System Owner managed the response and mitigation of these risks.

The QA reports were discussed in Steering Committee and Project Team meetings. The ODOT Project Manager captured risk factors from the risk assessments into a Project Risk Management Plan and process to ensure visibility and management attention. In a post-completion interview, the System Manager for Acquisitions observed, “If we didn’t have the QA provider looking over our shoulder all the time, I doubt that we would have succeeded”.

7.6.5 Knowledge Contribution to IT Project Governance Theory

As we have learned from the findings in Chapters 5 and 6, there are important distinctions between responsibilities of a Project Executive Sponsor and those of a System Owner. An active Project Executive Sponsor would oversee work on all three dimensions of change, act as a sounding board for the Project Manager, manage major issue resolution, and coordinate responses to quality reviews and risk assessments.

As defined and applied in the DMV and RITS initiatives, the role and responsibilities of system ownership can be both governing and managerial in nature, with extensive responsibilities; in a sense an *owner-operator*. The system ownership role would begin as a contributor to strategy and policy. During the change lifecycle, the System Owner would perform these responsibilities: (1) formulate the vision and strategy, (2) plan and organize the change agenda and mechanisms to carry out that agenda, (3) direct involvement in details of the solution content and several project processes, (4) lead preparations that respond to the organizational environment for change, (5) accept the system on behalf of the program, and (6) lead processes to realize benefits from the change, lasting many years.

This concept of system ownership aligns with the recommended role for the Senior Responsible Owner defined in the UK National Audit Office (2006) report on IT-enabled change. Another interesting aspect is the variety of knowledge, skills, experience and areas of emphasis for individuals in the System Owner role. Just as there are “horses for courses” there may well be “owners for projects” or even owners for stages of lengthy initiatives.

7.7 Managerial Roles and Responsibilities for Multiple Change Dimensions

This Section discusses the theme that successful IT-enabled public services change requires the assignment of specific *managerial roles and responsibilities* for each change dimension. It compares the managerial roles and processes applied to the DMV e-Government Applications and Right of Way Information Tracking System initiatives. The change dimensions from the Integrated Change Lifecycle Model – solution content, project processes, and organizational change environment - are the basis for these assignments.

7.7.1 Theories of Managerial Roles for IT- Enabled Change

The managerial tier is responsible for directing the work and resources assigned to a project in order to deliver the desired business change (Turner, 2006). Project management is informed in these activities by the choice of solution delivery methods, solution delivery sourcing model, and project and implementation management processes (Ward & Elvin, 1999). There is a need to determine and plan desired organizational effects of the solution (Bygstad & Lanestedt, 2009), and to provide leadership by championing a vision of the solution, creating a sense of organizational urgency, and demonstrating commitment to the change (Kotter, 1995).

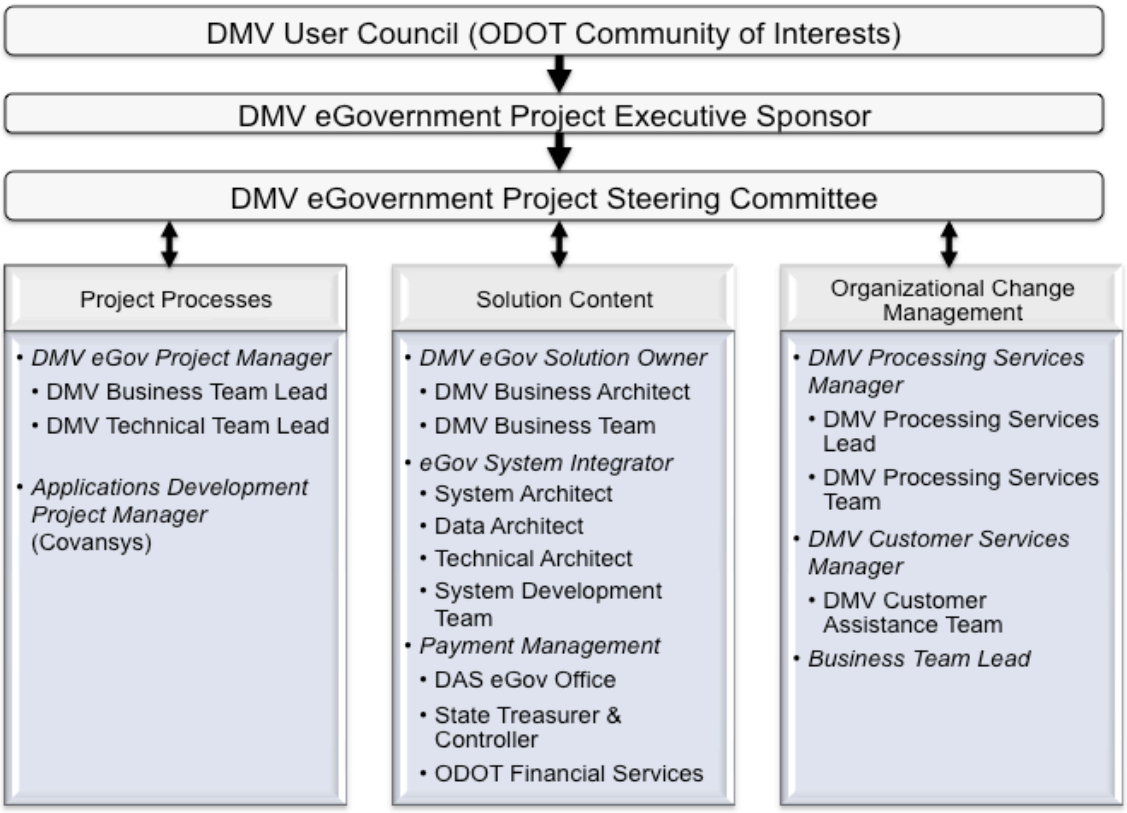
7.7.2 DMV e-Government Applications

7.7.2.1 DMV Managerial Roles for Solution Content

DMV Service Group managers were involved in technical solution conceptualization from the outset. They determined the e-Government applications scope choosing a proven, conservative option that would meet core customer needs and limit organizational change. DMV line managers identified new policies, procedures, standards, service process rules, knowledge and skills that would shape the system design. DMV managers also determined and carried out the changes to their Service Group organizations necessary to accommodate implementation and operation of the new service delivery channel and information system. For each of these areas of responsibility, it was one or more of the DMV Service Group managers who were assigned the tasks, but this occurred within the initiative structure to ensure effective coordination. The DMV e-Government Applications Project Manager coordinated these efforts, but was not responsible for any aspect of the solution content.

Figure 7.3 illustrates the DMV governance and managerial hierarchy, including the Project Team, and their coverage of the three dimensions of change for the DMV e-Government initiative.

Figure 7.3: A Project Governance and Management Structure for DMV e-Government



7.7.2.2 DMV Managerial Roles for Project Processes

In preparing to acquire turnkey software or build solutions, DMV created managerial roles and assigned responsibilities to carry out the processes by which the new information system was designed, developed, and implemented.

As its solution delivery model, DMV adapted the ODOT standard System Delivery Lifecycle Model (SDLC) *waterfall* methodology, combining it with the *agile* rapid development and process documentation methods from the primary IT provider. The combination yielded specific project management deliverables, decision gates, and approvals for each phase of solution delivery, which were managed by DMV's Project Manager.

7.7.3 Right of Way Information Tracking System

Right of Way managed the evolution from a COTS solution to a custom technology design. Project management directed design of solution content through approval of future process maps and through identification and resolution of design variances and defects.

Management also determined the business changes necessary to complement the information system implementation. Right of Way managers identified new policy, procedures, standards, business process rules, and knowledge and skills that would arise from the process redesign. Project management reviewed these content elements, approved them for incorporation into the business solution, and prepared transition strategies and plans that would support their acceptance by affected organizational units. The Right of Way System Manager provided content leadership throughout the RITS Project to validate these features, while the Project Product Manager reviewed and approved solution components supplied by the vendor.

7.7.3.1 Right of Way Project Processes

For Right of Way, the managerial role for project processes reflected the initial assumption that a COTS system would be configured and implemented. The resulting disconnect led to deficiencies in the design and execution of project processes, particularly for managing deliverable approvals. The shift to a custom system design required adoption of the ODOT methodology and appointment of a Project Process Manager to manage the expanded solution contents.

A significant managerial role and process for both projects was managing the agency response to ongoing third-party Quality Assurance reviews and risk assessments of project processes. The DMV Projects Director and RITS Project Process Manager worked within the project governance structure to develop and execute mitigation plans.

