

Assessing IT Governance Maturity: The Case of San Marcos, Texas

by

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Abstract

Purpose: Information Technology fundamentally changes how people interact. Cities are no different. Cities, as all organizations, interweave Information Technology into every process to provide services. This widespread use of technology requires cities to assess IT governance maturity to ensure good organizational practices and IT alignment with organizational goals and objectives. Cities can improve practices and IT alignment by assessing IT governance and creating benchmarks for future performance. This research assesses the IT governance maturity of the city of San Marcos, Texas and provides recommendations to improve IT governance.

Procedure: This research follows a case study design in assessing the IT governance maturity of the city of San Marcos. The research is based on the widely used *COBIT IT Governance Framework*. The case study uses only nine of the thirty four COBIT objectives as a modified framework to assess IT governance maturity. The research uses structured interviews conducted with members of the San Marcos Information Technology Department. The research also relies on relevant documentation collected and analyzed through document analysis.

Results: The results demonstrate that the city of San Marcos has many practices in place that meet maturity requirements for the IT governance framework. Though the city of San Marcos has not created or adopted an IT governance framework, many of the processes in place match practices outlined in *COBIT IT Governance Framework* objectives. The city of San Marcos can better utilize IT resources by improving IT governance as the city continues to grow and prosper.

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CHAPTER 1: Introduction and Research Purpose

Today's cities use technology in newer and more innovative ways than ever before. Technology is visible in police cruiser data terminals, political official's smart phones and tablets, computers and laptops on the desks of every city employee, and complex websites citizens use to retrieve vital information and engage in public services. Invisible are the processes behind the technology that keep the various components connected and running. This "pervasive use of technology has created a critical dependency on IT that calls for a specific focus on IT governance" (Kordel 2004, 2). Effective Information Technology (IT) governance¹ ensures people and technology work together to fulfill the goals and objectives of a city or organization.

Information Technology governance guides IT management as well as long-term planning by standardizing the decision making process. The evidence of IT governance, though not always visible, originates in IT decision making process throughout the life of an organization. As an organization can examines how it makes IT decisions through the planning, implementation, management, and upgrade of IT resources, it will see the evidence of IT governance. Therefore, studying the IT decision making from top to bottom, rather than just how an organization implements and manages IT resources provides a better picture of IT governance². In contrast, focusing only on various aspects of IT management diminish the fundamental understanding of how an organization uses IT and what influence IT decisions.

IT governance requires relationships, communication, and knowledge-sharing between the organizations leadership and IT management. These requirements necessitate coordination

¹ IT governance refers to several terms. In this study, IT governance, IS governance, Corporate governance for IT, and Enterprise governance for IT have very similar meanings. For practitioners in these fields the terms contains subtle differences and meanings.

² Guldentops et al. 2004, Van Grembergen 2002, COBIT 4.1, 2007, Van Grembergen and De Heas 2009

along the strategic level of the organization³, top management in an organization⁴, and the operational level of the organization⁵ (Van Grembergen and De Haes 2009, 21-22). Individuals throughout the organization must coordinate information about their specific goals, expectations, project parameters, and even political aspirations in order to determine IT uses. Information Technology governance “refers to what decisions must be made to ensure effective management and use of IT and who makes the decisions” (Khatri and Brown 2010, 148). Simply put, IT governance deals with the overall control of IT whereas, “management involves making and implementing decisions” about the technology itself (Khatri and Brown 2010, 148).

Legitimacy and Summary of the Framework: *COBIT IT Governance Framework*

Organizations need a starting point in order to implement IT governance practices. Those who already manage significant IT infrastructures can leverage and expand existing IT management processes to begin implementing IT governance practices. As an organization’s leadership and managers transition from a solely IT management perspective to an IT governance perspective, evaluating practices as they currently exist and determining what the organization can leverage in carrying out IT governance practices become a valuable exercise. Organizations achieve this by adopting IT governance framework that organizes existing management processes into higher level IT governance practices. One widely used and commonly accepted framework that organizations can use is the *COBIT IT Governance Framework*.

³ This level is often referred to as the board of directors but varies depending on the type of organization

⁴ This level of management is also known as Senior Management or C-class management (referring to the CEO, CFO, CIO etc.). Again, these designations vary based on the organization

⁵ The operational level of the organization deals with the day to day operations of IT.

The Control Objectives for Information and related Technology (COBIT) originally assisted financial auditors in addressing IT related issues. COBIT currently serves as an excellent best-practices model for IT governance⁶. This study uses COBIT used version 4.1, developed using the input and collaboration of almost 100 IT professionals, auditors, and academics (COBIT 4.1 1-2, 2007). This collaboration created one of the most comprehensive and exhaustive IT governance frameworks to date.

COBIT, or the Control Objectives for Information and related Technology, takes an organization's existing IT management and decision making processes and organizes those processes into higher level IT governance practices called objectives. These objectives follow a natural, logical flow through four phases of IT use (COBIT 4.1 2007). These four stages are: Plan and Organize (**PO**), Acquire and Implement (**AI**), Deliver and Support (**DS**), and Monitor and Evaluate (**ME**). Utilizing this framework, IT managers and IT decision makers create a logical framework to communicate and coordinate all activities and decisions related to the organization's information technology (COBIT 4.1 2007). COBIT was created by IT and business professionals, and academics from all over the world (COBIT 4.1 2007). "COBIT consists of linking business goals to IT goals, providing metrics and maturity models to measure their achievement, and identifying the associated responsibilities of business and IT process owners" (COBIT 4.1 2007, 5).

The Tool

The *COBIT IT Governance Framework* contains a set of tools specific to each objective⁷. These tools help individuals throughout the organization evaluate and enhance specific practices,

⁶ Grembergen and De Heas 2009, Tuttle and Vandervelde 2007

⁷ COBIT 4.1 is divided into 4 domains and 34 objectives.

and communicate with others about those practices. A key tool to IT governance development, specifically the first stages of development, is the Maturity Model. This tool allows the organization to assess current practices in relation to IT governance framework and creates a high level overview prior to IT governance practice implementation (Guledntops 2004). The Maturity Model provides a broad picture the entire organization can use to address strengths and weaknesses on an organization-wide level.

Maturity Models are not new, having been used extensively by IT managers to evaluate the progress of software management. Maturity models were originally developed in 1989 by Watts Humphrey in his book *Managing the Software Process*. Maturity Models measure maturity level based on a set of agreed upon criteria for whatever an organization wants to measure. Organizations have applied the Maturity Models concept to software development, project management, and design completion to name a few. COBIT uses the Maturity Model concept to create maturity levels for each objective (Simonsson and Johnson 2005, 5). Each maturity model measures the maturity of an objective on a scale of 0 to 5. The scale assesses the existing practice maturity in order to plan future improvement (COBIT 4.1).

Relevance

“Goals that are measured will be achieved” (Ebert et al. 2004, 34). Measurement creates clear, agreed upon indicators that an organization can use to gauge its performance and make plans for future endeavors. A survey conducted by Price Waterhouse found that “a higher maturity level will in most cases deliver superior performance in terms of project delivery and business benefits” (PWC 2004, 11). The COBIT Maturity Models allow organizations to measure the ability to use IT effectively against a framework created by IT and business

professionals all over the world. Putting this tool into the hands of managers at all levels of an organization creates a new dynamic, which can increase the longevity and sustainability of an organization (COBIT 4.1 2007). Additionally, “measurement supported by control framework” is recognized as a “key factor for success in governing IT” (Guldentops 2004, 2). Therefore, studying IT governance benefits all organizations who wish to utilize IT resources to strengthen performance and ability. Before an organization can improve IT maturity, the organization must measure current maturity levels. This measurement process is the focus of this Applied Research Project.

Research Purpose

Motivation for this research comes from the author’s own experiences with conflict during years of service in the IT industry. Serving as an IT technician, consultant, and auditor⁸ in both the public and private sectors, the author has witnessed the best and worst IT practices imaginable, and searched for a way to communicate to business and IT professionals the importance of, and techniques needed to, implement IT strategies logically and productively. The author recognizes the potential of the COBIT IT Governance Framework for IT implementation in organizations, especially for small and medium sized cities; however, literature and training on the topic historically focuses on large corporations and is too technical and dense for those not already familiar with the subject.

This study mimics the early stages of IT governance evaluation an organization must conduct in order to evaluate current IT practices that meet COBIT IT governance objectives. This evaluation method provides IT and management personnel across an organization, the information needed to map practices to a globally recognized framework in order to effectively

⁸ Mr. David Wood maintains a CISA certification

communicate plans for future implementation and development. Additionally, professionals that use this methodology gain access to resources and tools that assist in planning and implementation, and prevent essentially “recreating the wheel” as IT matures.

The purpose of this research is to conduct a focused evaluation using a modified COBIT IT Governance Framework to measure the IT governance maturity of an organization. The subject of this research is the city of San Marcos, Texas. A detailed description of the city and its IT challenges appears in the research setting chapter of this study.

Chapter Summaries

Chapter one introduces the concept of IT governance, the framework for understanding IT governance, the tool for measuring IT governance, and the relevance of IT governance to IT and business professionals.

Chapter two presents a literature review to support the criteria of this study. This chapter provides a discussion of IT Governance, COBIT, and maturity models, including model application.

Chapter three presents the research setting. This chapter discusses the city of San Marcos and places it geographically. The chapter also details some of the challenges to and strengths of this city.

Chapter four discusses the methodology used to study the IT governance of the city of San Marcos. This applied research project follows a case study model. Using structured interviews and document analysis, this project provides maturity model analysis and offers a basis for recommendations which the city of San Marcos can use to improve its IT governance maturity.

Chapter five presents the results of the study. This chapter analyzed maturity assessments against nine COBIT objectives.

Chapter six contains conclusions about the IT governance maturity derived from the research and recommendations for improvement. Additionally, this chapter provides a list of three priority recommendations that could most benefit the city of San Marcos. This chapter also discusses potential research bias as well as recommendations for future research.

CHAPTER 2: Literature Review

Chapter Purpose

This chapter explores IT governance through a review of the scholarly literature. The first part of the chapter provides background information on IT governance and the role and importance of IT governance for large organizations. The second part of the chapter discusses the COBIT Maturity Models as a tool for measuring IT governance. The third part of the chapter discusses the conceptual framework, which is comprised of nine COBIT objectives and the maturity models the research uses to measure them. The last part of the chapter presents a summary of the conceptual framework.

Defining IT Governance

IT governance is similar to other governance practices. The *International Standards for the Professional Practice of Internal Auditing* defines governance as, “the combination of processes and structures implemented by the board to inform, direct, manage, and monitor the activities of the organization toward the achievement of its objectives.” On a broad level, IT governance is a subset of corporate governance, also known as enterprise governance (Guldentops et al. 2004). “Enterprise Governance is the system by which entities are directed and controlled” (Guldentops et al. 2004, 4). Therefore, IT governance is a combination of practices used by top management and IT managers to direct IT activities towards the organization’s goals. Still, IT governance is a broad, overarching concept that many find difficult to define (De Haes and Van Grembergen 2004). Evaluating different definitions provides insight into the different aspects of IT governance.

Scholars have studied IT governance, and many definitions have emerged. The following are characteristic definitions commonly found in the literature.

IT governance is the organizational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT strategy and in this way ensuring the fusion of business and IT.

(Van Grembergen 2002, 1)

IT governance is the responsibility of executives and the board of directors, and consists of the leadership, organizational structures and processes that ensure that the enterprise's IT sustains and extends the organization's strategies and objectives.

(COBIT 2007, 5)

The preceding definitions provide several insights into IT governance. Both definitions recognize that IT governance is not an isolated function of an organization but one that requires cooperation and communication through many levels of the organization. "IT management must be involved in the IT governance processes," and not just the most senior management of the organization (De Haes and Van Grembergen 2004, 1). Both definitions recognize IT governance as concerned with the strategic, or long term, goals of the organization. Top management must guide IT management to ensure that tactical, or short term, goals of the organization support strategic goals (Van Grembergen and De Haes 2009, 1-20). Finally, both definitions recognize when goals of IT management align with goals of senior management the organization is more likely to succeed in the future (Van Grembergen and De Haes 2009, 1-20). Therefore, IT governance links the organization's purpose, IT, and top management's responsibilities (De Haes and Van Grembergen 2004, 1).

IT Governance vs. IT Management

IT governance guides IT direction and differs from IT management. This section discusses the difference between IT governance and IT management. As organizations grow

managers must separate these two concepts because problems become more complex and require more input from different people within the organization.

The difference between IT governance and IT management

IT management focuses on the effective and efficient supply of IT products, and management of IT operations. IT Governance performs two functions, first it contributes to “present business operations and performance” and second, it transforms and positions “IT for meeting future business challenges” (Peterson 2004, 44). “As the governance of IT typically covers a broad scope of activities it can be helpful to conceptualize the application of IT governance to an organization’s day-to-day operations” (Yuwono, et al. 2009, 2). For example, IT management of an organization might be concerned with maintaining laptops and ensuring enough laptops for everyone in the organization. IT governance requires senior management and IT management work together to identify those who need laptops, and resources, human and mechanical, further the goals of the organization. While IT management attends to the delivery of IT services and manages IT equipment; IT governance works to ensure IT management meets the long-term goals of the organization. The coordination and synchronicity of strategic goals and tactical goals between IT management and senior management is called alignment. Alignment is the primary focus of IT governance. Ultimately, “alignment evolves into a relationship where the function of IT and other business functions adapt their strategies together” (Luftman 2004, 99)

So far, the literature review defines IT governance and how it differs from IT management. IT management has many frameworks⁹ as does IT governance¹⁰. The following

⁹ Information Technology Infrastructure Library (ITIL), Project Management Institute (PMI), Systems Development Life Cycle (SDLC), IT Service Management (ITSM) to name a few

¹⁰ Information Technology Infrastructure Library (ITIL) and Global Technology Audit Guides (GTAG) to name a couple

section introduces COBIT, a highly regarded IT governance framework (Wiederkehr 2010). COBIT provides organizations the tools to implement and evaluate IT governance.

IT Governance Framework

This section presents COBIT IT Governance framework. The first part of this section introduces COBIT and provides a brief history. The second part discusses how maturity models within COBIT evaluate IT governance.

COBIT – A Brief History

Chapter five of Van Grembergen and De Heas's book offers a history of the evolution of COBIT (2009, 137-164). COBIT, which stands for Control Objectives for Information and Related Technologies, grew from humble beginnings to become the first open framework for IT governance. "COBIT initially originated mid 1990s out of the (financial) audit community, who were confronted more and more with automated environments" (Van Grembergen and De Heas 2009, 137). The Information Systems Audit and Control Association (ISACA) developed this framework primarily to execute IT audit assignments later adding management guidance interrelating different IT processes. Through acceptance and use by many businesses, governments, and regulatory bodies, COBIT establishes itself as the generally accepted framework for IT Governance (Van Grembergen and De Heas 2009, 137). COBIT uses many tools to assist in the development and evaluation of IT governance. COBIT links itself to common IT management practices through communication of risks and controls.

COBIT – The Risk Control Dichotomy

Information Technology often causes anxiety and confusion to many people because of its complexity and variety. In order to communicate effectively about IT (and IT governance by extension) managers at all levels of an organization need to communicate complex arguments and concepts quickly and easily. COBIT uses the concept of risks and controls as the basis for communication, and builds tools upon this communication (COBIT 4.1 2007, 5). Simply put, risks are issues an organization faces and controls are the combination of activities (also known as processes) management uses to mitigate issues.

The concept of risk is simple in nature, and therefore is a great tool for communicating between different levels of an organization¹¹. The concept of risk easily translates to daily life, making the concept easy to understand. For example, one risk many people face is arriving late to work. A common way people manage this risk is by setting an alarm clock to ensure they wake up and arrive at work on time. Though setting an alarm clock is a common solution, other solutions, such as requesting a wakeup call, exist. In similar fashion IT practitioners discover a variety of responses to a given issue, each with slightly different strengths or weaknesses.

The *International Standards for the Professional Practice of Internal Auditing* defines risk as, “the possibility of an event occurring that will have an impact on the achievement of objectives” (IIA Standards 2009, 19). For example, the risk of chronically arriving to work late could negatively impact an employee through means such as a reprimand or termination. Though more complex than merely arriving to work on time, all managers, regardless of their level in the organization, must understand what can go wrong and how to keep these things from happening. Like the alarm clock from the previous example, processes that mitigate risks are

¹¹ For more information on risk please see the following citation in the bibliography: Altemeyer (2004)

called controls. The *International Standards for the Professional Practice of Internal Auditing* defines a control as:

Any action taken by management, the board, and other parties to manage risk and increase the likelihood that established objectives and goals will be achieved. Management plans, organizes, and directs the performance of sufficient actions to provide reasonable assurance that objectives and goals will be achieved.
(IIA Standards 2009, 17)

To prevent a reprimand or loss of employment caused by tardiness, people all over the world set alarm clocks every night to control or mitigate this risk. Just as an organization faces “risks” “controls” are actions management across the organization agree upon to mitigate those risks.

The risk-control dichotomy is a fundamental concept recognized in all governance frameworks, such as COBIT, as well as in auditing standards worldwide. For example, the *COSO Enterprise Risk Management Framework*¹², created in response to poor controls exemplified by the Enron scandal identifies the same risk-control dichotomy. The Committee of Sponsoring Organizations of the Treadway Commission (COSO) uses a similar process whereby an organization must identify risks and implement controls to mitigate those risks (COSO Executive Summary 2004). Though IT risks are more complex than simply getting to work on time, the concept is straight forward. The combination of controls and processes, which COBIT calls objectives, comprises the COBIT IT Governance Framework. COBIT contains maturity models for each objective to assist top managers in evaluating current management practices. “The COBIT Maturity Model is an IT governance tool used to measure how well developed the management processes are with respect to internal controls” (Pederiva 2003, 1). Analysis using the COBIT maturity models provides management across the organization with the information

¹² COSO stands for the Committee of Sponsoring Organizations of the Treadway Commission. [COSO](#) is a voluntary private-sector organization, established in the United States, dedicated to providing guidance to executive management and governance entities on critical aspects of organizational governance, business ethics, internal control, enterprise risk management, fraud, and financial reporting.

it needs to understand current maturity levels and coordinate plans for implementing new controls or strengthening existing controls.

COBIT Maturity Models – A Tool for Measuring IT Governance

Maturity Models use began in the software development field as programmers and developers worked to define the level of completeness of different projects (Luftman 2004). In a similar fashion, maturity models determine the maturity level for a COBIT objective. “The use of maturity models greatly simplifies [IT governance assessment] and provides a pragmatic and structured approach for measuring how well developed processes are against a consistent and easy-to-understand scale” (Guldentops 2004, 274). The COBIT maturity models measure maturity across organizations and even industries (Khaiata 2009). Maturity models “enable benchmarking and identification of necessary capability improvements” (COBIT 4.1 2007, 17).

The basic Maturity Model consists of six levels with each level representing a different level of maturity¹³. Table 2.1 provides a generalized list of maturity levels and a description for each level:

¹³ It is important to note is that maturity assessment is an opinion of the assessor based on evidence gathered to come to that conclusion (Doughty and O'Driscoll 2002).

TABLE 2.1: Basic Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	Management processes are not applied at all.
1	Initial	Processes are ad hoc and disorganized.
2	Repeatable	Processes follow a regular pattern.
3	Defined	Processes are documented and communicated.
4	Managed	Processes are monitored and measured.
5	Optimized	Best practices are followed and automated.

(COBIT 4.1 2007)

Maturity levels progress from 0 to 5 as maturity increases. COBIT features a different Maturity Model for each objective in the framework. As stated earlier, COBIT maturity models measure IT Governance maturity within an organization or across organizations. The next section demonstrates research that utilizes COBIT maturity models.

Examples of Maturity Model Research: Studies from the Literature

This section explores two studies that use the COBIT maturity models to measure IT governance. One study measures IT governance within two government agencies, and the other study measures IT governance across both public and private sector industries. In both studies, researchers use maturity models to quantify and analyze their data.

Study 1 - Republic of Indonesia

In the first study, Yuwono, et al. conduct a study of two low level agencies within the Republic of Indonesia (2009). The two agencies studied are Agency A and Agency B. Agency A is a large agency that manages a great deal of data and operates a fairly large data system. Agency B is an inspectorate general of the ministry (inspector general) and features significantly less data and fewer data systems.

For this study, the researchers used a modified IT Governance framework composed of twenty eight COBIT objectives. The researchers prepared a set of questions and conducted

structured interviews of high level officials within the organization, subsequently measuring the responses against the COBIT maturity models.

Yuwono, et al. found that that Agency A scored an overall maturity level of 2.17 and agency B scored an overall maturity level of 2.03. The researchers concluded that both agencies utilized some mature processes when managing costs. Processes that managed and procured supplies, and those that dealt with contractors and suppliers were more developed than processes that dealt with performance and were not directly related to costs.

The researchers recommended that the agencies increase maturity levels of IT governance objectives to above level two. The researchers made this recommendation since objectives that operate above maturity level two are repeatable and will ensure that processes are carried out in a consistent manner. At that point the agencies will at least have the information they need to implement any further improvements. The authors noted one specific area needing improvement concerned training. At the time of this study training employees to analyze and understand agency systems required a large investment in time and input from other employees. Yuwono, et al. recommended that the agencies decrease the amount of time and resources required to train a new employee.

Study 2 – Cross Industry Survey

In the second study, Guldentops, et al. use the COBIT maturity models to measure the alignment between business objectives and IT objectives across many organizations in different industries (Guldentops et al., 2002). In this research, Guldentops, et al. created a modified COBIT Framework using fifteen COBIT objectives. The researchers worked with experts to develop an online questionnaire the researchers could send to different organization that would measure the what organization thought about its own IT governance maturity. The researchers

then analyzed the data and compiled detailed information about IT governance across different demographics.

The survey prompted 168 valid responses from the finance, retail and manufacturing, public, and other sectors. The researchers broke down the information by organization size, geographic location, and sector. However, the unweighted averages show overall maturity fluctuating between 2.0 and 2.5. Breaking the data down by organization size reveals that large organizations (generally those with around 5,000 employees or more) have much higher levels of maturity than medium or small organizations. Maturity levels for large organizations averaged between 2.5 and 3.0. Maturity levels for small organizations (those with around 500 or fewer employees) averaged between 1.5 and 2.5 across the fifteen COBIT objectives. Analyzing the data by sector reveals the financial sector with the highest levels of maturity and the retail sector with the lowest. Public sector maturity fluctuates between 1.5 to just above 2.5.

The researchers do not make any recommendations to increase IT governance maturity for any sector but present this tool as one possible avenue for benchmarking across different organizations and communicating information regarding IT governance maturity.

Summary

These two studies used very different research methods and studied very different entities, yet demonstrate how researchers can use the COBIT maturity models to conduct meaningful research. Most importantly, these two studies demonstrate a positive way to use maturity models when assessing two or more entities. Both studies use the maturity models to compare organizations to one another and did not compare each organization or industry against the model itself. Since the model itself is an ideal framework, comparing an organization(s) to the model would only provide information on deficiency rather than organizational trends. This

practice is also known as benchmarking¹⁴. Benchmarking is useful because an organization can use one year's results to show improvement in another year, or to compare one organization to another.

On that note, the studies provide two interesting generalizations. First, larger organizations tend to have higher IT governance maturity than smaller organizations. Second, public sector organizations tend to have lower IT governance maturity than private sector organizations. Therefore, when studying public sector organizations with approximately 500 employees, one should expect to find IT governance maturity levels between 1.5 and 2.5. Insufficient literature exists to determine whether that maturity level is sufficient or not.

As in the previous two studies, the next part of this chapter presents a modified IT governance framework based on nine COBIT objectives. These nine objectives make up the conceptual framework for this applied research project. Applying the conceptual framework to an organization provides insights into the governance of that organization and establishes the foundation for recommendations and improvements.

Conceptual Framework: Modified COBIT Framework

This section of the chapter presents each COBIT objective and ties the objective to scholarly literature. Each objective contains a maturity model, and this section discusses important information needed to study each model and assess IT governance maturity.

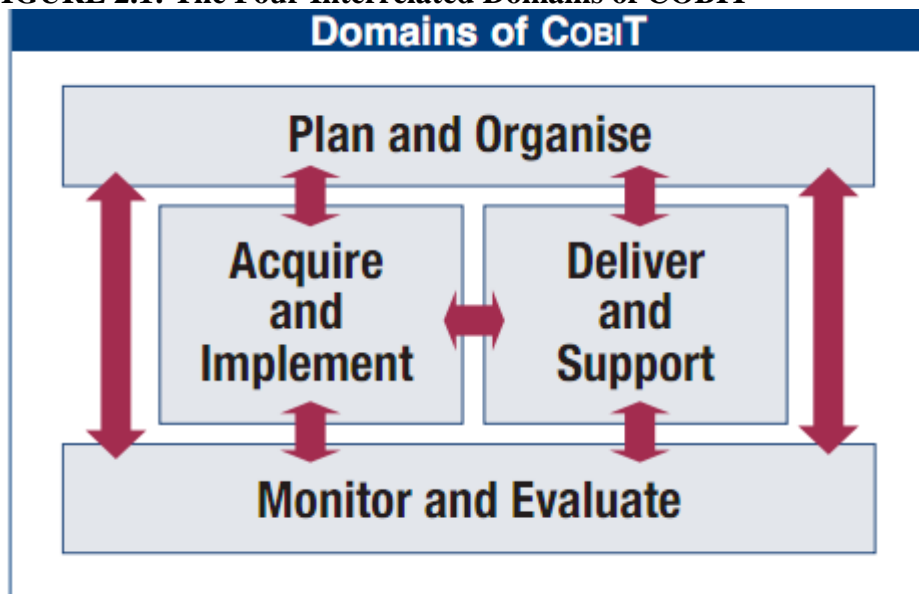
COBIT IT Governance Framework combines controls into objectives. In a similar way COBIT combines objectives together into four overarching domains. The authors of COBIT observed that responsibilities were often organized into four common domains: plan, build, run,

¹⁴ Pederiva 2003, Doughty and O'Driscoll 2002, COBIT 4.1 2007

and monitor. In COBIT, these domains are called Plan and Organize; Acquire and Implement; Deliver and Support; and Monitor and Evaluate. These domains interrelate and support one another, together comprise the high-level structure to guide IT decisions and management activities¹⁵.

Plan and Organize (PO) “[p]rovides direction to solution delivery (AI) and service delivery (DS) (COBIT 4.1 2007, 12). Acquire and Implement (AI) provides the solutions that later form IT services (COBIT 4.1 2007, 12). Deliver and Support (DS) “[r]eceives the solutions and makes them usable for end users” (COBIT 4.1 2007, 12). Monitor and Evaluate (ME) “[m]onitors all processes to ensure that the direction provided is followed” (COBIT 4.1 2007, 12). Using objectives from each one of the four COBIT domains provides a comprehensive picture of the entire governance process. Figure 2.1 illustrates how these four domains fit together and support one another.

FIGURE 2.1: The Four Interrelated Domains of COBIT



(COBIT 4.1 2007, 12)

¹⁵ Also referred as **controls** from Chapter 1

Because each domain supports another, it is logical to study each of the governance domains.

Though an organization may not be able to fully apply COBIT, a limited application can reveal beneficial information about the IT governance environment. Table 2.2 demonstrates the modified framework developed from COBIT and used in this applied research project.

TABLE 2.2: Conceptual Framework at a Glance (Modified COBIT Framework)

Plan and Organize (PO)
PO1 - Define a Strategic IT Plan PO10 - Manage Projects
Acquire and Implement (AI)
AI4 - Enable Operation and Use AI6 - Manage Changes
Deliver and Support (DS)
DS1 - Define and Manage Service Levels DS7 - Educate and Train Users DS13 – Manage Operations
Monitor and Evaluate (ME)
ME1 - Monitor and Evaluate IT Performance ME4 - Provide IT Governance

(COBIT 4.1 2007)

Plan and Organize (PO)

The following excerpt comes directly from the Executive Summary from COBIT 4.1.