7.7.4 Managerial Role for Organizational Change

In an IT-enabled change initiative, a managerial role is needed to understand and to develop a response to the recipient organization context, and its capability, capacity, and readiness to change. This role involves studying these aspects of the internal environment and working to develop and apply the necessary preparations.

This managerial role and action was informed by an assessment of organizational capability to implement change, capacity to absorb change, and readiness to change. Managers considered the change receptivity of affected organizational units in planning the transition to the new business system. In each case, it was determined that implementation should involve a pilot in a change-receptive Region to refine preparatory actions and training materials for the full implementation.

Line operations managers in both cases had a distinct role as a champion and advocate for the public services change. They provided personal mentorship and support to help individuals adjust to their realigned jobs. For Right of Way, the System Owner, Business Transition Manager, and Business Transition Leader shared organizational change management duties. The latter coordinated employee training and introduction of changes to policies, procedures and jobs. For DMV, line managers from the Service Groups that run the alternative service delivery channels and back-office processing had the key organizational change management role and responsibilities.

7.7.5 Knowledge Contribution to IT Project Management Theory

7.7.5.1 Managerial Role for Information System Integration

The *information system integrator* is a managerial role that connects project processes with solution content. This is to ensure that information technology components from all providers are fit for purpose, compatible, and successfully integrated.

In this regard, it was necessary for DMV to determine whether *they*, or Covansys, the primary IT solution component provider, had the capability and capacity to perform this role. DMV recognized that they could rely on their applications development partner to accept accountability for this role. In contrast, Right of Way and ODOT IS were required to accept accountability as system integrator as the RITS product supplier did not have the capability or capacity to do this.

7.7.5.2 Managerial Role for Public Services Integration

A second managerial role that connects process and solution content is the role of *public services integrator* to ensure that the (re)-designed business processes to produce and deliver services to citizens are properly supported by information system components.

7.8 Responding to the Organizational Environment for Change

7.8.1 Theories for Managing the Organizational Environment for Change

The literature defines the organizational environment for change to include: *organizational readiness* to accept the change (Hope Hailey & Balogun, 2002; Weiner, 2009); *organizational capacity* to absorb the change (Cohen & Levinthal, 1990; Zahra & George, 2002); and the *capability* of individual change recipients, and the organization as a whole, to use the solution (Balogun & Hope Hailey, 2008; Hiatt, 2006). As context, these constructs inform development of objectives and methods for organizational and individual transitions (Bridges, 2009). As a means of effecting change, these characteristics are developed, managed, and applied during the delivery stage to prepare the organization, its managers, and staff to accommodate the solution.

7.8.2 Evaluating the Organizational Environment for Change

Delivery of a public services solution occurs within an organizational environment that is both the context of the change and a means of bringing it into effect. Understanding and developing an effective response to the environment in which change is to occur are characteristics found in both of these successful change initiatives. The cases highlighted change characteristics that may require additional emphasis in public sector settings.

Both DMV and Right of Way initiatives utilized solution delivery processes that were planned in response to a review of readiness, capacity, and capability at both the individual and organization levels. Both organizations used a capability, capacity, and readiness assessment of affected organizational units and change recipients to inform change preparations and transition planning. In both initiatives, a receptive context combined with a broad scope and an ambitious change target supported phased implementation of the business solution to provide necessary transition support to all recipients. Regions were selected for pilot implementation to identify, study, and resolve issues prior to full implementation. For DMV, the assessment and pilot study included customer use of the e-Government services, which resulted in multiple methods and levels of support for the new channel. Right of Way used a gap analysis of current and required organizational capabilities in affected units to identify and plan staff training that responded to varying levels of change

readiness. This approach to transition planning ensured that solution implementation was grounded in the environment of each functional unit and was structured to resolve impacts.

7.8.3 Managing the Business Transition

A key aspect of the preparations for change in both environments was development and execution of a Business Transition Plan. This Plan was a blueprint for organizational change management in the both initiatives. The Plan included: (1) leadership, advocacy, and championing change at executive and management levels; (2) mechanisms to monitor and support staff to develop knowledge and skills needed to make changes to their individual work practices; (3) identifying and resolving issues and concerns with solution implementation as they arose; and (4) focusing organizational resources on the transition.

7.8.4 Summary of Case Comparisons

Both DMV and Right of Way were attentive to the organizational environment for change starting with a solution design using business process modeling. DMV Service Group managers initiated early discussions with back-office administrative personnel who faced potentially disruptive personal transitions. Both DMV and Right of Way pursued phased solution implementation to understand the existing environment and to help develop organizational capacity, capability, and readiness for change. Pilot studies were used to resolve outstanding issues and refine procedures for the full implementation. Project Sponsors and System Owners were advocates and overseers of the transitions, modeling clear and consistent decision-making, and directing professional support to individuals and operational units to help them adopt new ways of working. This approach built solution acceptance by individual DMV customers and support staff, and Right of Way recipients with less initial commitment to change, such as staff in the more complex or distant Regions.

7.8.5 Knowledge Contribution to Organizational Change Management Theory

The DMV and RITS cases sharpened the focus on organizational environment as a distinct change dimension, with specific objectives, areas of coverage, and responsibilities. The cases demonstrated the importance of rigorous preparations for transitions by individual change recipients, and for preferred practices at an organization level. Distinctions among capacity, capability, and readiness at organizational and performer levels were re-affirmed.

7.9 Realization of Benefits through Technology Diffusion

These cases support the view that the Integrated Change Lifecycle Model should distinguish project results from benefits to which a project might contribute. The literature claims that realization of benefits from IT-enabled change is often delayed for many years after project closeout. Moreover, benefits can be very difficult to measure and frequently are not attributable to results from a single project, due to other influential factors and actions.

7.9.1 Theories of Technology Adoption and Diffusion

Most early research into citizen adoption of e-government services (e.g. Venkatesh *et al*., 2003) is based on various technology acceptance models. The core concept is that user acceptance of an IT system is jointly determined by its *perceived ease of use* and *perceived usefulness*. More recent research has paid attention to citizens' trust, in two respects – *trust of the government or agency that offers the service* and *trust of the information technologies that enable the service.* The latter concern is with sharing of personal information online and, if applicable, the security and effectiveness of the payment mechanism. A fifth factor is *computer self-efficacy*, the belief of an individual's ability to use technology in various settings. Studies of such factors in e-government settings have yielded some consistent, and some contradictory results. But evidence from some contexts suggests that each factor is positively associated with citizen intention to use certain types of e-government services.

7.9.2 DMV Benefits Realization

The DMV e-Government Project created an opportunity for eligible vehicle owners to take charge of their relationship with DMV, which in turn created internal process efficiencies. Benefits to citizens and DMV from the e-Government delivery channel depend upon the volume of use by citizens and the degree to which online services can substitute for labour-intensive, time consuming, and costly, visits to Field Offices. To increase the volume of use, it is important to understand the reasons why citizens might not use the system.

DMV designed the web applications and online vehicle registration policies and processes to enhance the customer experience. In this way the e-Government solution has possibly improved perceptions of ease of use and usefulness. Trust in DMV appears to have been positively influenced by reliable and available web applications, prompt and accurate

fulfilment, payment integrity, and timely, informative responses to customer inquiries. These factors have contributed to attainment of the expected level of customer adoption in the first decade of use, although cost savings have fallen short due to the advantages of competing DMV service delivery channels.

7.9.3 Right of Way Benefits Realization

RITS was intended to position Right of Way and its stakeholders to realize benefits in Acquisition and Property Management program areas. At completion of this study, RITS had been fully operational in the Acquisition program areas statewide for about 18 months, and more recently in Property Management. Operational performance using RITS over this period provides early indications of value potential along a number of trajectories.

7.9.3.1 Right of Way Acquisition and ODOT Project Delivery

RITS has been implemented on all active files, which can be active for many years during the ODOT Project Delivery lifecycle, so these benefits might not be recognized for some time on ODOT construction projects. Right-of-way property definition, appraisal, negotiation, appeal, and acquisition during highway project development demand significant investment of time, resources, and coordination. By streamlining, automating, and enhancing output quality of these processes, delays and constraints in acquiring right-of-way should be minimized, and benefits to highway construction projects can be more quickly realized. These projects improve road safety, reduce traffic congestion, and improve the travel experience for the public and the transportation industry. Although project delivery occurs over a much longer period than RITS has been active, indications are that streamlined and enhanced acquisition processes are already benefiting highway projects.

7.9.3.2 FHWA Process Standards and Transparency

A RITS business driver was for right-of-way acquisition processes to be documented and performed statewide using a common information system. There would be assurance that these processes comply with state and federal laws, rules and regulations guided by the Uniform Act. Federal Highway Administration (FHWA), which administers this Act, performs periodic compliance audits and reviews of right-of-way acquisitions. FHWA maintains an on-site presence at ODOT Headquarters and can access RITS electronic files and documents. This provides increased transparency and can reduce effort needed on future FHWA audits.