This excerpt explains exactly what the Plan and Organize domain represents.

This domain covers strategy and tactics, and concerns the identification of the way IT can best contribute to the achievement of the business objectives. The realization of the strategic vision needs to be planned, communicated and managed for different perspectives. A proper organization as well as technological infrastructure should be put in place. This domain typically addresses the following management questions:

- Are IT and the business strategy aligned?
- Is the enterprise achieving optimum use of its resources?
- Does everyone in the organization understand the IT objectives?
- Are IT risks understood and being managed?
- Is the quality of IT systems appropriate for business needs?

(COBIT 4.1 2007, 12)

PO1 - Define a Strategic IT Plan

PO 1 – Define a Strategic IT Plan is the first of the Plan and Organize objectives. As the title suggests, this objective addresses strategic planning related to IT implementation. The following section covers strategic planning and how it relates to IT, as well as the maturity model used to measure this objective.

The longer the effect of a plan and the more difficult it is to reverse, the more strategic it is. Therefore, strategic planning is concerned with decisions that have enduring effects that are difficult to reverse. Strategic planning is long-range planning. In general strategic planning is concerned with the longest period of time worth considering... (Ackoff 1970, 4)

Strategic planning is a concept commonly used by many types of management, including IT management. “Strategic planning involves determining long-term objectives by analyzing the strengths and weaknesses of an organization, studying opportunities and threats in the business environment, predicting future trends, and projecting the need for new products and services” (Schwalbe 2010, 134, 135). As this definition implies, strategic planning requires many perspectives about the organization’s environment, and expertise in different fields, to set the long-term organizational goals. The Government Accountability Office’s¹⁶ “prior work has shown that strategic planning is the foundation for defining what the agency seeks to accomplish, identifying the strategies it will use to achieve desired results, and then determining how well it succeeds in reaching results-oriented goals and achieving objectives” (GAO 2010, 5). In a similar way, smaller organizations such as municipalities have been using strategic planning for over twenty years (Poister and Streib 2005). However, the literature recognizes that the most difficult part of strategic planning is communicating how the long-term plans will be placed into action¹⁷. Though IT governance assists with implementing long-term IT goals, the strategic IT

¹⁶ The Government Accountability Office is an independent, nonpartisan federal agency that acts as the investigative arm of the United States Congress

¹⁷ Poister and Streib 2005, Schwalbe 2010 136 – 137, Bryson 1995 82 – 103

plan must align with and support the organization's long-term goals and objectives (Schwalbe 2010, 136). By evaluating the strategic IT plan the organization can improve implementation of the IT objectives and ensure that the strategic plan aligns with the organization's long-term goals and objectives.

The literature recognizes one tool used to develop a strategic plan as the SWOT method (Strengths, Weaknesses, Opportunities, and Threats)¹⁸. This method requires management within the organization to recognize SWOT analysis, allowing IT managers and top management to carefully consider the environment as they identify and communicate thoughts about IT development. The SWOT method assists managers at all levels of the organization in identifying potential IT projects and helping align IT with business strategies¹⁹. By developing a strategic plan, a city can tie its IT goals directly into the goals set forth by city leadership. Using strategic planning over time helps the organization clarify how it uses IT on a daily basis and how the organization can use IT more efficiently.

Like the SWOT methodology, COBIT recognizes the importance of strategic planning as well. The first COBIT objective (PO1 - Define a Strategic IT Plan) deals specifically with strategic IT planning. "IT strategic planning is required to manage and direct all IT resources in line with the business strategy and priorities" (COBIT 4.1 2007, 29). Consistent with the literature²⁰, COBIT places importance on strategic IT planning and the fact that must align with the organization's long-term strategy as well. Defining a strategic IT plan requires:

- Engaging with business and senior management in aligning IT strategic planning with current and future business needs
 - Understanding current IT capabilities
 - Providing for a prioritization scheme for the business objectives that quantifies the business requirements.
- (COBIT 4.1 2007, 29)

¹⁸ Schwalbe 2010 134 – 135, Bryson 1995 82 – 103

¹⁹ Schwalbe 2010, 134 – 136, Lederer and Sethi 1996, 35

²⁰ Harrison 1995, Linn 2008, Ackoff 1970, Steiner 1979, Boyd and Reubug-Elliott 1998, Mintzberg 1994

The first requirement demonstrates how all levels of management must communicate in order to ensure IT meets the needs of the organization. Like the SWOT technique, the second requirement requires leaders in the organization know what IT can and cannot do. The final point requires all of the relevant parties engaged in planning for current and future IT needs. IT governance facilitates greater communication and long-term understanding of the organization's overall direction (Schwalbe 2010, 55).

Strategic planning “is a process of deciding in advance what kind of planning effort is to be undertaken, when it is to be done, who is going to do it, and what will be done with the results” (Steiner 1979, 14). COBIT provides a maturity model to measure how well an organization conducts Strategic IT Planning. The following table illustrates the COBIT maturity model used to measure the Strategic Planning Process.

TABLE 2.3: PO1 Define a Strategic IT Plan Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	IT strategic planning is not performed. There is no management awareness that IT strategic planning is needed to support business goals.
1	Initial/Ad Hoc	The need for IT strategic planning is known by IT management. IT planning is performed on an as-needed basis in response to a specific business requirement. IT strategic planning is occasionally discussed at IT management meetings. The alignment of business requirements, applications and technology takes place reactively rather than by an organization-wide strategy. The strategic risk position is identified informally on a project-by-project basis.
2	Repeatable but Intuitive	IT strategic planning is shared with business management on an as-needed basis. Updating of the IT plans occurs in response to requests by management. Strategic decisions are driven on a project-by-project basis without consistency with an overall organization strategy. The risks and user benefits of major strategic decisions are recognized in an intuitive way
3	Defined	A policy defines when and how to perform IT strategic planning. IT strategic planning follows a structured approach that is documented and known to all staff. The IT planning process is reasonably sound and ensures that appropriate planning is likely to be performed. However, discretion is given to individual managers with respect to implementation of the process, and there are no procedures to examine the process. The overall IT strategy includes a consistent definition of risks that the organization is willing to take as an innovator or follower. The IT financial, technical and human resources strategies increasingly influence the acquisition of new products and technologies. IT strategic planning is discussed at business management meetings.
4	Managed	IT strategic planning is standard practice and exceptions would be noticed by management. IT strategic planning is a defined management function with senior-level responsibilities. Management is able to monitor the IT strategic planning process, make informed decisions based on it and measure its effectiveness. Both short-range and long-range IT planning occurs and is cascaded down into the organization, with updates done as needed. The IT strategy and organization-wide strategy are increasingly becoming more coordinated by addressing business processes and value-added capabilities and leveraging the use of applications and technologies through business process re-engineering. There is a well-defined process for determining the usage of internal and external resources required in system development and operations.
5	Optimized	IT strategic planning is a documented, living process; is continuously considered in business goal setting; and results in discernible business value through investments in IT. Risk and value-added considerations are continuously updated in the IT strategic planning process. Realistic long-range IT plans are developed and constantly updated to reflect changing technology and business-related developments. Benchmarking against well-understood and reliable industry norms takes place and is integrated with the strategy formulation process. The strategic plan includes how new technology developments can drive the creation of new business capabilities and improve the competitive advantage of the organization.

(COBIT 4.1 2007, 32)

The preceding literature reveals two things: that strategic planning is an important, time honored tool and that strategic planning is a process. The following analysis provides some insight as to why this maturity model measures strategic planning the way it does.

Strategic planning is a process that differs across industries, as well as between organizations within the same industry (Mintzberg 1994). Strategic planning cannot adhere to a strict format of market analysis, projections, and analysis completed on a standard time table²¹. Organizations that adhere to this method of strategic planning are really not planning at all, but thinking strategically, or long term, about information they already know about the organization and creating a plan based on that information (Mintzberg 1994). Strategic planning involves synthesizing both quantitative and qualitative data as well as listening to rumor, speculation, and hearsay before creating, focusing, and directing the organization. Most importantly, the organization must turn plans into action (Mintzberg 1994, Harrison 1995). The COBIT maturity model does not measure how well an organization succeeds in strategic planning, but how mature the process for strategic planning is within the organization.

When measuring strategic planning, success or failure is not as important as how well the organization uses the information to make critical decisions²². Boyd and Reububg-Elliott criticize strategic planners because they focus too much on studying variables that affect their organization, rather than understanding how those variables fit together (1998). Though Boyd and Reububg-Elliott's research focuses on the interrelationships of variables in strategic planning, the authors make two important conclusions. First, involvement of top management with middle and lower management is key in the strategic planning process. Second, it is important that all of the bits of information, both from inside and outside the organization, reach

²¹ Boyd and Reububg-Elliott 1998, Harrison 1995, Linn 2008, Mintzberg 1994

²² Mintzberg 1994, Boyd and Reububg-Elliott 1998

top management and then the plans top managers make as well as the actions they begin flow down to middle and lower management. The organizations ability to gather information, synthesize that information, and create long-term plans is what the COBIT maturity model measures.

Each level of the COBIT maturity model measures how information flows in the strategic planning process. The levels discuss who is involved, what documentation is created, how that documentation is used to synthesize information, and how actions from that information is to further the goals of the organization. COBIT stipulates that if an organization follows this model, the organization will have a process in place that will give strategic planning the best possible chance to succeed. But, ultimately the success of the plan depends upon the aptitude of individuals within the organization (Mintzberg 1994). Ultimately, the success or failure of the plan is not as important as using the information to avoid past mistakes and to build on lasting achievements (Mintzberg 1994).

PO10 - Manage Projects

PO10 – Manage Projects is the tenth and last objective of the Plan and Organize objectives. As the title suggests, this objective deals with the IT project management process. The following section covers the IT project management process and the COBIT maturity model used to measure this objective.

Projects have a limited scope and purpose and are characterized as having a specific goal, timeline, and budget²³. However, there are many ways to manage projects so knowing how to manage characteristics of a project makes for an effective project manager²⁴. In fact, measuring

²³ Schwalbe 2010, 7-9, Rosacker and Olson 2008

²⁴ Schwalbe 2010, Besner and Hobbs 2008, Legris and Collette 2006, Reich 2007

and even creating maturity models for key dimensions of success for projects or project managers occupies much of the literature²⁵. In general, the literature discusses how to judge a project's effectiveness and whether a project was "successful". The literature provides as many articles for project and for project evaluation of success. One article defines success as percentage of system usage²⁶, another study creates a statistical framework for quantifying success and bases success on a score²⁷, and yet another study creates a maturity model measuring management success based on the activities of the project manager²⁸. The literature identifies the difficulty in defining project success as a fundamental problem²⁹ and advocates for the establishment of standardized practices for management.

Two articles³⁰ create maturity models similar to the COBIT maturity model for PO10 – Manage Projects, these models measure IT project management maturity rather than project success. These articles offer similar reasons for measuring IT project management process. First, both recognize the fundamental problem in defining and measuring project success. Second, providing information about the process, regardless of project success helps organizations avoid practices that do not lead to success and help organizations develop better IT project management processes that lead to successful projects.

As with the two maturity models developed by Ibbs and Kwak, and Judgev and Thomas, the COBIT maturity model measures the maturity of the IT project management process. The following table contains the COBIT maturity model for this objective.

²⁵ Shenhar, Levy, and Dvir 1997, Besner and Hobbs 2008, Legris and Colletette 2006, Rosacker and Olson 2008,

²⁶ Legris and Colletette 2006

²⁷ Shenhar, Levy, and Dvir 1997

²⁸ Hartman and Skulmosk 1998

²⁹ Ibbs and Kwak 2000, Judgev and Thomas 2002, Besner and Hobbs 2008, Legris and Colletette 2006, Rosacker and Olson 2008

³⁰ Ibbs and Kwak 2000, Judgev and Thomas 2002

TABLE 2.4: PO10 - Manage Projects Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	Project management techniques are not used and the organization does not consider business impacts associated with project mismanagement and development project failures.
1	Initial/Ad Hoc	The use of project management techniques and approaches within IT is a decision left to individual IT managers. There is a lack of management commitment to project ownership and project management. Critical decisions on project management are made without user management or customer input. There is little or no customer and user involvement in defining IT projects. There is no clear organization within IT for the management of projects. Roles and responsibilities for the management of projects are not defined. Projects, schedules and milestones are poorly defined, if at all. Project staff time and expenses are not tracked and compared to budgets.
2	Repeatable but Intuitive	Senior management gains and communicates an awareness of the need for IT project management. The organization is in the process of developing and utilizing some techniques and methods from project to project. IT projects have informally defined business and technical objectives. There is limited stakeholder involvement in IT project management. Initial guidelines are developed for many aspects of project management. Application of project management guidelines is left to the discretion of the individual project manager.
3	Defined	The IT project management process and methodology are established and communicated. IT projects are defined with appropriate business and technical objectives. Senior IT and business management are beginning to be committed and involved in the management of IT projects. A project management office is established within IT, with initial roles and responsibilities defined. IT projects are monitored, with defined and updated milestones, schedules, budget and performance measurements. Project management training is available and is primarily a result of individual staff initiatives. QA procedures and post-system implementation activities are defined, but are not broadly applied by IT managers. Projects are beginning to be managed as portfolios.
4	Managed	Management requires formal and standardized project metrics and lessons learned to be reviewed following project completion. Project management is measured and evaluated throughout the organization and not just within IT. Enhancements to the project management process are formalized and communicated with project team members trained on enhancements. IT management implements a project organization structure with documented roles, responsibilities and staff performance criteria. Criteria for evaluating success at each milestone are established. Value and risk are measured and managed prior to, during and after the completion of projects. Projects increasingly address organization goals, rather than only IT-specific ones. There is strong and active project support from senior management sponsors as well as stakeholders. Relevant project management training is planned for staff in the project management office and across the IT function.
5	Optimized	A proven, full life cycle project and program methodology is implemented, enforced and integrated into the culture of the entire organization. An ongoing initiative to identify and institutionalize best project management practices is implemented. An IT strategy for sourcing development and operational projects is defined and implemented. An integrated project management office is responsible for projects and programs from inception to post-implementation. Organization wide planning of programs and projects ensures that user and IT resources are best utilized to support strategic initiatives.

(COBIT 4.1 2007, 72)

This maturity model reflects maturity models in the literature. Though this maturity model is more extensive than those in the literature the model still has many of the same features. The literature review indicates importance of understanding of the IT project management process (Doughty and O'Driscoll 2002), who is involved in the process, upper management's

involvement in the IT project management process, how information is shared between project managers and other levels of organizational management, and how information is used to improve the IT project management process³¹.

Though important, the success or failure of the project is not assessed by the maturity model. More important is identifying the process that leads to success. Additionally, maintaining information on failure is equally important for an organization to avoid repeating the same mistakes in the future.

Acquire and Implement (AI)

The following excerpt comes directly from the Executive Summary of COBIT 4.1. This excerpt clearly explains the Acquire and Implement domain.

To realize the IT strategy, IT solutions need to be identified, developed or acquired, as well as implemented and integrated into the business process. In addition, changes in and maintenance of existing systems are covered by this domain to make sure the solutions continue to meet business objectives. This domain typically addresses the following management questions:

- Are new projects likely to deliver solutions that meet business needs?
- Are new projects likely to be delivered on time and within budget?
- Will the new systems work properly when implemented?
- Will changes be made without upsetting current business operations?

(COBIT 4.1 2007, 13)

AI4 - Enable Operation and Use

AI4 – Enable operation and Use is the fourth Acquire and Implement objective. In this objective, “knowledge about new systems is made available. This process requires the production of documentation and manuals for users and IT, and provides training to ensure the proper use and operation of applications and infrastructure” (COBIT 4.1 2007, 85). This objective is similar to Chinowsky et al. and Ruiz’s discussions of knowledge management and

³¹ Ibbs and Kwak 2000, Judgev and Thomas 2002, Besner and Hobbs 2008, Legris and Colletette 2006, Rosacker and Olson 2008

how organizations use knowledge to improve operations³². Both studies about knowledge management indicate the creation of process documentation is essential to managing knowledge within the organization. COBIT's requirements for management to achieve this objective are to:

- Develop and make available knowledge transfer documentation
 - Communicate and train users, business management, support staff and operational staff
 - Produce training materials
- (COBIT 4.1 2007, 85)

One of the biggest obstacles to IT knowledge management is convincing individuals within the organization to use the information³³.

The primary issue causing failures in knowledge resources is a lack of end user use³⁴. These articles argue that if the user will not use the knowledge assets, then the knowledge is not useful to the organization. Detlor describes an organization that invested in a state of the art, web-based system to train support staff on the operation and use of a system needed to support daily functions (1999). In the course of his study, Detlor found the majority of the staff used the Internet rather than the internal system to look up information about common issues covered in the web-based training. Therefore, the company invested in a system employees did not use. Detlor found that problems with knowledge management systems primarily revolve around accessibility and quality of information. The literature supports Detlor's assertions.

Accessibility is defined as "the time and effort needed to approach, contact, or locate each information source, as well as the ease with which to get the desired information from that source" (Detlor 1999). When designating access to the information, designers need to know who will use the information and how, in order to meet the needs of the end user³⁵. Knowing how the user will access the information and designing the knowledge asset in anticipation of its use

³² Chinowsky, Paul, and Patricia Carrillo 2007, Ruiz 2010

³³ Koenig 2007, Detlor 1999,

³⁴ Conley and Zheng 2009, Wang, Kleinz, and Jiang 2007, Reich 2007, Petter and Randolph 2009, Koenig 2007, Detlor 1999

³⁵ Detlor 1999, Petter and Randolph 2009, Reich 2007

leads to greater retention of information once that information is accessed (Conley and Zheng 2009). Though some of the literature supports the use of web-based solutions,³⁶ widely distributed multimedia assets may not be necessary, especially if only a few people need information on a regular basis (Petter and Randolph 2009). Regardless what knowledge asset an organization develops, the quality of the information is a key consideration.

Quality can be evaluated in terms of “the relevancy and reliability of each information source” (Detlor 1999). In Detlor’s study, users often chose to use the internet as their source of information, because the users perceived that the Internet had more information relevant to their needs, despite the fact the internal system was much more accessible (1999)³⁷. When organizations invest in knowledge assets that contain highly reliable and relevant information those organizations reduce employee learning time (Petter and Randolph 2009). The point at which an employee can effectively operate a system on his own decreases the workload on other employees and increases the overall efficiency of the organization³⁸. Reducing employee learning time places a premium on quality information because even the most accessible systems are ineffective without good information (Detlor 1999).

The literature contains many responses to the problem of poor quality information and poor accessibility. Some feel the solution lies with linking the information more closely to the end users’ expectations (Detlor 1999, Reich 2007). Others advocate for tighter control over the knowledge retention and distribution processes in general³⁹. Wang, et al. went so far as to create a way to statistically analyze variables to reliability in a knowledge management system (2007). Though the literature offers many ideas to make knowledge management better, all suggestions

³⁶ Koenig 2007, Detlor 1999

³⁷ A key point here is, just because the organization makes training web-based does not mean people will use it.

³⁸ Petter and Randolph 2009, Reich 2007, Koenig 2003, Kipley, Lewis, and Helm 2008

³⁹ Petter and Randolph 2009, Koenig 2003, Kipley, Lewis, and Helm 2008, Wang, Kleinz, and Jiang 2007

revolve around improving the processes, ensuring top management commits to the success of knowledge management in the organization, and ensuring that knowledge management aligns with the organizations goals and objectives. However, the literature does not offer a single method to determine the quality of the knowledge management practices. To this end, various authors support the use of maturity models, very similar to COBIT, to assess knowledge management in organizations⁴⁰. Similar to the COBIT maturity model, these authors developed a maturity assessment using a five level system. The table below contains the COBIT maturity model for this objective.

⁴⁰ Bartczak, Blair, Peachy, and Turner 2010, Ehms and Langen 2002, Freeze and Kulkarni 2005, Freeze and Kulkarni 2006

TABLE 2.5: AI4 - Enable Operation and Use Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	There is no process in place with regard to the production of user documentation, operations manuals and training material. The only materials that exist are those supplied with purchased products.
1	Initial/Ad Hoc	There is awareness that process documentation is needed. Documentation is occasionally produced and is inconsistently distributed to limited groups. Much of the documentation and many of the procedures are out of date. Training materials tend to be one-off schemes with variable quality. There is virtually no integration of procedures across different systems and business units. There is no input from business units in the design of training programs.
2	Repeatable but Intuitive	Similar approaches are used to produce procedures and documentation, but they are not based on a structured approach or framework. There is no uniform approach to the development of user and operating procedures. Training materials are produced by individuals or project teams, and quality depends on the individuals involved. Procedures and quality of user support vary from poor to very good, with very little consistency and integration across the organization. Training programs for the business and users are provided or facilitated, but there is no overall plan for training rollout or delivery.
3	Defined	There is a clearly defined, accepted and understood framework for user documentation, operations manuals and training materials. Procedures are stored and maintained in a formal library and can be accessed by anyone who needs to know them. Corrections to documentation and procedures are made on a reactive basis. Procedures are available offline and can be accessed and maintained in case of disaster. A process exists that specifies procedure updates and training materials to be an explicit deliverable of a change project. Despite the existence of defined approaches, the actual content varies because there is no control to enforce compliance with standards. Users are informally involved in the process. Automated tools are increasingly used in the generation and distribution of procedures. Business and user training is planned and scheduled.
4	Managed	There is a defined framework for maintaining procedures and training materials that has IT management support. The approach taken for maintaining procedures and training manuals covers all systems and business units, so that processes can be viewed from a business perspective. Procedures and training materials are integrated to include interdependencies and interfaces. Controls exist to ensure adherence to standards, and procedures are developed and maintained for all processes. Business and user feedback on documentation and training is collected and assessed as part of a continuous improvement process. Documentation and training materials are usually at a predictable and good level of reliability and availability. An emerging process for using automated procedure documentation and management is implemented. Automated procedure development is increasingly integrated with application system development facilitating consistency and user access. Business and user training is responsive to the needs of the business. IT management is developing metrics for the development and delivery of documentation, training materials and training programs.
5	Optimized	The process for user and operational documentation is constantly improved through the adoption of new tools or methods. The procedure materials and training materials are treated as a constantly evolving knowledge base that is maintained electronically using up-to-date knowledge management, workflow and distribution technologies, making it accessible and easy to maintain. Documentation and training material is updated to reflect organizational, operational and software changes. The development of documentation and training materials and the delivery of training programs are fully integrated with the business and business process definitions, thus supporting organization-wide requirements, rather than only IT-oriented procedures.

(COBIT 4.1 2007, 88)

As in the maturity models from the literature, the COBIT maturity models assess the knowledge management process in and organization. Kulkarni and Freeze use a similar model.

The author's maturity model contains five levels ranging from a basic understanding of the

knowledge assets (level 1), to a continuous improvement of knowledge management process (level 5) (2006). Similarly, Ehms and Langen use a maturity model that ranges from “initial” to “optimizing” knowledge management (2002). All three of these models⁴¹ use an assessment method focused on improving the quality of IT knowledge management. An organizations knowledge management formation is Important to the models. Namely, who is involved in the knowledge management process, how an organization manages information, and how an organization uses its documentation to improve knowledge management⁴². Therefore, studying information related to the knowledge management provides a better understanding of the process itself and how the organization can make the process better.

AI6 - Manage Changes

AI6 – Manage Changes is the sixth Acquire and Implement objective. As the title suggests, this objective deals with the IT change management process. For this objective COBIT offers the following description:

All changes, including emergency maintenance and patches, relating to infrastructure and applications within the production environment are formally managed in a controlled manner. Changes (including those to procedures, processes, system and service parameters) are logged, assessed and authorized prior to implementation and reviewed against planned outcomes following implementation. This assures mitigation of the risks of negatively impacting the stability or integrity of the production environment.
(COBIT 4.1 2007)

To summarize the COBIT description; IT change management addresses processes relating to making any change to hardware, software, or altering the scope of an IT asset. This objective is achieved by:

⁴¹ COBIT, Ehms and Langen 2002, and Kulkarni and Freeze 2006

⁴² Ehms and Langen 2002, and Kulkarni and Freeze 2006

- Defining and communicating change procedures, including emergency changes
 - Assessing, prioritizing and authorizing changes
 - Tracking status and reporting on changes
- (COBIT 4.1 2007)

Change management is a critical yet problematic process and is prone to failure⁴³.

The primary dilemma for IT managers is communication throughout the change management process⁴⁴. Lack of communication leads to problems in planning, implementation, and the overall quality of the change management process⁴⁵. Failure of this process can cause lost revenue, cost overruns, and decreased productivity for staff and the organization as a whole⁴⁶. Addressing this critical function, many researchers offer recommendations for increasing the quality of the IT change management process. Two authors support a position on this issue of a quality management approach to change management⁴⁷, while others support a governance structure⁴⁸.

Proponents of a quality management type approach focus on enhancing the IT management function itself as opposed to addressing change management organization-wide. The following two examples are suggestions to enhance the change management function. Pintelon, et al. focus on specific practices managers can implement to enhance change management (1999). The authors recommend short term and long term planning, goal setting, tighter management of resources⁴⁹, and performance evaluation. Rebougas, et al. created a decision making model to assist IT managers with change management (2007). Both enhancements address the change management process within IT

⁴³ Rebougas,Sauve, Moura, Bartolinil, and Trastour 2007, Sarup 2002

⁴⁴ Kulkarni 2003, Sarup 2002, Rebougas,Sauve, Moura, Bartolinil, and Trastour 2007, Almaraz 1994, Diefenbach 2005, Margherita and Petti 2010, Saka 2002

⁴⁵ Rebougas,Sauve, Moura, Bartolinil, and Trastour 2007, Sarup 2002, Kulkarni 2003,

⁴⁶ Kans 2009, Pintelon, Du Preez and Puyvelde 1999

⁴⁷ Rebougas,Sauve, Moura, Bartolinil, and Trastour 2007, Pintelon, Du Preez and Puyvelde 1999

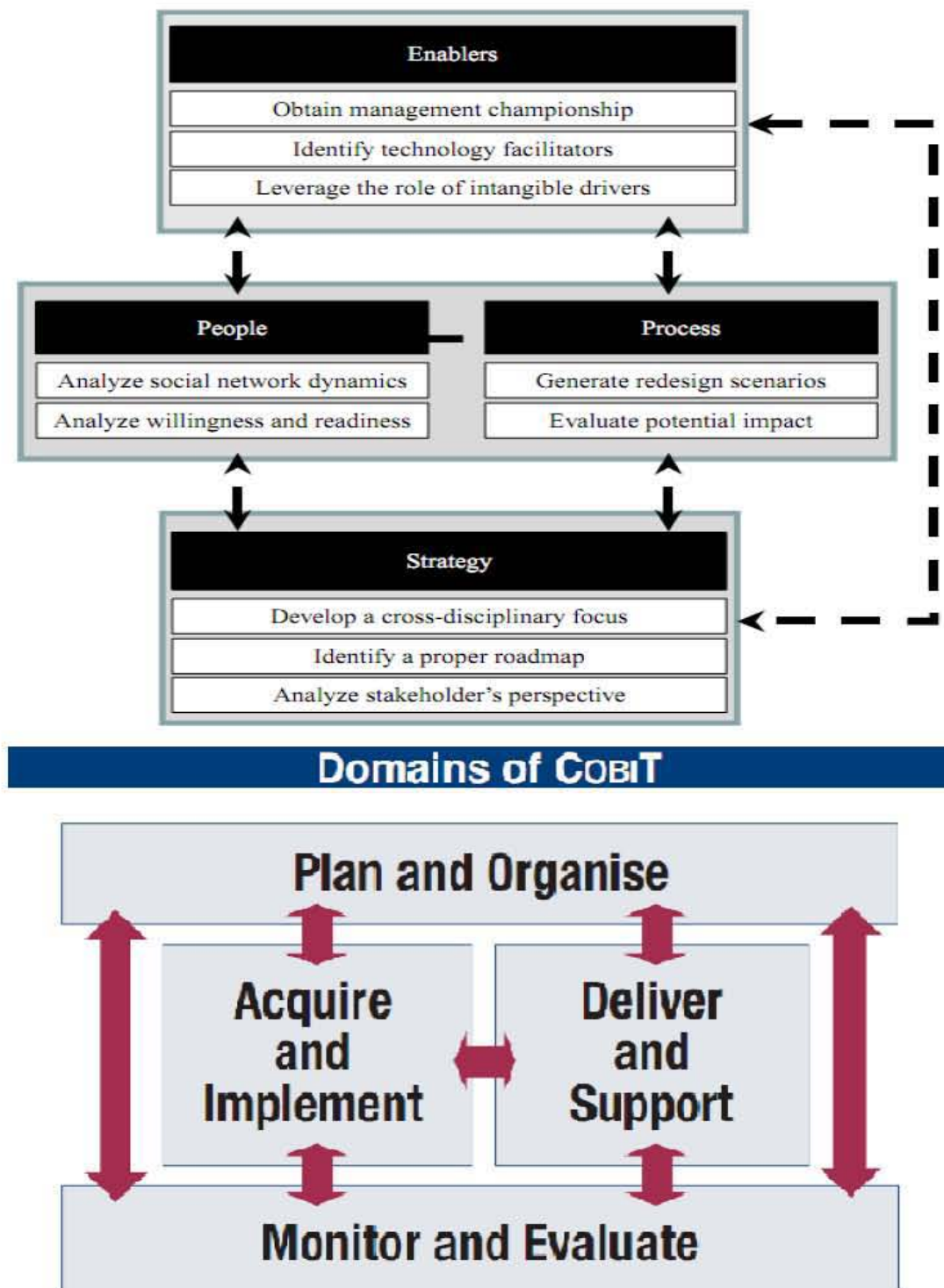
⁴⁸ Saka 2002, Kans 2009, Almaraz 1994, Margherita and Petti 2010