7.9.3.3 Communications with Clients for Consistency, Clarity and Certainty

Liaison Files and Diary of Contacts in RITS capture Right of Way communications with property owners and occupants from the initial point of contact onwards. These provide a basis for more consistency and clarity of engagement during property acquisition and potential relocation. These records ensure that owners and occupants can be clearly apprised of project status and their legal rights. Legal templates that are maintained electronically and are accessible via RITS support formal communication. This functionality is expected to improve client relations and negotiations by removing uncertainties and reducing miscommunications with property owners and occupants.

7.9.3.4 Effectiveness of Property Management Processes

RITS record-keeping features enhances Property Management capacity to manage the real estate assets and respond to use or purchase requests. RITS allows workers to be "…going back to the point of actually doing our work in the context of a system…", which is in contrast to instability and overall disuse of PMI software. With property management records readily accessible via RITS, and automatically linked to property acquisition files, the office can improve public access to information on its holdings with greater reliability and process offers more efficiently. Further, the *PM-Inquiry* system generates case files for customers, collecting communications records and supporting Right of Way staff in discussions with potential buyers. Document migration into RITS enables the Property Management Unit to better understand their holdings and to engage potential buyers more effectively.

7.9.3.5 Right of Way Work Process Efficiencies

Internal Right of Way workflow efficiency outcomes are already becoming evident in several program processes and roles. There is evidence of widespread adoption and effective use of the array of RITS components and a remarkably low level of resistance to work process and role changes. More efficient operations are facilitated by RITS features, such as: collaborative electronic document generation and review; automated tools and utilities; enhanced data retrieval and maintenance; and comprehensive electronic case files. A similar assessment is a finding of near-universal acceptance of RITS as the successor to RAIN by Right of Way Operations. Other opportunities for improvement using RITS are being explored, such as additional digitization of documents and expanded database capabilities.

Benefits should be realized through shorter turnaround times in Right of Way processes, notably improved access to necessary information and documentation, and streamlined management of legal obligations. Electronic file management supports greater coordination of acquisitions and substantially expedites periodic FHWA quality control reviews, facilitating compliance with federal and State laws and regulations. Because of these features, RITS has been reviewed as a potential solution by other jurisdictions.

7.9.3.6 Diffusion of Technology for Right of Way

Although the return on investment from the RITS solution is still being assessed, the initial period of operation has seen RITS achieve its design objectives and generate improvements to Right of Way program processes. By replacing RAIN and PMI, RITS has facilitated increased use of information technology resources in daily operations, reversing the evident decline in use of these legacy systems in performing this work. This use could enable additional benefits from continuous process improvement as new electronic tasks are discovered, as well as reduction in redundant tasks, increased process transparency, and improved coordination between the acquisition and property management domains.

With RITS in place, several additional features are being studied as a basis for more robust criteria for performance measures and benefits tracking. Since RITS technology is embedded into Right of Way processes, its system alerts and information tracking tools could be formalized as new metrics for process performance. Task-based alerts in RITS could be used to gauge performance of associated processes or procedures, while improved oversight of data and document integrity could become quality control standards. For Property Management, the subsystem that catalogues inquiries from prospective buyers provides Property Management Unit with details on volumes and workload that could enable articulation of service commitments and contributions by their program.

7.9.4 Knowledge Contribution to Benefits Management Theory

These cases demonstrate that there different trajectories for recognition of benefits to be realized by a variety of stakeholders, which include inter-governmental clients, citizens being served directly, internal process performers, and regulators. Each class of beneficiary will create value at their own pace as the technology is diffused and the acceptance grows.

7.10 Successful Change as a Social Construction

7.10.1 Theoretical Concepts of Success

An assumption underpinning the exploration of the selected cases is that each meets the criteria of a successful change. Managers claim that their change initiative achieved results that met all project and solution objectives, as recorded in approved initiating documents. This is a traditional notion of success and may be considered as an unbiased measure. A second point of reference for evaluating success is whether key stakeholders consider that their expectations were met. This is a subjective measure since stakeholder expectations might not be captured in initiating documents, can differ according to their stake in the game, and frequently can evolve over time.

A third perspective is the concept of success itself. The literature and case findings lead to a tentative conclusion that there are five constructions for judging success in an IT-enabled public services change initiative: (1) *project management success*; (2) *public service solution success*; (3) *information system success*; (4) *organizational transition success*; and (5) *outcomes success*.

From a *project management* perspective, success is defined as achieving the agreed scope, within budget, according to schedule, and to an expected level of quality. The Project Management Institute (2012) extends the notion of project management success to include effective management of other *knowledge areas*: resources, risks, issues, procurement, contracts, and communication.

Success also can be viewed in terms of the *functional integrity and completeness of a public services solution*, whether to effect a change in legislation, to improve delivery of an existing service or program, to achieve internal work efficiency, or to implement a new or modified program, service, or delivery channel. In this realm, Bjornolfsson & Hitt (2000, p.24) conclude, “a significant component of the value of information technology is its ability to enable complementary organizational investments such as business processes and work practices”.

A more limited view of solution success is *information system (IS) success*. DeLone & McLean (2003, 2004) define IS success as the use of, or intention to use, the system, combined with user satisfaction. A result of using the system is that certain benefits will be achieved, which will (positively or negatively) influence user satisfaction and further system use. Contributing factors in this model are the quality of information in the system, the quality of the system itself, and the quality of service that the system provides. In the current research, three IS success constructs: information, system, and service quality are applicable elaborations of the change content dimension. System (or intention to) use and user satisfaction are measures of project results.

Two related concepts of success are *organizational transition success* and *change outcome success*. Organizational transition success can be determined at two levels. First, is the level of adoption and effective use of the public services solution by individual change recipients, whether customers or government workers. This concept is similar to the IS success model, but entails a broader definition of the solution. The second level of organizational transition success uses a theory of organizational readiness for change (Weiner, 2009), an organizational-level construct. Successful implementation depends upon organizational members' shared resolve or commitment to carry out change and a shared belief in their capability to do so - their collective change efficacy.

Change outcome success is defined as the actual or anticipated realization by citizens as customers, and by government, of the benefits that were the basis for the approved business case. Cronk & Fitzgerald (1999) citing Broadbent *et al.,* (1995) and Katz (1993), promote a three-dimensional "IS business value" concept: (1) *system dependent* value added to the organization from information system content characteristics; (2) *user dependent* value added to the organization from user characteristics, such as skills and attitudes; and (3) *business dependent* value added to the organization from business factors, such as business and information system goal alignment.

Change outcome success may be difficult to measure and attribute. Remenyi *et al.* (1997), Thorp (2003), Manwani (2008), and Jenner (2009) warn that realization of benefits from IT-enabled change initiatives is often deferred for several years after close-out, might

be very difficult to measure, and may not be directly attributable to the results of the change initiative under study, due to other influencing factors and concomitant change initiatives.

7.10.2 Knowledge Contribution to Theory of Successful Change

A common finding from the DMV and Right of Way initiatives is that variability of interests and expectations among participating roles and stakeholders leads to differences in conclusions about what constitutes successful change. Table 7.4 analyzes these interests and expectations based on the five theoretical success concepts introduced above. While there is evidence of considerable variability in success construction by role within each case, there are no noteworthy differences in success construction for the same role in both cases.

A likely reason for the commonality in perspectives of success for each role across both case initiatives is the application of standard role definitions from the ODOT standard system delivery lifecycle methodology, as was discussed in Sections 7.6 and 7.7.

Table 7.4: Participant Constructions of IT-Enabled Change Initiative Success

Roles and Stakeholders	Interests and Expectations	Concept of Success
Project Executive Sponsor	• Meets project and solution objectives • Enhanced customer service delivery • Project on schedule & within budget • Solution positioned to realize benefits	• Project management • Public service solution • Organizational transition • Change outcomes
Business System Owner	• Meets project and solution objectives • Target processes are (re)-designed, streamlined & automated • Integrated business solution that works • Minimal disruption to existing operations	• Project management • Public service solution • Organizational transition • Change outcomes
Project Leadership Team or Steering Committee	• Meets project and solution objectives • Minimal disruption to operations • Key processes are streamlined/automated	• Public service solution • Organizational transition • Change outcomes
Program Managers & Staff	• Solution is trustworthy • Web interface is easy to use • Processes are timely and accurate	• Public service solution • Change outcomes
Information Systems – Service Delivery	• Integrated technical solution that works • Technical solution aligns w/ODOT standard • Solution is supportable & maintainable	• Information system
External IT Solution Provider	• IT solution that functions to specs • Web components part of integrated IS • Meets contracted schedule & cost • Can be marketed to other jurisdictions	• Information system • Project management
Project Managers & Delivery Team	• IT solution that functions to specs • Integrated technical solution that works • Effective and efficient project delivery • Meets project schedule & cost	• Information system • Project management • Public service solution
External Authorities	• Compliance with laws & regulations • System ease of use for audit tests	• Public service solution • Change outcomes

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8. Conclusions and Implications

8.1 Introduction

There appears to be considerable value to government and its citizens from the application of the Integrated Change Lifecycle Model. Characteristics defined for each change stage and dimension could be considered for application as potential standards for controllable factors, organizational conditions, and managerial practices.