⁴⁹ personnel, materials, documentation and management information systems

management and only minimally involve the rest of the organization. Diefenbach, conducted a case study on a large Western-European University (2005). Diefenbach suggests that strictly following management models without first evaluating the model to see if it fits the organization can negate the change management process all together and lead to greater losses. Saka also adopts this stance and points out that organizations can benefit from the flexibility of a less rigid best-practices approach rather than “rational-linear models of change “ (2002). Saka advocates for a more integrated approach that incorporates more stakeholders in the process.

Diefenbach and Saka represent a governance approach to change management where overarching objectives help tailor the process to the organization. Several researchers take the concept one step farther and propose a maturity model-based solution that addresses the overall quality of the process by measuring process maturity. Margherita and Petti (2010) present a governance framework similar to the COBIT IT Governance Framework. The illustration below shows these two frameworks from Margherita and Petti and from COBIT 4.1.

FIGURE 2.2: Margherita and Petti and COBIT 4.1



TOP: (Margherita and Petti 2010, 479) BOTTOM: (COBIT 4.1 2007, 12)

Margherita and Petti's framework contains four domains that follow a similar format to the COBIT domains. Margherita and Petti domains inter-connect and support

one another, much like the COBIT domains. Unlike COBIT, Margherita and Petti create this framework specifically for IT change management. Margherita and Petti also create an assessment tool for all stakeholders that evaluates the processes on four levels. In similar fashion, Kans presents a six level assessment based on both growth and maturity (2009). Kans develops his assessment framework in respect to IT maturity and time. Kans adapts a previously developed maturity framework and applies it to known phases in IT development. Kans creates a way to track maturity and compare that maturity to expected IT development. Similar to Margherita and Petti and Kans, COBIT uses a maturity model to assess the change management process. The following table contains the AI6 – Manage Changes maturity model.

TABLE 2.6: AI6 – Manage Changes Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	There is no defined change management process, and changes can be made with virtually no control. There is no awareness that change can be disruptive for IT and business operations, and no awareness of the benefits of good change management.
1	Initial/Ad Hoc	It is recognized that changes should be managed and controlled. Practices vary, and it is likely that unauthorized changes take place. There is poor or non-existent documentation of change, and configuration documentation is incomplete and unreliable. Errors are likely to occur together with interruptions to the production environment caused by poor change management.
2	Repeatable but Intuitive	There is an informal change management process in place and most changes follow this approach; however, it is unstructured, rudimentary and prone to error. Configuration documentation accuracy is inconsistent, and only limited planning and impact assessment take place prior to a change.
3	Defined	There is a defined formal change management process in place, including categorization, prioritization, emergency procedures, change authorization and release management, and compliance is emerging. Workarounds take place, and processes are often bypassed. Errors may occur and unauthorized changes occasionally occur. The analysis of the impact of IT changes on business operations is becoming formalized, to support planned rollouts of new applications and technologies.
4	Managed	The change management process is well developed and consistently followed for all changes, and management is confident that there are minimal exceptions. The process is efficient and effective, but relies on considerable manual procedures and controls to ensure that quality is achieved. All changes are subject to thorough planning and impact assessment to minimize the likelihood of post-production problems. An approval process for changes is in place. Change management documentation is current and correct, with changes formally tracked. Configuration documentation is generally accurate. IT change management planning and implementation are becoming more integrated with changes in the business processes, to ensure that training, organizational changes and business continuity issues are addressed. There is increased co-ordination between IT change management and business process redesign. There is a consistent process for monitoring the quality and performance of the change management process.
5	Optimized	The change management process is regularly reviewed and updated to stay in line with good practices. The review process reflects the outcome of monitoring. Configuration information is computer-based and provides version control. Tracking of changes is sophisticated and includes tools to detect unauthorized and unlicensed software. IT change management is integrated with business change management to ensure that IT is an enabler in increasing productivity and creating new business opportunities for the organization.

(COBIT 4.1 2007, 96)

Like the other maturity model solutions, the COBIT maturity model for AI6 – Manage Changes measures the change management process potential to effectively manage changes. The primary difference between this model and those from the literature is that the COBIT maturity model is part of a much larger framework that integrates the objective with other COBIT objectives to provide a more complete governance structure.

Whether or not the individual literature presents a solution for change management, every researcher collected information on some very similar topics to reach conclusions. All of the researchers discussed the people involved in the change management process⁵⁰. The types of individuals include IT managers, those affected by the changes, and top management. Every article points out that change management success requires support from top management. If the organization's leadership does not value the process, then the rest of the organization will not implement the process. The literature also discusses documentation of changes and how organizations use documentation to standardize and improve the process⁵¹.

Deliver and Support

This domain deals with the delivery of required services by means of the tools adopted in the acquisition and implementation domain. Ensuring the proper functioning of the systems implemented and providing support to the systems in use are the core purposes of this domain. To deliver services, necessary support processes must be set up to help in processing data or support application controls. Acquiring such services requires decisions such as whether a new system should be outsourced or be developed in-house. The critical support services must be provided for optimal functioning and uninterrupted operations. (Mishra, et al. 2007, 715)

DS1 - Define and Manage Service Levels

DS1 – Define and Manage Service Levels is the first of the Deliver and Support objectives. This objective focuses on effective communication between service providers and service consumers (COBIT 4.1 2007, 101). COBIT users achieve effective communication by:

- Formalizing internal and external agreements in line with requirements and delivery capabilities
 - Reporting on service level achievements (reports and meetings)
 - Identifying and communicating new and updated service requirements to strategic planning
- (COBIT 4.1 2007)

⁵⁰ Rebougas, Sauve, Moura, Bartolinil, and Trastour 2007, Sarup 2002, Kulkarni 2003, Almaraz 1994, Diefenbach 2005, Margherita and Petti 2010, Saka 2002, Kans 2009, Pintelon, Du Preez and Puyvelde 1999

⁵¹ Diefenbach 2005, Margherita and Petti 2010, Pintelon, Du Preez and Puyvelde 1999, Kans 2009, Rebougas, Sauve, Moura, Bartolinil, and Trastour 2007, Saka 2001

Organizations can deliver IT services via internal systems and personnel or through contracted services. One example of contractual IT service is mobile phone service. Phones and the service originate from an external provider because it is not cost effective for every organization to have its own mobile phone service. The service level agreement (SLA) between the organization and the phone company is the service contract signed by the organization's representative. In the event of defective service or services change, the two parties reference the terms that service agreement to determine action.

Any person experiencing mobile phone service disruption can understand the importance of managing service levels. Service level management is critical because service loss causes productivity loss to the organization, and sustained loss or diminished capacity may cause irreversible damage to the organization (Van Grembergen, et al. 2004, 1-36). A service level agreement⁵² identifies the service commitments between the service provider and service purchaser and the boundary of those responsibilities (Larson 1998). Therefore, IT managers and consumers of IT management's services must communicate and understand organizational goals and objectives in order to provide effective service (COBIT 4.1).

When it comes to IT service level agreements, the literature identifies a common problem – enforceability⁵³. Because of the dynamic and fast-paced nature of technology, IT service level agreements today may not be relevant later⁵⁴. No agreement, IT related or otherwise addresses every possible scenario. Therefore, IT service level agreements address primary service with provisions for common contingencies (Taylor and Tofts 2006). Any contingency not spelled out in the service level agreement must be addressed individually and this is often done in an ad hoc

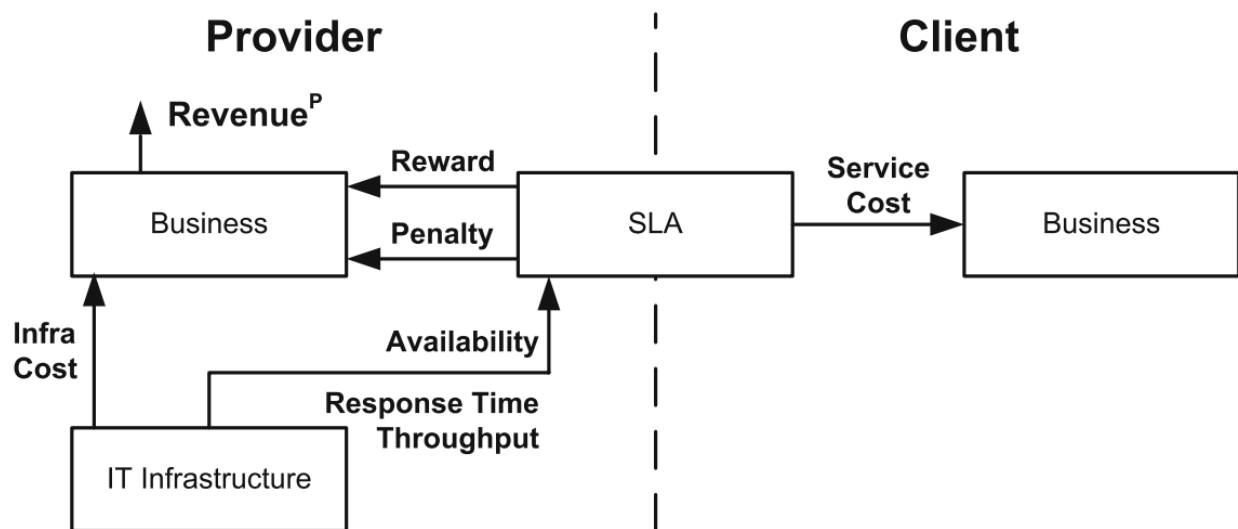
⁵² The literature uses service level agreement, formal contract, contract, and agreement interchangeably.

⁵³ Goo 2010, Marques, Sauve´ and Moura 2009, Larson 1998, Goo, Kishore, Rao, and Nam 2009

⁵⁴ Marques, Sauve´ and Moura 2009, Larson 1998

manner⁵⁵. Unplanned contingencies can cause friction between the organization and the service provider. Additionally, IT service levels are often defined in technical terms, but not tying these terms to a business need can create a disparity between the organization and the service provider⁵⁶. A disparity occurs when the service level is originally vaguely defined and the organization needs more than the service provider can give or the organization contracts for more service than it really needs (Wan and Chan 2008). Operating outside of the service level agreement or operating within a poorly defined service level agreement creates conflicts between service providers and organizations. Therefore, receiving compensation from a customer for services outside the scope of a service agreement or enforcing poorly defined service levels may be problematic⁵⁷. Following is an illustration of the service level agreement concept.

FIGURE 2.3: Conventional SLA Design Approach



Conventional SLA design approach
(Marques, Sauve, and Moura 2009, 76)

⁵⁵ Marques, Sauve and Moura 2009

⁵⁶ Marques, Sauve and Moura 2009

⁵⁷ Van Grembergen, De Haes and Guldentops 2004, COBIT 4.1, Larson 1998, Goo 2010, Marques, Sauve and Moura 2009, Larson 1998, Goo, Kishore, Rao, and Nam 2009, Wan and Chan 2008, ISACA Standards Board 2002

This figure illustrates the division in responsibilities between the service provider and the client stipulated by the service level agreement. The service level agreement (SLA) outlines the cost of service to the business and reward for service, or penalty for lack of service, to the provider. If problems occur in the fundamental definitions of the service, then costs, penalties and rewards are affected as well. Solutions to the problem of unenforceable service level agreements focus on clearly defining IT services and ensuring services are clearly tied to business needs⁵⁸.

The COBIT framework takes service level management solutions one step farther by addressing the process for creating, implementing, and evaluating service levels. Organizations invest many resources assessing problems with a service level issue, rather than taking action based on information generated from IT services, both contracted and internal (Luftman 2003). Instead of focusing on refining an individual service level agreement, COBIT recommends creating an environment that fosters good service level management by, “identifying service requirements, agreeing on service levels and monitoring the achievement of service levels” (COBIT 4.1 2007, 101). The COBIT IT Governance Framework uses a maturity model to assess the quality of service level management to an organization. The following table contains that maturity model.