As with any work of this type, the proposed Integrated Change Lifecycle Model should be seen as guidance for planning, organizing, and managing new change initiatives and for evaluating existing change initiatives in progress. The purpose of the ICLM is to provide informative structure to these processes, but not to constrain or limit thinking.

The research positioning in this thesis is based on a conclusion that the application domain maturity is *high* and that solution maturity is *low*. The effort, therefore, is to develop a new solution for a known problem, which places the result in the *Improvement Research* quadrant of the DSR Knowledge Contribution Framework (Gregor & Hevner, 2013).

This Chapter has five main topics. Section 8.2 proposes a set of management actions to take advantage of the practical knowledge contained in the elaborated Model.

Section 8.3.1 discusses transferability in management and organizational research, which is the degree to which a study has made it possible for managers to determine whether similar conditions could be present in their organizational settings.

Section 8.3.2 discusses possible transferability of the ICLM to potential change initiatives within a range of government program contexts, starting within the vicinity of the case studies, and extending to other transportation jurisdictions, and then to other government program areas.

Section 8.3.3 discusses the conditions for transferability of a modified ICLM to change initiatives in the private sector and non-governmental organizations (NGOs).

Section 8.4 provides an assessment of the methods, processes, and results from this thesis in relation to the guidelines for Design Science Research.

Section 8.5 outlines possibilities for future research by building on the advanced ICLM that was designed, developed and presented in this thesis.

8.2 Implications for Management Policy and Practice

There appears to be considerable value to government and its citizens from application of the change dimensions and stages of the ICLM to plan and organize new change initiatives and to evaluate existing change initiatives that are already underway.

The following implications pertain to the organizational entities and program areas in the current research. There are implications for policy and practice at governance and managerial levels in all change initiatives, including those undertaken in the private sector.

Recommendations have implications for policy and practice, as well as for further research. The recommendations in Chapter 8 combine the insights gained from the findings and conclusions from the case studies. The recommendations are designed to have an important impact on the planning and execution of IT-enabled change initiatives by public agencies. In the judgement of the researcher, these recommendations have been designed so that they are within the implementation capacity and capability of many organizations.

(1) Use the Integrated Change Lifecycle Model to plan and evaluate IT-enabled change initiatives.

Consider adopting the Integrated Change Lifecycle Model that was designed, developed, and evaluated in this research as organization-wide guidance for governing and managing IT-enabled change initiatives. Apply the ICLM and the detailed elaboration of the characteristics for its dimensions and stages as standards with which to plan new change initiatives and to evaluate existing change initiatives that are in progress.

(2) Extend coverage of Project Governance processes throughout change lifecycle.

Establish or extend existing IT Project Governance roles, processes, representation, and mechanisms across the entire change lifecycle from the Policy and Strategy Formulation stage through to the Benefits Realization stage, covering all dimensions of change delivery.

(3) Articulate vision, change ambition and solution concept at earliest possible time.

Ensure that the strategic direction on an IT-enabled change initiative is articulated in the form of tangible expressions of why the organization is doing this (its change ambition) and what a successful solution would look like (the vision and integrated solution concept).

(4) Assign managers to cover each change dimension throughout the lifecycle.

Define, staff, and perform managerial roles for the scope of responsibility for each change dimension during solution design, development, and implementation. Three managerial roles and assignments are needed: (a) to design and carry out project processes (Project Manager, supported by the Executive Sponsor); (b) to manage the solution content (Business System Manager, Project Product Manager, or Business Architect); and (c) to manage preparations and delivery of services for the organizational environment in which change is to occur (managers of affected service groups or program areas).

(5) Apply project management processes to all change dimensions for the lifecycle.

Reinforce the practice of applying project management processes, e.g. scope, schedule, budget, resource and risk management, to cover lifecycle management of the project entity, the entire business solution content, and also management of organizational preparations for transitions by people in affected service groups and program areas.

(6) Assign knowledgeable program resources for non-technical solution aspects.

Institutionalize the practice of assigning dedicated, project-savvy, program area resources to design, develop and implement the business components of an IT-enabled solution. This includes responsibilities to define requirements, to develop test cases, and to perform business acceptance testing of the integrated information system.

(7) Define roles and responsibilities for system integration and ensure accountability.

Establish whether an external IT solution provider will be expected to perform as the complete *information systems integrator* or only as a system solution component provider. In the latter situation, the sponsoring organization will be responsible to perform the system integrator role. Resolution among these choices will require appropriate language to explain this accountability in Requests for Proposals and in professional services contracts.

(8) Ensure methodologies applied to an initiative align with Change Lifecycle Model.

Request prospective external solution providers to demonstrate how their solution delivery methods align with key concepts of the Integrated Change Lifecycle Model. Acceptable methodologies should have achievement targets and decision gates, which correspond to the stages and phases of the ICLM, and cover specified dimensions and components of change.

8.3 Transferability of Findings and Contributions

8.3.1 Definition of Transferability

As discussed in Chapter 3, transferability in management and organizational research refers to the degree to which a study has made it possible for management practitioners to determine whether similar findings could be present in their organizational settings. This is achieved by the researcher providing information in suitable depth and sufficient detail to explain what is present or has occurred in the original research setting. Decision-makers then would be in a position to assess whether the research conducted elsewhere is appropriate for application in their own settings.

According to Burchett et al. (2011), two central assessments to consider are whether an intervention evaluation is applicable (i.e. an intervention could be implemented in a new, specific setting); and whether it is transferable (i.e. original study findings could be as effective in a new setting as they were in the original setting; Wang et al. (2005)).

Table 8.1 outlines the potential scope for transferability of ICLM and findings from the case study demonstrations and evaluations to other organizational entities.

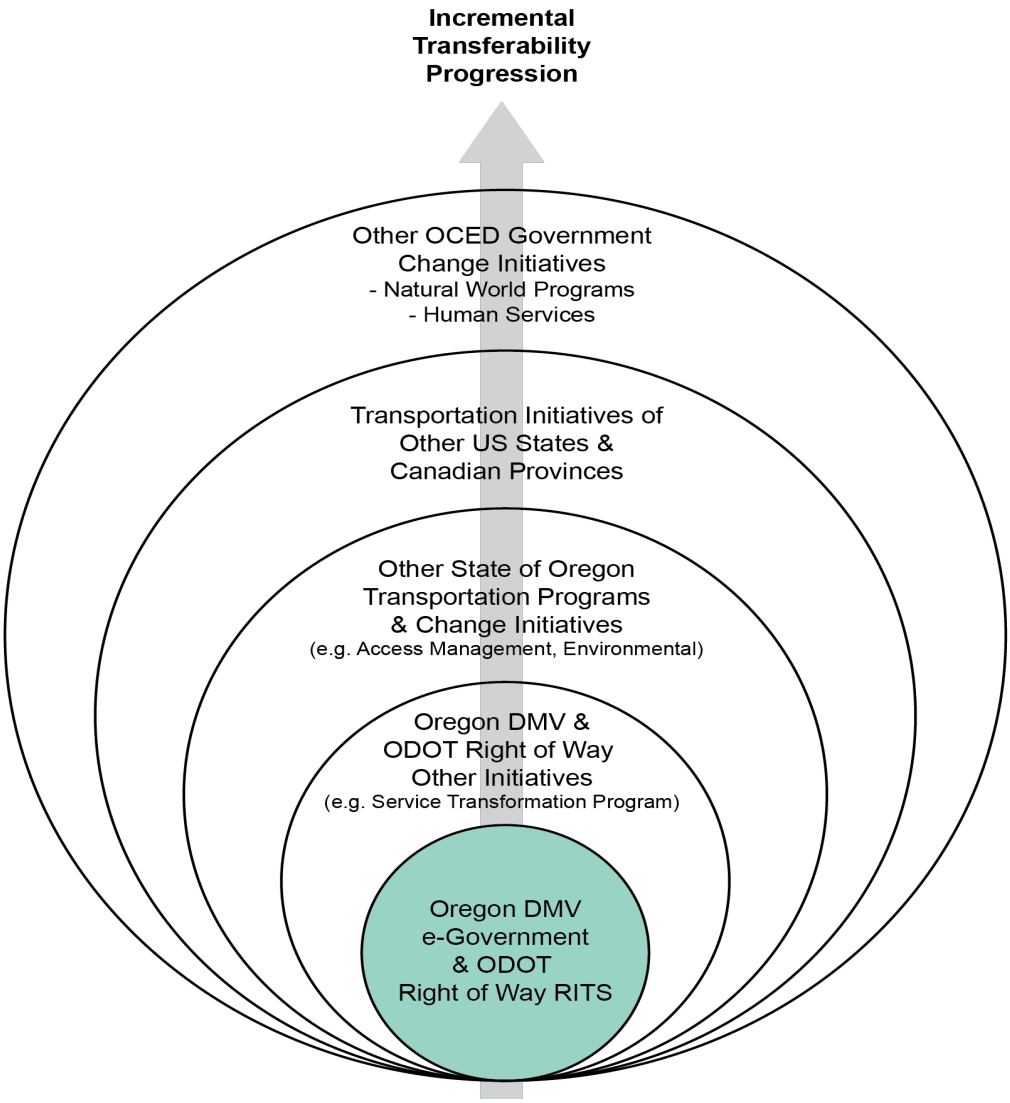
Table 8.1: Potential Application of ICLM in Other Organizational Contexts

Transportation Programs	Other Government Programs	Private Sector & NGOs
Organizational Entities	Organizational Entities	Organizational Entities
▪ Other Change Initiatives for Oregon DMV & ODOT Right of Way ▪ Other Change Initiatives in State of Oregon Transportation Programs ▪ Change Initiatives in Transportation Programs in other US States & Canadian Provinces	▪ E-Government Change Initiatives in other Programs of OECD countries ▪ Human Services Programs (e.g. Health, Education, Social Services) ▪ Natural World Programs (e.g. Fish & Wildlife. Forestry, Environmental Protection ▪ Government administrative support (e.g. Finance, Payroll, Pensions)	▪ Publicly-owned businesses ▪ Privately-owned businesses ▪ Public & private foundations

8.3.2 Transferability within the Public Sector

For the public sector, transferability of the ICLM and its constituent change stages and dimensions is for the management and organization of planned initiatives to improve public services that involve a significant investment in information technology. The degree to which the ICLM is transferable for use by other public sector organizations would appear to depend upon the extent to which characteristics of the organizational environment are similar and the content of the public services system solutions being delivered are comparable.

Figure 8.1: Progression of ICLM Transferability to Other Public Sector Contexts



8.3.2.1 Transferability to Other Initiatives in Oregon DMV or ODOT Right of Way

Potential transferability to this layer is an incremental extension of ICLM use in other public service system initiatives by Oregon DMV Services and ODOT Right of Way section.

Building upon e-Government success, DMV launched the Service Transformation Program (STP). The STP is a multi-year initiative to improve DMV business processes, enhance service capabilities, and replace obsolete computer systems. This will enable DMV to become more flexible and timely in meeting customer expectations and implementing legislative mandates. The STP has been planned and organized with reference to many ICLM-type features.

Having completed fundamental components of its own transformation, Right of Way plans to add process and system functionality that, for example, would enable full-service consultants to utilize RITS to perform most of their contracted acquisition processes.

8.3.2.2 Transferability to other Oregon Transportation Program Areas

The next layer of potential transferability is a further extension of ICLM artifact for use by other ODOT program areas and disciplines. Active public services system initiatives that have received some direction from the ICLM framework are the Access Management Enterprise System (AMES) initiative and the Integrated Collaboration and Environmental Review Tool (iCERT) initiative, both undertaken by the Highway Division of ODOT. These initiatives are being guided by the same statewide and ODOT IT Governance policies, processes, and standards that were applied to the DMV e-Government and RITS initiatives. The main deliverable from each of these initiatives is a redesigned public services system, with changes at the organization, process, and job/performer levels. The technical solution content includes requirements to share data with other ODOT financial, project delivery, geographic, and administrative systems.

8.3.2.3 Transferability to Transportation Program Areas in other States and Provinces

The potential for transferability to this layer is an incremental extension from application of the ICLM in Oregon to program areas within other transportation agencies in North America. These agencies are members of North American government transportation associations. DMV is a member of the American Association of Motor Vehicle Administrators (AAMVA) and ODOT Highway Division belongs to the American Association of State Highway Transportation Officials (AASHTO). These associations represent common program interests of 50 U.S. state governments and 10 Canadian provincial governments. Transportation agencies in these states and provinces have core functions, processes, and systems that are similar to those in Oregon and support a common mandate to develop and manage the jurisdiction's system of highways, roads, bridges, railways, public transportation services, and transportation safety programs. This offers the possibility that the ICLM stages and change dimensions can be applied to the broader transportation community.

8.3.2.4 Transferability to other Government Program Areas

There is also potential for transferability of the ICLM and study results to state and provincial agencies that have a mandate to administer programs for the natural world, such as environmental protection, natural resource development, water resource management, parks and recreation, and climate change. The research could be extended to other tiers of

government with transportation or natural world programs and/or administrative mandates, at the federal, municipal or county level.

The public administration and organizational change literatures are dominated by studies of initiatives and change programs for services to individuals, i.e. health, education, and human services (e.g., Casebeer, 2007; Hinings et al., 2003; Homa, 1998; Levin, 2007; Pettigrew et al., 1992; Wallace et al., 2007b). As there is a considerable body of knowledge and many case studies on successful IT-enabled change in these program areas, there is a potential opportunity to assess the applicability of the ICLM to documented IT-enabled change initiatives for these programs.

Transferability of the ICLM to other government programs assumes a level of maturity and sophistication in the governance, management, and performance of IT-enabled public services change initiatives. It is probable that receptive contexts would be found in countries that are members of the Organisation for Economic Cooperation and Development (OECD).

8.3.3 Transferability to Private Sector Organizations and NGOs

For the private sector, as well as Non-Governmental Organizations (NGOs), transferability of the ICLM would entail its use to plan, organize, and manage IT-enabled initiatives to improve business products, services, and processes. At the macro-level, the change stages and dimensions of the ICLM could be adapted to the private sector by redefining the purpose and name of each construct to reflect a commercial orientation. It is also recognized that many of the theories upon which the change stages and dimensions of the ICLM were developed apply to general business IT-enabled change.

The degree to which the ICLM is transferable to private sector organizations at a detailed characteristic level would appear to depend largely upon the content of the business system solution and characteristics of the organization itself.

As discussed in Chapter 2, there are major differences between public services systems and business systems in the private sector. Transferability of the ICLM, which was developed and evaluated using public services change initiatives, for application to IT-enabled solutions in the private sector or NGOs is certainly possible, with adaptation.

Policy formulation in government is generally a political process, established in laws and regulations by lawmakers, and implemented by public sector managers. In contrast, managers typically set policy in the private sector, sometimes with decision-making escalation to a Board of Directors, to achieve business goals and objectives, usually oriented towards profit maximization and shareholder value. Therefore, characteristics of the initial ICLM stage are likely to be different.

In the Improvement Definition stage, the ICLM characteristics for both sectors are similar, although the change initiative would align with different types of organizational goals. The content of the solution would be a new or redesigned business system covering these same theoretical domains: organization, business process, information technology, and job/performer. Although many of the solution characteristics are transferable, the characteristics of the organization domain would need to be redefined to capture differences in how policies are enacted. Stakeholder impacts and considerations are likely to be less complex than those experienced by public sector initiatives.

Transferability of characteristics for the three dimensions of change delivery would depend upon the technical and organizational complexity of the change. Organizations with mature project management practices would likely exhibit similarities in the nature and scope of project processes.

8.4 Application of Design Science Research Guidelines

Table 8.2 lists and describes DSR guidelines for information systems and technology research, as outlined by Hevner et al. (2004). The third column is an assessment of the process, methods and results to develop the Integrated Change Lifecycle Model against these guidelines.