⁵⁸ Marques, Sauve´ and Moura 2009, Goo 2010, Marques, Sauve´ and Moura 2009, Larson 1998, Goo, Kishore, Rao, and Nam 2009

TABLE 2.7: DS1 – Define and Manage Service Levels Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	Management has not recognized the need for a process for defining service levels. Accountabilities and responsibilities for monitoring them are not assigned.
1	Initial/Ad Hoc	There is awareness of the need to manage service levels, but the process is informal and reactive. The responsibility and accountability for defining and managing services are not defined. If performance measurements exist, they are qualitative only with imprecisely defined goals. Reporting is informal, infrequent and inconsistent.
2	Repeatable but Intuitive	There are agreed-upon service levels, but they are informal and not reviewed. Service level reporting is incomplete and may be irrelevant or misleading for customers. Service level reporting is dependent on the skills and initiative of individual managers. A service level coordinator is appointed with defined responsibilities, but limited authority. If a process for compliance to SLAs exists, it is voluntary and not enforced.
3	Defined	Responsibilities are well defined, but with discretionary authority. The SLA development process is in place with checkpoints for reassessing service levels and customer satisfaction. Services and service levels are defined, documented and agreed-upon using a standard process. Service level shortfalls are identified, but procedures on how to resolve shortfalls are informal. There is a clear linkage between expected service level achievement and the funding provided. Service levels are agreed to, but they may not address business needs.
4	Managed	Service levels are increasingly defined in the system requirements definition phase and incorporated into the design of the application and operational environments. Customer satisfaction is routinely measured and assessed. Performance measures reflect customer needs, rather than IT goals. The measures for assessing service levels are becoming standardized and reflect industry norms. The criteria for defining service levels are based on business criticality and include availability, reliability, performance, growth capacity, user support, continuity planning and security considerations. Root cause analysis is routinely performed when service levels are not met. The reporting process for monitoring service levels is becoming increasingly automated. Operational and financial risks associated with not meeting agreed-upon service levels are defined and clearly understood. A formal system of measurement is instituted and maintained.
5	Optimized	Service levels are continuously re-evaluated to ensure alignment of IT and business objectives, whilst taking advantage of technology, including the cost-benefit ratio. All service level management processes are subject to continuous improvement. Customer satisfaction levels are continuously monitored and managed. Expected service levels reflect strategic goals of business units and are evaluated against industry norms. IT management has the resources and accountability needed to meet service level targets, and compensation is structured to provide incentives for meeting these targets. Senior management monitors performance metrics as part of a continuous improvement process.

(COBIT 4.1 2007, 104)

The above maturity model measures the capability of an organization to manage service levels. Much of the literature addresses service level agreements often in the form of a document. This maturity model begins by acknowledging that some organizations may not recognize the need to manage service levels, let alone form an agreement. Therefore, as the organization grows in service level management maturity, so will the organization's ability to create better service level agreements.

Organizations may not always have service level agreements in place when reviewing service levels. However, the literature advises gathering some key information when reviewing service level agreements or level maturity. First, it is important to know who is involved in the service level management process⁵⁹. Different kinds of information, such as daily updates versus annual reports, must flow to different organizational levels. Therefore, determining who gets what information is important. Second, it is important to define service levels⁶⁰. The organization should have a process to determine what service is needed and how to determine if the service is sufficient. Third, it is important to know how the organization documents service levels, such as by using service level agreements, and how the organization uses that documentation to improve the service level management process⁶¹. Service level agreements, monitoring reports, and daily updates are a few of the documentation of service level types used in service level management. This documentation assists organizations in making future service levels more manageable and in avoiding prior service level mistakes. This information helps individuals assess the service level management process in order to assess the overall maturity of the DS1 – Define and Manage Service Levels objective.

DS7 - Educate and Train Users

DS7 – Educate and Train Users is the seventh Deliver and Support objective. This objective addresses organization wide IT training. “An effective training program increases effective use of technology by reducing user errors, increasing productivity and increasing compliance with key controls. This objective is achieved by”:

⁵⁹ Marques, Sauve´ and Moura 2009, Doughty and O'Driscoll 2002, Luftman 2003, Gellings 2007

⁶⁰ Marques, Sauve´ and Moura 2009, Doughty and O'Driscoll 2002, Luftman 2003, Gellings 2007, Larson 1998, Goo, Kishore, Rao, and Nam 2009

⁶¹ Sallé and Rosenthal 2005, ISACA 2002, Pederiva 2008, Luftman 2003, Gellings 2007

- Establishing training curricula
 - Organizing training
 - Delivering training
 - Monitoring and reporting on training effectiveness
- (COBIT 4.1 2007, 125)

The literature identifies two key benefits to educating and training users. First, training “is a critical factor in enabling users to make effective use of their computers”⁶². Additionally, effective user training adds to employee satisfaction with the IT systems and increases productivity and efficiency⁶³. Secondly, the more satisfied users are with their IT systems, the more likely they are to use them to improve other management processes⁶⁴. Therefore, improving and maintaining an effective user training program provides great benefit to organizations.

Various researchers offer solutions for increasing the effectiveness of the training process. Gupta and Sadowski recommend implementing “a formal plan to ... assist top management in understanding the definition, direction, and cost/benefits of training activities in the organization” as well as progress monitoring of end user training programs (1998, 216). A formal process provides critical information and feedback and creates a process of continuous improvement⁶⁵. A formal plan facilitates quality communication between all levels of an organization, which increases the success and support for user training (Sidorko and Woo 2008). However, organizations need a means to evaluate education and training to ensure the organization receives needed benefits from the training⁶⁶. Like COBIT, several researchers

⁶² Blakey, Phillips, and Bunnell 2000, 57

⁶³ Cronan and Douglas 1990, Au, Eric, and Cheng 2002,

⁶⁴ Petter, DeLone, and McLean 2008

⁶⁵ Sidorko and Woo 2008, Blakey, Phillips, and Bunnell 2000, Sibley 1988

⁶⁶ Sibley 1988, Ryan 1991, Au, Eric, and Cheng 2002

support the use of a maturity model to measure the capability of an organization to train and educate users.

Every researcher recommends maintaining high quality IT education and training processes for users⁶⁷. Ryan conducted a quantitative study of training needs (1991). Ryan recommends a general increase in all IT knowledge for users. While Ryan does recognize the need for a training assessment tool, his research does not provide a tool for assessment. Like Ryan, many researchers discuss the benefits and the needs of user training and conclude organizations need a means to assess the education and training process⁶⁸. COBIT provides a tool for organizations to measure education and training practices through the DS7 - Educate and Train Users maturity model. The following table contains the maturity model.

⁶⁷ Sidorko and Woo 2008, Blakey, Phillips, and Bunnell 2000, Sibley 1988, Ryan 1991, Au, Eric, and Cheng 2002, Petter, DeLone, and McLean 2008, Koenig 2003, Cronan and Douglas 1990, Gupta and Sadowski 1998,

⁶⁸ Sidorko and Woo 2008, Blakey, Phillips, and Bunnell 2000, Sibley 1988, Ryan 1991, Au, Eric, and Cheng 2002, Petter, DeLone, and McLean 2008

TABLE 2.8: DS7 - Educate and Train Users Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	There is a complete lack of a training and education program. The organization does not even recognize that there is an issue to be addressed with respect to training, and there is no communication on the issue.
1	Initial/Ad Hoc	There is evidence that the organization has recognized the need for a training and education program, but there are no standardized processes. In the absence of an organized program, employees identify and attend training courses on their own. Some of these training courses address the issues of ethical conduct, system security awareness and security practices. The overall management approach lacks any cohesion, and there is only sporadic and inconsistent communication on issues and approaches to address training and education.
2	Repeatable but Intuitive	There is awareness of the need for a training and education program and for associated processes throughout the organization. Training is beginning to be identified in the individual performance plans of employees. Processes are developed to the stage where informal training and education classes are taught by different instructors, whilst covering the same subject matter with different approaches. Some of the classes address the issues of ethical conduct and system security awareness and practices. There is high reliance on the knowledge of individuals. However, there is consistent communication on the overall issues and the need to address them.
3	Defined	A training and education program is instituted and communicated, and employees and managers identify and document training needs. Training and education processes are standardized and documented. Budgets, resources, facilities and trainers are being established to support the training and education program. Formal classes are given to employees on ethical conduct and system security awareness and practices. Most training and education processes are monitored, but not all deviations are likely to be detected by management. Analysis of training and education problems is only occasionally applied.
4	Managed	There is a comprehensive training and education program that yields measurable results. Responsibilities are clear, and process ownership is established. Training and education are components of employee career paths. Management supports and attends training and educational sessions. All employees receive ethical conduct and system security awareness training. All employees receive the appropriate level of system security practices training in protecting against harm from failures affecting availability, confidentiality and integrity. Management monitors compliance by constantly reviewing and updating the training and education program and processes. Processes are under improvement and enforce best internal practices.
5	Optimized	Training and education result in an improvement of individual performance. Training and education are critical components of the employee career paths. Sufficient budgets, resources, facilities and instructors are provided for the training and education programs. Processes are refined and are under continuous improvement, taking advantage of best external practices and maturity modeling with benchmarking against other organizations. All problems and deviations are analyzed for root causes, and efficient action is expediently identified and taken. There is a positive attitude with respect to ethical conduct and system security principles. IT is used in an extensive, integrated and optimized manner to automate and provide tools for the training and education program. External training experts are leveraged, and benchmarks are used for guidance.

(COBIT 4.1 2007, 128)

The DS7 - Educate and Train Users maturity model evaluates practices organizations use to create, deliver, and improve user training. This maturity model addresses a key need identified in the literature. This maturity model addresses the need to: assess communication between users, educators, and managers (Sidorko and Woo 2008); assess the need for user

training and education (Nelson 1991), the need to collect data to evaluate effectiveness⁶⁹; and the need to provide continuous improvement⁷⁰. Whether using a maturity model or not, organizations need key information to understand user training practices. First, researchers determine who is involved in the education and training process⁷¹, what kind of documentation the organization retains to indicate training effectiveness and the training process⁷², and how data improves the training and education process (Sidorko and Woo 2008). This information allows researchers to evaluate training and education practices and determine the level of maturity (Guldentops 2003).

DS13 – Manage Operations

DS13 – Manage Operations is the final Deliver and Support objective. As the title suggests, this objective concerns IT operation management. Information Technology operations management is difficult because product management by IT managers is highly integrated into every aspect of the organization. Additionally, IT departments manage a set of services with different scopes and requirements than other departments (Grönroos 1994). For example, IT management scope is different than a legal department whose purpose is to render a legal opinion or a delivery department whose purpose is to ensure delivery of a physical product. The DS13 – Manage Operations COBIT objective is achieved by:

- Operating the IT environment in line with agreed-upon service levels and defined instructions
 - Maintaining the IT infrastructure
- (COBIT 4.1 2007)

⁶⁹ Petter, DeLone, and McLean 2008

⁷⁰ Au, Eric, and Cheng 2002

⁷¹ Petter, DeLone, and McLean 2008

⁷² Blakey, Phillips, and Bunnell 2000, Gupta and Sadowski 1998,

Since IT operation management must maintain the service infrastructure as well as meet different service levels, IT managers serve a special role by dealing with both the physical and human aspects of the organization⁷³. The literature focuses on evaluating and increasing the effectiveness and efficiency of operations management⁷⁴. However, most literature on this topic focuses on quantitative measures, such as decreasing costs and delivery times, or increasing returns from services, rather than also integrating qualitative measures of operational effectiveness and efficiency⁷⁵. As research models move away from strictly quantitative measure of operations management that evaluate efficiency and effectiveness, researchers have begun searching for or creating tools that adequately measure operation management (Adam and Swamidass 1989). Assessment models for operation management should include a focus on content, process, and performance (Adam and Swamidass 1989).

The DS13 – Manage Operations objective addresses the need for managers to evaluate operation management using qualitative as well as quantitative aspects. The detailed section of the objective focuses on the quantitative aspects of the IT operations management, and the maturity model for this objective evaluates the capability of the process based on quantitative aspects of operation management, such as processes, documentation content, and information processing (COBIT 4.1 2007, 149-152). The following table contains the maturity model for this objective.

⁷³ Voss, Nikos, Tsikriktsis, and Frohlich 2002, Adam and Swamidass 1989

⁷⁴ Chen and Kang 2009, Grönroos 1994, Johnston 1994, Adam and Swamidass 1989, Voss, Nikos, Tsikriktsis, and Frohlich 2002, Wustenhoff, Moore, and Avery 2005, Cooke-Davies 2002

⁷⁵ Voss, Nikos, Tsikriktsis, and Frohlich 2002

TABLE 2.9: DS13 – Manage Operations Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	The organization does not devote time and resources to the establishment of basic IT support and operations activities.
1	Initial/Ad Hoc	The organization recognizes the need for structuring the IT support functions. Few standard procedures are established, and the operations activities are reactive in nature. The majority of operational processes are informally scheduled, and processing requests are accepted without prior validation. Computers, systems and applications supporting the business processes are frequently interrupted, delayed and unavailable. Time is lost while employees wait for resources. Output media sometimes show up in unexpected places or not at all.
2	Repeatable but Intuitive	The organization is aware of the key role that IT operations activities play in providing IT support functions. Budgets for tools are being allocated on a case-by-case basis. IT support operations are informal and intuitive. There is a high dependence on the skills and abilities of individuals. The instructions covering what to do, when and in what order are not documented. Some operator training exists, and there are some formal operating standards.
3	Defined	The need for computer operations management is understood and accepted within the organization. Resources are allocated and some on-the-job training occurs. Repeatable functions are formally defined, standardized, documented and communicated. The events and completed task results are recorded, with limited reporting to management. The use of automated scheduling and other tools is introduced to limit operator intervention. Controls are introduced for the placement of new jobs in operations. A formal policy is developed to reduce the number of unscheduled events. Maintenance and service agreements with vendors are still informal in nature.
4	Managed	The computer operations and support responsibilities are clearly defined and ownership is assigned. Operations are supported through resource budgets for capital expenditures and human resources. Training is formalized and ongoing. Schedules and tasks are documented and communicated, both internally to the IT function and to the business customers. It is possible to measure and monitor the daily activities with standardized performance agreements and established service levels. Any deviations from established norms are quickly addressed and corrected. Management monitors the use of computing resources and completion of work or assigned tasks. An ongoing effort exists to increase the level of process automation as a means of continuous improvement. Formal maintenance and service agreements are established with vendors. There is full alignment with problem, capacity and availability management processes, supported by an analysis of the causes of errors and failures.
5	Optimized	IT support operations are effective, efficient and sufficiently flexible to meet service level needs with minimal lost productivity. Operational IT management processes are standardized and documented in a knowledge base and are subject to continuous improvement. Automated processes that support systems operate seamlessly and contribute to a stable environment. All problems and failures are analyzed to identify the root cause. Regular meetings with change management ensure timely inclusion of changes in production schedules. In co-operation with vendors, equipment is analyzed for age and malfunction symptoms, and maintenance is mainly preventive in nature.

(COBIT 4.1 2007, 152)

Using this maturity model, organizations can assess operation management maturity by evaluating the process (Grembergen and De Heas 2009, 82-84). Therefore organizations must understand the process, how it works, and who is involved (Johnston 1994). Additionally, organizations need to know how information from IT operations managers flows to top

management and how those operations are documented⁷⁶. Finally, organizations need to understand how information from operations management continuously improves the process through analysis and implementation of process improvements (Cooke-Davies 2002).

Monitor and Evaluate

This domain focuses on checking and supporting all functions to ensure smooth operations. Identifying solutions to business needs and acquiring these solutions does not automatically realize the goals of an organization. A critical factor for smooth functioning of IT systems is to provide continued support to such IT solutions so that business objectives are realized. This domain monitors all IT processes for its quality and compliance with control requirements. Continuous monitoring ensures that all the controls are in place and working effectively. It also addresses any oversight on behalf of management in the control process. (Mishra, et al. 2007, 715)

One of the primary benefits to monitoring and evaluating IT processes is that “ongoing and/or separate evaluations enable management to determine whether the other components of internal controls continue to function over time” (COSO 2009).

Monitoring IT practices provides information to encourage improvements in other areas of IT governance and to confirm good operations.

ME1 – Monitor and Evaluate IT Performance

ME1 – Monitor and Evaluate IT Performance is the first of the four Monitor and Evaluate objectives. This objective deals with the concept of performance management (COBIT 4.1 2007, 153). “Performance management is the systematic process of planning work and setting expectations, continually monitoring performance, developing the capacity to perform, periodically rating performance in a summary fashion, and rewarding good performance” (OPM 2001). Focusing first on overall performance before trying to measure individual components

⁷⁶ Voss, Nikos, Tsikriktsis, and Frohlich 2002, Cooke-Davies 2002

can provide a better framework for measurement (Town 2000). Achieving this COBIT objective requires:

- Collating and translating process performance reports into management reports
- Reviewing performance against agreed-upon targets and initiating necessary (COBIT 4.1 2007, 153)

In essence, this objective observes the performance from all of the other processes and evaluates this performance based on targets set for that objective. However, many organizations have “difficulty setting up systematic and formal monitoring processes” (Debreceeny 2009, 4).

One obstacle to organizations achieving an effective monitoring process is a lack of vital feedback from the organization’s management processes (ISACA 2010, 9). Each of the maturity models presented in this literature review features an aspect of data quality. For this objective, organizations must have quality feedback. The monitoring process cannot succeed without information on which to base meaningful conclusions (McNaughton, et al. 2010). Therefore, if each objective produces quality feedback, the organization can monitor performance and track that performance over time to determine future action (ISACA 2010). “This requires asking focused, relevant and answerable questions” (Booth 2006, 72) and ensuring the process adequately measures the organizations performance (ISACA 2010). The COBIT maturity model for this objective evaluates the ability of an organization to monitor its own IT processes. The following table contains the maturity model for the ME1 – Monitor and Evaluate IT Performance objective.

TABLE 2.10: ME1 – Monitor and Evaluate IT Performance Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	The organization has no monitoring process implemented. IT does not independently perform monitoring of projects or processes. Useful, timely and accurate reports are not available. The need for clearly understood process objectives is not recognized.
1	Initial/Ad Hoc	Management recognizes a need to collect and assess information about monitoring processes. Standard collection and assessment processes have not been identified. Monitoring is implemented and metrics are chosen on a case-by-case basis, according to the needs of specific IT projects and processes. Monitoring is generally implemented reactively to an incident that has caused some loss or embarrassment to the organization. The accounting function monitors basic financial measures for IT.
2	Repeatable but Intuitive	Basic measurements to be monitored are identified. Collection and assessment methods and techniques exist, but the processes are not adopted across the entire organization. Interpretation of monitoring results is based on the expertise of key individuals. Limited tools are chosen and implemented for gathering information, but the gathering is not based on a planned approach.
3	Defined	Management communicates and institutes standard monitoring processes. Educational and training programs for monitoring are implemented. A formalized knowledge base of historical performance information is developed. Assessment is still performed at the individual IT process and project level and is not integrated amongst all processes. Tools for monitoring IT processes and service levels are defined. Measurements of the contribution of the information services function to the performance of the organization are defined, using traditional financial and operational criteria. IT-specific performance measurements, non-financial measurements, strategic measurements, customer satisfaction measurements and service levels are defined. A framework is defined for measuring performance.
4	Managed	Management defines the tolerances under which processes must operate. Reporting of monitoring results is being standardized and normalized. There is integration of metrics across all IT projects and processes. The IT organization's management reporting systems are formalized. Automated tools are integrated and leveraged organization-wide to collect and monitor operational information on applications, systems and processes. Management is able to evaluate performance based on agreed-upon criteria approved by stakeholders. Measurements of the IT function align with organization-wide goals.
5	Optimized	A continuous quality improvement process is developed for updating organization-wide monitoring standards and policies and incorporating industry good practices. All monitoring processes are optimized and support organization-wide objectives. Business-driven metrics are routinely used to measure performance and are integrated into strategic assessment frameworks, such as the IT balanced scorecard. Process monitoring and ongoing redesign are consistent with organization-wide business process improvement plans. Benchmarking against industry and key competitors becomes formalized, with well-understood comparison criteria.

(COBIT 4.1 2007, 156)

Organizations can use this maturity model to assess the current state of monitoring capabilities and set targets for improvement (ISACA 2010).

When evaluating any monitoring process, an organization must understand the monitoring process and what is involved (Guldentops 2003). Organizations should understand the metric's origin used to measure process performance, as well as ensuring that measurements

input still measures what it is intended to measure⁷⁷. The organization must also know who is involved in the performance management process and how information about management practices flows between different levels of management⁷⁸. Finally, organizations must know how performance measures are documented and how information and documentation continuously improves the monitoring process (ISACA 2010).

ME4 - Provide IT Governance

ME4 - Provide IT Governance is the fourth and final Monitor and Evaluate objective. This objective differs from the other eight objectives by assessing the implementation of the entire IT governance structure. This objective supports the adoption and creation of a formal IT governance framework (COBIT 4.1 2007, 165). “Without formal IT governance, individual managers are left to resolve isolated issues as they arise, and those individual actions can often be at odds with each other” (Weill and Ross 2005, 26). This objective is achieved by:

- Establishing an IT governance framework integrated into corporate governance
 - Obtaining independent assurance over the IT governance status
- (COBIT 4.1 2007, 165)

This COBIT objective is unique in that it requires the input from an objective party, as well as a combination of information and decisions from all managers at every level of the organization (Guldentops 2004). Input from management, including top management, is necessary to establish an IT governance framework. As seen in all of the previous objectives, information, documentation, and communication between all levels of the organization increases maturity and also provides the information needed to make effective decisions (Weill and Ross 2005). As stated above, this objective requires obtaining independent assurance. Independent

⁷⁷ McNaughton, Ray, and Lewis 2010, Booth 2006

⁷⁸ Booth 2006, Evans and Weir 1995

assurance is the primary purpose of the audit function within the organization (Guldentops 2004). Assurance is “an objective examination of evidence for the purpose of providing an independent assessment on governance, risk management, and control processes for the organization” (IIA 2008, 16). Since this objective requires such a high level of input and assessment, organizations must utilize a sound process to make quality decisions. Additionally, mature IT governance is important for organizations as they grow and become more complex⁷⁹. “An effective IT governance program will help organizations understand the issues and risks surrounding the strategic importance of IT, ensure that IT can sustain operations, and help enable companies to use IT for competitive advantage” (Damianides 2005, 78). To assess the maturity and capability of the organizations IT governance COBIT provides the following maturity model.

⁷⁹ Weill and Ross 2004, Weill and Ross 2005

TABLE 2.11: ME4 - Provide IT Governance Maturity Model

Maturity Level	Meaning	Description
0	Non-existent	There is a complete lack of any recognizable IT governance process. The organization does not even recognize that there is an issue to be addressed; hence, there is no communication about the issue.
1	Initial/Ad Hoc	There is recognition that IT governance issues exist and need to be addressed. There are ad hoc approaches applied on an individual or case-by-case basis. Management's approach is reactive, and there is only sporadic, inconsistent communication on issues and approaches to address them. Management has only an approximate indication of how IT contributes to business performance. Management only reactively responds to an incident that has caused some loss or embarrassment to the organization.
2	Repeatable but Intuitive	There is awareness of IT governance issues. IT governance activities and performance indicators, which include IT planning, delivery and monitoring processes, are under development. Selected IT processes are identified for improvement based on individuals' decisions. Management identifies basic IT governance measurements and assessment methods and techniques; however, the process is not adopted across the organization. Communication on governance standards and responsibilities is left to the individual. Individuals drive the governance processes within various IT projects and processes. The processes, tools and metrics to measure IT governance are limited and may not be used to their full capacity due to a lack of expertise in their functionality.
3	Defined	The importance of and need for IT governance are understood by management and communicated to the organization. A baseline set of IT governance indicators is developed where linkages between outcome measures and performance indicators are defined and documented. Procedures are standardized and documented. Management communicates standardized procedures, and training is established. Tools are identified to assist with overseeing IT governance. Dashboards are defined as part of the IT balanced business scorecard. However, it is left to the individual to get training, follow the standards and apply them. Processes may be monitored, but deviations, while mostly being acted upon by individual initiative, are unlikely to be detected by management.
4	Managed	There is full understanding of IT governance issues at all levels. There is a clear understanding of who the customer is, and responsibilities are defined and monitored through SLAs. Responsibilities are clear and process ownership is established. IT processes and IT governance are aligned with and integrated into the business and the IT strategy. Improvement in IT processes is based primarily upon a quantitative understanding, and it is possible to monitor and measure compliance with procedures and process metrics. All process stakeholders are aware of risks, the importance of IT and the opportunities it can offer. Management defines tolerances under which processes must operate. There is limited, primarily tactical, use of technology, based on mature techniques and enforced standard tools. IT governance has been integrated into strategic and operational planning and monitoring processes. Performance indicators over all IT governance activities are being recorded and tracked, leading to enterprise-wide improvements. Overall accountability of key process performance is clear, and management is rewarded based on key performance measures.
5	Optimized	There is an advanced and forward-looking understanding of IT governance issues and solutions. Training and communication are supported by leading-edge concepts and techniques. Processes are refined to a level of industry good practice, based on results of continuous improvement and maturity modeling with other organizations. The implementation of IT policies leads to an organization, people and processes that are quick to adapt and fully support IT governance requirements. All problems and deviations are root cause analyzed, and efficient action is expediently identified and initiated. IT is used in an extensive, integrated and optimized manner to automate the workflow and provide tools to improve quality and effectiveness. The risks and returns of the IT processes are defined, balanced and communicated across the enterprise. External experts are leveraged and benchmarks are used for guidance. Monitoring, self-assessment and communication about governance expectations are pervasive within the organization, and there is optimal use of technology to support measurement, analysis, communication and training. Enterprise governance and IT governance are strategically linked, leveraging technology and human and financial resources to increase the competitive advantage of the enterprise. IT governance activities are integrated with the enterprise governance process.

(COBIT 4.1 2007, 168)

In order to assess the IT governance, an organization must understand how decisions occur within the organization and who is involved in the decision making process (Weill and Ross 2004). In order to be effective, each management process within the organization must target performance and document those targets to assess performance (Booth 2006). It is important for those implementing an IT governance framework and those providing assurance to understand document creation and how decisions made based on information from that documentation affects other aspects of the IT governance (Weill and Ross 2005).

Summary of the Conceptual Framework

This research selected nine objectives across the four COBIT domains provide an assessment of each IT governance domain within an organization. These nine objectives comprise the conceptual framework for this study. The complete COBIT framework contains thirty four objectives and requires more information than one study could reasonably address. The modified COBIT framework and the supporting literature are summarized in Table 2.12.

TABLE 2.12: Conceptual Framework and Literature

COBIT Framework	Literature
Plan and Organize (PO)	
PO1 - Define a Strategic IT Plan	Harrison 1995, Linn 2008, Boyd and Reubug-Elliott 1998, Mintzberg 1994, Ackoff 1970, Schwalbe (2010), GAO (2010), Poister and Streib (2005), Bryson (1995), Lederer and Sethi (1996), COBIT 4.1 2007
PO10 - Manage Projects	Schwalbe (2010), Rosacker and Olson 2008, Levy, and Dvir 1997, COBIT 4.1, Besner and Hobbs (2008), Legris and Colletette (2006), Reich (2007), Hartman and Skulmosk 1998, Ibbs and Kwak 2000, Judgev and Thomas 2002, Doughty and O'Driscoll 2002
Acquire and Implement (AI)	
AI4 - Enable Operation and Use	Ruiz 2010, Chinowsky, Paul, and Patricia Carrillo 2007, Koenig 2007, Detlor 1999, Conley and Zheng 2009, Wang, Kleinz, and Jiang 2007, Reich 2007, Petter and Randolph 2009, Lewis, and Helm 2008, Bartczak, Blair, Peachy, and Turner 2010, Ehms and Langen 2002, Freeze and Kulkarni 2005, Freeze and Kulkarni 2006
AI6 - Manage Changes	Rebougas,Sauve, Moura, Bartolinil, and Trastour 2007, Sarup 2002, Kulkarni 2003, Almaraz 1994, Diefenbach 2005, Margherita and Petti 2010, Saka 2002, Kans 2009, Pintelon, Du Preez and Puyvelde 1999
Deliver and Support (DS)	
DS1 - Define and Manage Service Levels	Van Grembergen, De Haes and Guldentops 2004, Larson 1998, Goo 2010, Marques, Sauve and Moura 2009, Goo, Kishore, Rao, and Nam 2009, Taylor and Tofts 2006, Wan and Chan 2008, Doughty and O'Driscoll 2002, Luftman 2003, Gellings 2007, Sallé and Rosenthal 2005, ISACA 2002, Pederiva 2008
DS7 - Educate and Train Users	Gupta and Sadowski 1998, Blakey, Phillips, and Bunnell 2000, Cronan and Douglas 1990, Au, Eric, and Cheng 2002, Petter, DeLone, and McLean 2008, Sidorko and Woo 2008, Sibley 1988, Nelson 1991, Koenig 2003, Guldentops 2003
DS13 – Manage Operations	Adam and Swamidass 1989, Voss, Nikos, Tsikriktis, and Frohlich 2002, Chen and Kang 2009, Grönroos 1994, Johnston 1994, Wustenhoff, Moore, and Avery 2005, Cooke-Davies 2002, Grembergen and De Heas 2009
Monitor and Evaluate (ME)	
ME1 - Monitor and Evaluate IT Performance	OPM 2001, Town 2000, Debreceny 2009, ISACA 2010, McNaughton, Ray, and Lewis 2010, Booth 2006, Guldentops 2003, McNaughton, Ray, and Lewis 2010, Evans and Weir 1995
ME4 - Provide IT Governance	Weill and Ross 2005, Guldentops 2004, Weill and Ross 2004, IIA 2008, Damianides 2005,

Chapter Summary

“IT governance is not about making specific IT decisions – management does that – but rather determines who systematically makes and contributes to those decisions” (Weill and Ross 2004, 2). Each maturity model in this literature review assesses the ability of an organization to manage itself and does not directly review the individual management styles, practices, or decisions. This literature review develops a modified COBIT and establishes the framework for a focused evaluation of IT governance specifically for this study. This model evaluates components across all four domains of the COBIT framework. Each section demonstrates different aspects of IT management need different things in order to succeed. COBIT supports management’s role and seeks to elevate those practices to the strategic level.