Table 8.2: Application of the Design Science Research Guidelines

Guideline	Description	Integrated Change Lifecycle Model
1. Design as an Artifact	Design-science research must produce a viable artifact in the form of a construct, a model, a method, or an instantiation.	The Model (ICLM) provides a viable set of concepts, processes and methods for managing IT-enabled change.
2. Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.	Significant investments in IT-enabled change experience high failure rates and visible exposures.
3. Design Evaluation	Utility, quality, and efficacy of a design artifact must be rigorously demonstrated via well-executed evaluation methods.	ICLM is evaluated in the contexts of two public sector change initiatives. Iterations of ICLM evaluated and design improved.
4. Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of design artifact, design foundations, and/or design methodologies.	Clear contributions of the ICLM as a tool to improve the planning and assessment of IT-enabled change initiatives.
5. Research Rigour	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artifact.	Rigorous methods for data collection and validation (triangulation). Thematic analysis method used to synthesize findings from evaluation.
6. Design as a Search Process	The search for an effective artifact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.	Initial iteration of ICLM based on works of Pettigrew, Van de Ven & Poole, Rummler & Brache, Manwani, Hope Hailey & Balogun.
7. Communication of Research	Design-science research presented effectively both to technology-oriented as well as management-oriented audiences.	Presentations of artifact design at academic conferences and colloquiums and to public sector managers.

8.5 Possibilities for Future Research

Numerous possibilities exist for researchers to build upon information and knowledge provided by this limited scope research by refining and extending the Integrated Change Lifecycle Model to elaborate characteristics of successful IT-enabled public services change initiatives using different research settings to move towards *cracking the code of change*.

(1) An expanded evaluation of the ICLM could be conducted using a larger selection of successful IT-enabled public services initiatives. This evaluation could further explore the change dimensions over the complete change initiative lifecycle, starting from strategy and policy formulation through to benefits realization.

(2) The ICLM could be applied to organize a comparative study to examine whether there are similarities and differences in factors, conditions, and practices between successful IT-enabled public services initiatives and those that are considered to be unsuccessful.

(3) Since this research focused on evaluating change in two transportation administrative areas within one U.S. state government, there is considerable scope for extending the reach of the ICLM to assess its effectiveness in other transportation programs in other U.S states, or the second tier of government in other countries with hierarchical systems, such as Canada and Australia.

(4) Within government, the IT-enabled change using ICLM could be studied in agencies with mandates to administer programs for the natural world, such as environmental protection, natural resource development, water resource management, parks and recreation. The research could be extended to other government tiers with transportation or natural world programs and administrative mandates, at federal, municipal, or county levels.

(5) Compare ICLM evaluations from studies of transportation and natural world IT-enabled change initiatives with similar studies performed in human services program areas, such as health, education or welfare. There is a considerable body of knowledge about factors that contribute to managing successful change in these program areas.

(6) With myriad change initiatives happening in the public sector globally, there could also be an opportunity for an ambitious research mandate to examine IT-enabled change with quantitative techniques, working with constructs offered by the ICLM characteristics.

Appendix A – Information Sources

A.1 – DMV e-Government information Sources

List of DMV e-Government Participant Interviews

A total of 15 interviews were conducted with the following individuals concerning their various roles in the DMV e-Government Applications initiative for the empirical evaluation of the ICLM.

Individual (#)	*Organization*	*e-Government Change Initiative Role(s)*
Allen D.	DMV Services	ODOT/DMV Project Manager, DMV e-Government Applications Project
Virginia E.	ODOT Information Systems	e-Government Project Steering Committee member Service Delivery Manager, DMV Applications DMV User Council member
Kathy H. (2)	DMV Services	Processing Services Group Manager JAD Session Participant DMV User Council member e-Government Project Steering Committee member
Tom Mc. (2)	DMV Services	DMV Administrator Executive Sponsor, DMV e-Government Applications Project DMV User Council chair e-Government Project Steering Committee member
Sheryl M.	DMV Services	Business Team Lead JAD Session Participant Business Architect, DMV e-Government Applications Project
Bill S. (3)	DMV Services	Customer Services Group Manager Business Owner, DMV e-Government Applications e-Government Project Steering Committee member JAD Session Participant DMV User Council member
Nell K.	Dept. of Administrative Services	e-Government Project Manager
John K.	Covansys, Inc.	Project Manager, DMV e-Government Applications
Becky H.	IBM Global Services	IT Component Provider – Software Specialist
Katherine L.	SPT Consulting Group, Inc.	Quality Assurance Analyst, DMV IT Project QA & Risk Assessment Program
David S.	SPT Consulting Group, Inc.	DMV Industry Specialist, DMV IT Project QA & Risk Assessment Program

DMV e-Government Project and Solution Document Profile

Sources included several documents produced by the Project, and related papers:

Document Title	Document Coverage
State of Oregon Information Resource Request	• Policy & Strategy • Solution Content • Defined Improvement • Project Process
Oregon DMV IT Governance Policy	• Policy & Strategy • Solution Content • Defined Improvement • Project Process
e-Government Project Statement	• Policy & Strategy • Project Process • Defined Improvement • Organizational Environment • Solution Content
Covansys/DMV Integrated Project Plan and Schedule	• Solution Content • Project Process
Covansys/DMV Stage II Contract	• Project Process
Project Change Requests	• Project Process
Business Tasks Plan & Schedule	• Project Process
DMV Monthly Project Status Reports	• Project Process
Macroscope v4.0 - Productivity Center (P+)	• Solution Content • Organizational Environment • Project Process
Project Weekly Status Reports	• Project Process
Steering Committee meeting minutes	• Project Process
Recommended System Architecture	• Solution Content
System Dynamics Proposed Work Processes	• Solution Content
Covansys Training Plan	• Organizational Environment
DMV e-Government Product Objectives & Quality Criteria	• Defined Improvement
e-Government Applications Test Plan (v1.0)	• Project Process
e-Government Applications Project Implementation Plan	• Organizational Environment
e-Government Applications Project Acceptance Test Plan	• Project Process
Requirements Management Plan	• Solution Content
Configuration Management Plan	• Project Process
Various e-mail communications on issues of interest	• Project Process

A.2 – Right of Way RITS Information Sources

List of RITS Project Participant Interviewees

A total of 28 interviews were conducted with the following individuals concerning their various roles in the Right of Way RITS Project for the evaluation of the ICLM using this case study.

Individual (#)	*Organization*	*RITS Project Role(s)*
Rick C. (2)	Right of Way Section	State Right of Way Manager Executive Sponsor, RITS Project Project Steering Committee chair
Joe G. (2)	Right of Way Section	Right of Way Operations Manager Business Owner, RITS Acquisition Solution Project Steering Committee member
Mike K. (2)	Right of Way Section	Right of Way Operations Manager Business Owner, RITS Property Management Solution RITS Project Steering Committee member
Geri H. (3)	Right of Way Section	Right of Way Business Transition Manager System Manager, RITS Acquisition Solution Right of Way Management Team member
Michael S. (2)	Right of Way Section	System Manager, RITS Property Management Right of Way Management Team member
David B. (2)	Region 4 Technical Center	Region Right of Way Manager Right of Way Leadership Team member RITS Project Steering Committee member Region 4 Pilot Implementation User Representative
Ron W.	ODOT Information Systems	Transportation Applications Service Delivery Manager
Tim B.	ODOT Information Systems	Highway Division IS Customer Service Manager RITS Project Steering Committee member
Lynn C.	ODOT Information Systems	Transportation Applications Project Delivery Manager RITS Project Steering Committee member
Shaydon S.	Region 3 Technical Center	Business Process Subject Matter Expert Operations Trainer
Leslie M.	Right of Way Section	Business Process Subject Matter Expert Business Transition & Training Coordinator
Richard D.	Right of Way Section	Business Process Subject Matter Expert Operations Business Process Architect
Suzanne G.	ODOT Information Systems	RITS Project Product (Solution) Manager
Greg F.	ODOT Information Systems	RITS Project Process Manager
Mary W.	Region 4 Technical Center	Region 4 Pilot Implementation User Representative
Jenny K.	Region 4 Technical Center	Region 4 Pilot Implementation User Representative
Christy W.	Right of Way Section	Business Process Subject Matter Expert Headquarters Operations User Representative
Chuck W.	Right of Way Section	Business Process Subject Matter Expert Headquarters Operations User Representative
Jennifer W.	Right of Way Section	Business Process Subject Matter Expert Headquarters Operations User Representative
Melissa D.	Public Knowledge, PLC.	External Quality Assurance & Risk Assessment Auditor

RITS Project and Solution Document Profile

Document Name	Document Coverage	Date Published	Contribution to Findings
RITS Project Documents			
State of Oregon Information Resource Request	• Policy & Strategy • Defined Improvement • Solution Content • Project Process • Organizational Environment	January 2010	• Problem, opportunity or legislated mandate • Cost-benefit analysis summary • Feasibility analysis of internal environment • Link to IT strategy, architecture, standards • Alignment with business strategy & plans • Budgetary & funding considerations • Basis for CIO approval
IT Investment Management Briefing	• Policy & Strategy • Defined Improvement • Solution Content • Project Process	January 2010	• RITS Initiative definition, budget, schedule • Business case, purpose & objectives • Technology solution concept • Project governance, organization, risks, issues & quality assurance
RITS Project Statement	• Defined Improvement • Solution Content • Project Process • Organizational Environment	January 2011 November 2013 Update	• RITS drivers, purpose, objectives, success criteria and factors, assumptions, issues, constraints, priorities, risks, mitigations • RITS Project Scope: WBS, components in scope, excluded, solution quality standards • Methodology, review & approval process, roles & responsibilities for each deliverable (RACI); project controls • Project Organization: structure, resources by role, responsibilities by role, training • Project Budget, Schedule & Milestones
RITS Steering Committee Meeting Presentations & Minutes	• Solution Content • Project Process • Organizational Environment	Meetings generally occurred monthly	• System development contract status • System and other deliverable status • Overall Project Status Report • Quality Assurance risk mitigation actions • Monitoring Business Transition planning
RITS Steering Committee Status Reports	• Project Process: Costs, Schedule, Activities	Reports generally produced monthly	• Project purpose and objectives • Project Governance roles and staffing • Project Budget & Expenditure to date • Key Project Schedule dates • Accomplishments and Events this period • Plans for next period
RITS Project Open Items Log	• Project Process: issues, decisions & action items	On-going presented monthly	• Item, responsibility assignment, resolution • Internal ODOT – related project impacts • Internal & contractor coordination
COI Council IT Project Status Reports	• Project Process: Issues, Risks, Schedule, Costs & Resources	Reports produced & submitted monthly	• Overall Project Health: Red-Yellow-Green • Project Status Highlights • Project Issues, Risks & Concerns • Project Stats: Schedule, Completion, Budget & Projected (Full) Cost by Phase • Resource Allocation Health: Business, IS
ODOT IS Project Change Request	• Project Process: Schedule & Resources	May 2014	• Extend Project End Date to Dec. 31, 2014 • Expand Scope to include Amendment #8 • Extend Resources at a Cost of $150-200k
RITS Project Completion Report	• Solution Content • Project Process • Organizational Environment	November 2015	• Project Management Processes: Scope, Procurement, Time, Cost, Quality, Human Resources, Communication, Risk & Issues, Requirements; Business Transition Planning; and Project Results vs. Objectives • Lessons Learned: Human Resources, Requirements, Procurement, Project Oversight, Business Change Mgmt

Document Name	Document Coverage	Date Published	Contribution to Findings
RITS Solution Documents			
Right of Way As-Is Business Process Structure	• Solution Content • Project Process • Organizational Environment	August 2013	• Framework of process list & definitions • Business processes affected by RITS • Data & documents for acquisition process • Identifies key roles & responsibilities
Right of Way Staff Survey Assessment	• Solution Content • Organizational Environment	May 2013	• Organizational readiness: Region & role • Operational capacity by Region & role • Anticipated capability by Region & role • Staff suggestions for change preparations
Right of Way As-Is Business Process Descriptions & Analysis	• Solution Content • Organizational Environment	June 2013	• Inventory & pre-RITS RW solution • Acquisition process scope & RITS impact • Business solution component profiles for RITS-enabled Acquisition processes (18) • Findings validated by Region & HQ SMEs
RITS Business Solution Assessment & Gap Analysis	• Solution Content • Organizational Environment	October 2013	• Assessment of RITS “To-Be” Business Solution Component for each Process • Assessment of Gap between “To-Be” and “As-Is” for each Component • Business Transition requirements based on Gap for each Component and Process • Changes to roles & responsibilities to perform Acquisition processes w/RITS
Right of Way Business ransition Plan	• Solution Content • Project Process • Organizational Environment	December 2013	• Business solution components with RITS • RW org. readiness, capability & capacity • RW Business Transition strategy & model • RW Acquisition process maps required • Transition Plan by business component • RW Transition Kaleidoscope Schematic • Business Transition WBS and Schedule • Integration w/Implementation Plan • Transition Delivery roles & responsibilities • RW Change Leadership profile • External process relationships defined • Changes to RW Policy & Procedures • RW business ownership & management • Skills and knowledge development plan
Right of Way To-Be Business Process Maps & Descriptions	• Solution Content • Organizational Environment	March 2014	• Detailed cross-functional Maps of RITS-enabled To-Be Acquisition processes (20) • Scope of RITS process improvements • Changes to flows of data & documents used by Acquisition processes for RITS • Detailed roles & responsibilities
RITS System Implementation Plan	• Solution Content • Project Process • Organizational Environment	June 2014	• Release Strategy with Region 4 Pilot • Confirmed Solution to be Implemented • Key System Features by Process Domain • Integration with Business Transition Plan • Implementation Plan by component • Schematic of RITS Technical Architecture • Implementation WBS and Schedule • Implementation roles and responsibilities • Business testing, acceptance & readiness • Pilot goals, scope, participants & process • Statewide Rollout intentions pre-Pilot • System ownership & governance Roles • On-going system management, operation & maintenance scope & responsibilities

Document Name	Document Author	Document Coverage	Date Published	Contribution to Findings
RITS Quality Assurance & Risk Assessment Documents				
RITS Quality Assurance Reports	Public Knowledge LLC	Independent Assessments of: • Project Processes • Solution Content • Organizational Environment	July 2014	• Stability of RITS solution during Pilot • Lessons from Pilot Implementation • Beneficial Training Program focused on executing business processes • New Risks: Resource planning, Product development, Data conversion • On-going Risks: Business transition, Technology, Implementation planning, Project management.
			December 2013	• Project is rated High Risk of schedule slippage & difficult implementation • Lack of consistency in use of readiness & acceptance criteria as basis to proceed • New Risks: Decision-making, Resource planning, Pilot implementation planning • On-Going Risks: Implementation plan, Testing, Project Mgmt, Communication, Technology, Decision criteria, Data conversion, Deliverable review process
			February 2013	• RITS still considered High Risk: some progress in vendor project management planning and performance. • Updated Project process evaluation against SDLC standards • Noted progress to procure resource for gap analysis & business transition • New Risks: Project management, Defect management planning • On-Going Risks: Project documentation, Communication, Technology, Go/No Go Decision Criteria, Data Conversion, Deliverable review process
			October 2012	• RITS still considered High Risk: some progress in vendor project management planning and performance. • Noted SC approved schedule extension to Feb/14 & Budget increase of $1.4M • Comprehensive process evaluation against standards from an SDLC model • Need for discrete, connected effort and dedicated resource for business transition, inc. BPM, workload, policies, documents, training, communication, organizational change management and user support. • On-Going Risks: Project schedule, Testing, Project resources, Project documentation, Deliverable review process, Project budget • Findings: Risk factors, impact, probability and recommendations for each
			May 2012	• Business transition task identified in readiness meetings but has not begun. • Not a clear distinction between system and user acceptance testing. • Functional Evaluation of solution needs template for end product, perhaps based on Functional Requirements. • Project management formality is not sufficient to handle complexity of testing, training & implementation

				• On-Going Risks: Go/No Go decision criteria, Data conversion, Deliverable review process, Communication w/vendor • Findings: Risk factors, impact, probability and recommendations for each
			June 2011	• RITS considered High Risk: deficiencies in vendor project management, deliverable quality, and staff turnover • Current Risks: Project schedule, Testing, Project resources, Project documentation, Deliverable review process, Project budget • Findings: Risk factors, impact, probability and recommendations for each
RW Risk Management Plan	Project Process Manager	• Solution Content • Project Process • Organizational Environment	QA Report Response produced quarterly	• Quality Assurance Findings by category • Quality Assurance review recommendation • Project Team mitigation response

A.3 – Interview Question Set & Protocol

The following primary questions were asked of each interviewee (Governance roles) using a semi-structured protocol, covering each change stage and dimension from the IT-enabled change model.

1. ***Roles and Responsibilities***
   - What were your roles and responsibilities on the Project, in terms of governance, management and execution/performance?
   - What was the duration of your involvement in each of these roles?
   - With reference to the IT-enabled change model (per handout p. 2), in which stages of the Project did you perform these roles?

2. ***Definition of Service Improvement***
   - What is your understanding of the original purpose and objectives of the Project?
   - Did the purpose and objectives change during your tenure on the Project and, if so, how?

3. ***Project Processes***
   - In what ways were the Project, program areas and Information Systems organizations effective in governing and managing design, development and implementation of the solution?

4. ***Governance - Decision Processes***
   - What were the key decisions that have enabled Project success thus far?
   - During which Project lifecycle stage did these decisions occur?
   - In each instance, what was the actual decision and what alternatives were considered?
   - Who/which group made the decision?
   - How did the individual or group arrive at the decision?
   - What was the impact of the decision on the success of the Project?

5. ***Solution Content***
   - From your various roles and perspectives, what are some of the noteworthy features of the IT-enabled business system that have contributed to success? (refer to “puzzle chart” [p. 4])

6. ***Organizational Preparations for Change***
   - How has the program area been preparing managers and staff to absorb the changes to their work processes and job environment brought about by the new system?
   - Based on the Pilot, how effective have these preparations been so far?

7. ***Project Results and Accomplishments***
   - What results and accomplishments has the Project achieved thus far?
   - Does the system perform as you expected?
   - Based on the Pilot, has it been readily adopted by users?

8. ***Benefits Realization***
   - When do you expect the organization and its stakeholders to begin to realize benefits of the new system?
   - How will the Agency know this?

9. Basis for Research Perspective

- What has been the duration of your work history (< 3 yrs., 3-7 yrs., 7 yrs.+) with?
    - ODOT/DMV Business Line
    - ODOT Information Systems
    - ODOT Other
    - Oregon State Government
    - Other State or Federal Government

- What has been the extent of your previous involvement in IT-enabled change initiatives?
    - This was the first project of this nature that I have participated in.
    - I have been involved in a few previous IT-enabled change initiatives.
    - I have extensive experience having participated in many IT-enabled initiatives.

Appendix B – Thematic Coding Schema

Level 1: Stages & Dimensions	Level 2 Categories: Components, Factors & Conditions	Level 3 Themes: Governance, Managerial & Performance Practices
1. Public Policy & Strategy Stage	1.1 Assessment of external environment	1.1.1 Driving forces for change identified 1.1.2 External change inhibitors understood
	1.2 Innovative change opportunity	1.2.1 Evaluation against policy goals 1.2.2 Level of IT-enabled change ambition
	1.3 Strategic direction	1.3.1 Vision for success articulated 1.3.2 Strategic purpose & outcomes defined
	1.4 Innovation resource allocation	1.4.1 Top management commitment 1.4.2 Projected investment recognized
	1.5 IT investment governance policy	1.5.1 Application of IT governance policy 1.5.2 External quality assurance requirement
2. Public Service Improvement Definition Stage	2.1 Target program/service improvement	2.1.1 Aligned to public policy strategy goals: Public service delivery, Government workflow efficiency, Legislated program change
	2.2 Initiative scope and objectives	2.2.1 Defined and achievable objectives 2.2.2 Planned and manageable scope
	2.3 Business case justification	2.3.1 Level of investment in technology 2.3.2 Accepted business case justification 2.3.3 Funded & approved to proceed
	2.4 Assessment of internal environment	2.4.1 Internal change enablers understood 2.4.2 Internal change inhibitors understood
	2.5 Change initiative organization	2.5.1 Formation of project temporary entity 2.5.2 Governance structure determined
3. Delivery Stage; Solution Content Dimension	3.1 To-Be Organization components: • Laws & Administrative rules • Agency policies and standards • Organization structure & stakeholders	*To-Be* Organizational Domain: 3.1.1 Enabling legislation & admin rules 3.1.2 Policies and standards reviewed 3.1.3 Organization & stakeholder impacts 3.1.4 Integration within organization domain 3.1.5 Integration with process domain
	3.2 To-Be Business process components • Processes and workflows • Procedures and business rules • Data and documents	*To-Be* Business Process Domain: 3.2.1 Process/workflow maps & descriptions 3.2.2 Procedures & business rules revised 3.2.3 Data and document integrity & quality 3.2.4 Integration within process domain 3.2.5 Integration with technology domain
	3.3 To-Be Info Technology components: • Customer access and connectivity • Infrastructure • New applications software & services • Legacy applications & services	*To-Be* Information Technology Domain: 3.3.1 Customer access and connectivity 3.3.2 Infrastructure 3.3.3 Software and services 3.3.4 Integration within technology domain
	3.4 To-Be Performer components: • Job definition and design • Skill development resources • Job performance measures	*To-Be* Job/Performer Domain: 3.4.1 Job re-alignment recognized & planned 3.4.2 Education & training on full solution 3.4.3 Job-level measures defined

Level 1: Stages & Dimensions	Level 2 Categories: Components, Factors & Conditions	Level 3 Themes: Governance, Managerial & Performance Practices
4. Delivery Stage: Project Processes Dimension	4.1 Project governance processes	4.1.1 Project governance process execution 4.1.2 Effective quality assurance process
	4.2 Ownership of solution domains	4.2.1 Business owner role performance 4.2.2 Business ownership demonstrated
	4.3 Project organization (e.g. roles & responsibility assignments, project team capability and capacity, project team collaboration)	4.3.1 Project change dimension coverage 4.3.2 Project communication mechanisms 4.3.3 Business & IT resource assessment
	4.4 Project management processes (i.e. scope, plans, issues, changes, status, communications, quality, risks, procurement, contractors)	4.4.1 Project scope managed effectively 4.4.2 Schedule managed - change request 4.4.3 Cost managed - by phase/component 4.4.4 Business & IT resources available
	4.5 Solution delivery model (e.g. turnkey, outsource, privatization)	4.5.1 Delivery model understood & agreed 4.5.2 System integrator role assigned
	4.6 Solution delivery lifecycle methods (e.g. requirements management, stage and/or phase decision gates)	4.6.1 Solution delivery methods in place 4.6.2 Requirements managed through-out 4.6.3 Stage and/or phase decision gates
	4.7 Solution testing (i.e. integrated system tests, business user acceptance tests)	4.7.1 Multi-faceted integrated system tests 4.7.2 Business owner/user acceptance tests 4.7.3 Defects managed and resolved
	4.8 System implementation strategy/plan	4.8.1 Pilot implementation - lessons learned 4.8.2 User support mechanisms in place 4.8.3 Implementation responsibilities clear
5. Delivery Stage: Organizational Environment for Change Dimension	5.1 Organization commitment to change	5.1.1 Organization committed to change 5.1.2 Organization change valence
	5.2 Organization absorptive capacity	5.2.1 Organization operational absorptive capacity understanding & response 5.2.2 Individual absorptive capacity defined
	5.3 Organization operational capability	5.3.1 Organizational capabilities defined 5.3.2 Staff skill requirements assessed
	5.4 Organization operational readiness	5.4.1 Organization-level readiness assessed 5.4.2 Individual readiness preparations
	5.5 Change leadership capability	5.5.1 Change leadership model established 5.5.2 Change leadership preparations made
	5.6 Organization culture and change	5.6.1 Change culture diversity understood 5.6.2 Valued existing assets preserved
	5.7 Business transition strategy and plan	5.7.1 Business transition plan established 5.7.2 Transition responsibilities assigned 5.7.3 Pilot transition & lessons learned 5.7.4 Business support mechanisms in place
6. Project Results Stage	6.1 Acceptance of solution content	6.1.1 Business owner accepts solution 6.1.2 Solution adopted by customers & staff
	6.2 Mechanisms to measure results	6.2.1 Delivers program/service features 6.2.2 Meets defined project objectives 6.2.3 Meets legislation or completion date
	6.3 Solution maintainability	6.3.1 Solution transitioned to maintenance
	6.4 Positioned for benefits realization	6.4.1 Positions solution recipients to benefit 6.4.2 Identifies contributing initiatives/factors
7. Public Benefits Realization Stage	7.1 Value to citizens/customers/clients	7.1.1 Diffusion of solution use by citizens 7.1.2 Enables citizens to realize value
	7.2 Value to government	7.2.1 Organizational inculcation of solution 7.2.2 Solution produces value to government
	7.3 Mechanisms to measure value	7.3.1 Measured against expected outcomes 7.3.2 Contributing to performance measures

Descriptive Codes:

Case:	Driver and Motor Vehicles e-Government Applications	DMV
	Right of Way Information Tracking System	RW
Project Role:	Project Executive Sponsor	ES
	Steering Committee Member	SC
	Business System (Solution) Owner	BO
	Business System Manager	SM
	Business Solution Architect	BA
	Project Manager	PM
	Business (Solutions) Team Member	BT
	Information Technology Team Member	ITT
	Organizational Change (Business Transition) Lead	OC
	Information System (Component) Developer (Vendor)	IS
	External Quality Assurance Oversight	QA
	Other Roles	OTH

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