CHAPTER 3: Research Setting

Chapter Purpose

This chapter describes the research setting and provides information about the city of San Marcos including: municipal services, particular challenges, and geographical references. This chapter also contains maps providing spatial references.

Research Subject: The City of San Marcos, TX

San Marcos, Texas is a lively city located approximately thirty miles south of Austin, Texas⁸⁰. Like many cities, San Marcos faces challenges providing public services such as fire fighting, police, and utilities. San Marcos also faces some unique challenges. San Marcos is home to Texas State University, the third largest university in Texas. The University offers the additional challenge of approximately 30,000 students moving in, out, and around the city. San Marcos also hosts one of the largest outlet malls⁸¹ in the United States, the Tanger and Prime outlet centers, commonly referred to as the San Marcos Outlets. San Marcos is situated along the San Marcos River, the focus of many ecology studies and environmental preservation initiatives. Additionally, San Marcos is a popular tourist location sitting at the mouth of the pristine Texas Hill Country⁸². San Marcos manages these and other challenges while serving a resident population between 35,000 and to 45,000 citizens,⁸³ in addition to thousands of businesses,

⁸⁰ For more applied research projects covering the City of San Marcos please see the following citations in the bibliography: Harkins (2010), Schneider-Cowan (2007), Tanous (2007), Ascott (2006), Lester (2005), Kopycinski (2005), Brooks (1999), Rose (1996)

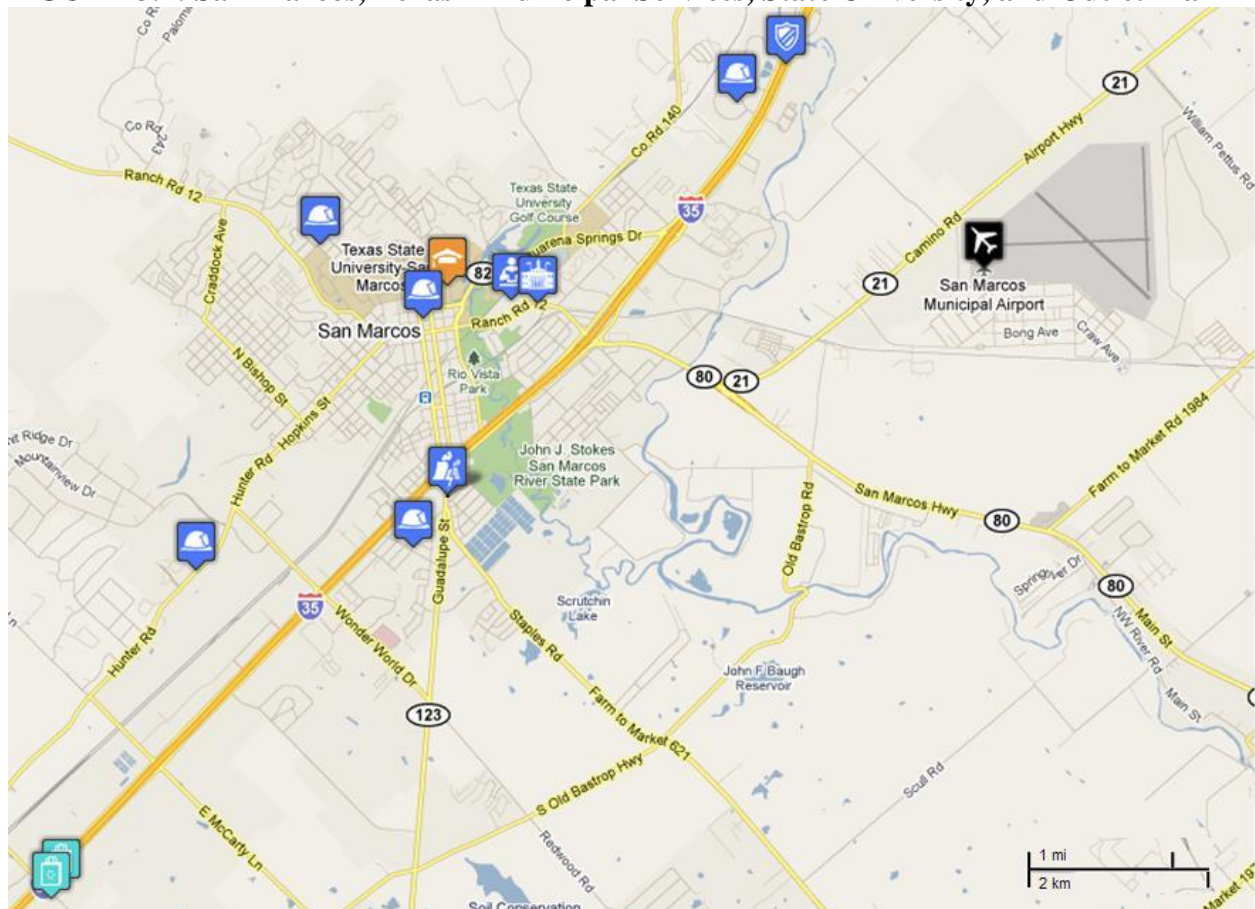
⁸¹ An outlet store or factory outlet is a retail store in which manufacturers sell their stock directly to the public through their own branded stores. The stores can be brick and mortar or online. Traditionally, a factory outlet was a store attached to a factory or warehouse. Often these stores are grouped together in [outlet malls](#) (Wikipedia).

⁸² "Hill Country" is a vernacular term applied to a region including all or part of twenty-five counties near the geographical center of Texas. In the geomorphological sense, the Hill Country represents in large part a dissected plateau surface. It is bordered on the east and south by the Balcones Escarpment, on the west by the relatively undissected Edwards Plateau, and on the north by rolling plains and prairies (The Handbook of Texas, [tshaonline.org](#)).

⁸³ According to 2000 census data and 2010 census estimates

visitors, and tourists in the city on a daily basis. Information Technology plays a vital role in city service. IT support for city services is provided by the Technology Services Department. Regardless of location of each service, or which department requires support, the Technology Services Department supports hardware, software, and initiatives for all city functions. The following maps provide an overview of San Marcos and the space the city inhabits, as well as the area the Technology Services Department supports. This special representation demonstrates a key challenge the Technology Services Department must overcome in addition to the traditional challenges that accompany any IT environment.

FIGURE 3.1: San Marcos, Texas – Municipal Services, State University, and Outlet Mall



Description: This map shows the city of San Marcos. It contains some of the key municipal services, Texas State University – the largest state institution in the city, and the Outlet Mall – the largest shopping experience in Texas.

FIGURE 3.2: City of San Marcos Maps Key














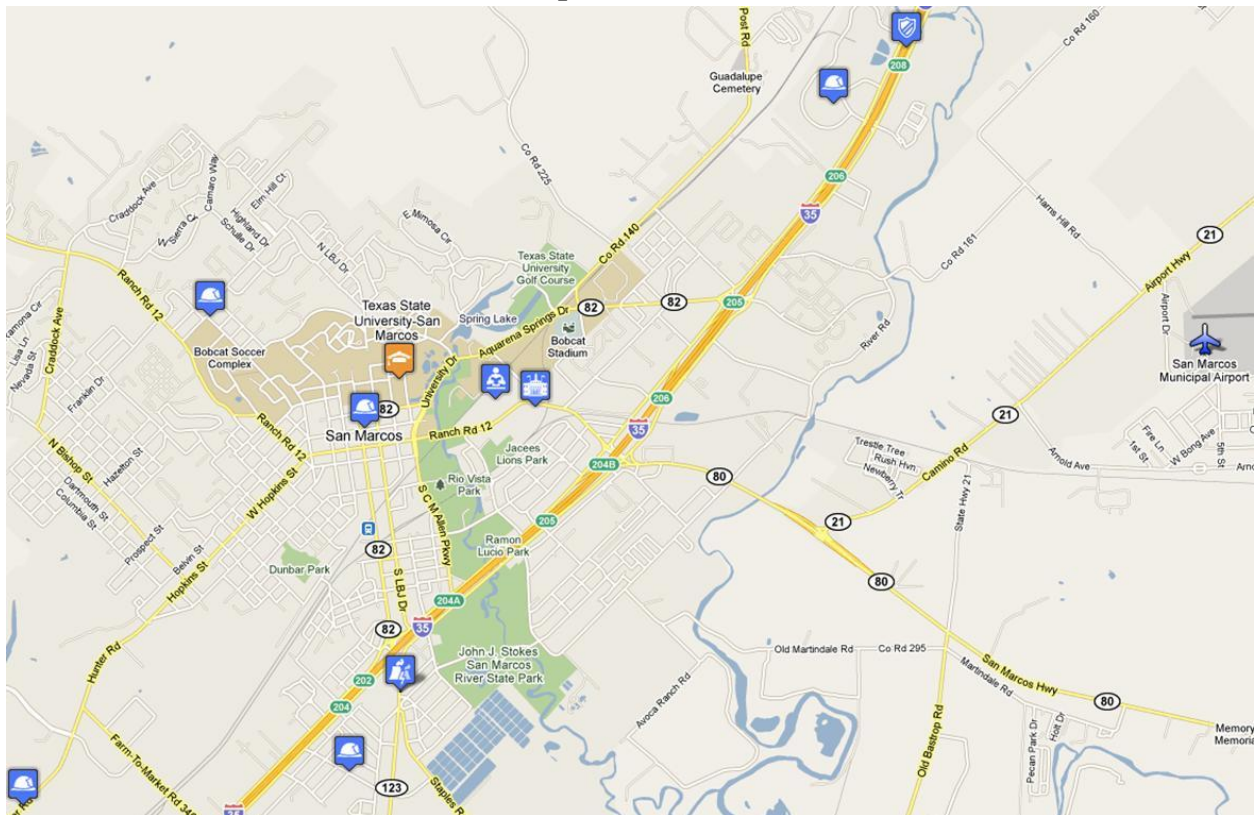
 Fire Station 1 114 E Hutchison St, San Marcos, TX 78666	 City Hall & Offices 630 E Hopkins St, San Marcos, TX 78666
 Fire Station 2 1314 Academy St, San Marcos, TX 78666	 San Marcos Public Library 625 E Hopkins St, San Marcos, TX 78666
 Fire Station 3 2420 Hunter Rd, San Marcos, TX 78666	 Electric Utility 1040 Texas 123 San Marcos, TX 78666
 Fire Station 4 404 Broadway St, San Marcos, TX 78666	 Texas State University - San Marcos
 Fire Station 5 100 Carlson Cir, San Marcos, TX 78666	 Prime Outlets
 San Marcos Police Department	 Tanger Outlets
 San Marcos Municipal Airport	

FIGURE 3.3: San Marcos, Texas Municipal Services



Description: This map shows municipal services provided by the city of San Marcos. Texas State University is included in the map since it is a major part of the city. The University is a state institution but coordinates with the city to support its needs.

All other IT challenges aside, these maps articulate the distances that the Technology Services Department must traverse on a daily basis. The City Hall and Offices house many of the city's departments, but the communication and resource intensive services, such as fire and police, reside throughout the city. In addition to the coverage area, the Technology Services Department supports IT for upwards of 500 city employees⁸⁴ across roughly twenty four departments. The Technology Services Department must support IT for the city with existing resources.

The primary Technology Services Department resources are staff and budget. IT services fall under the purview of the Chief Technology Officer (CTO) for the city of San Marcos⁸⁵. In addition to the CTO, the Technology Services Department has seven staff members including one IT Manager, three IT Support Technicians, one Webmaster, one IT administrator, and one Network / Technology Administrator. However, at the time of the focused evaluation the Technology Services Department was not fully staffed and also employed two contract managers. In addition to staff, the Information Technology Department manages a budget of approximately \$1.4 million. This budget supports the department itself, as well as the hardware, software, and initiatives of the city and its employees.

The Information Technology Department manages these resources and challenges using an IT Service Management model. This model focuses on managing and optimizing the flow of services from the Information Technology Department to departments it supports. This service management model is common among smaller IT departments and easily adapts to more complex IT management models as the department grows. While the Information Technology

⁸⁴ Page 76 of the 2009 – 2010 annual budget

⁸⁵ Page 126 of the FY 2009 Budget

Department does not implement an IT governance model, the department does plan to implement a risk-based model for IT management⁸⁶.

As the city grows, the Technology Services Department must grow along with it. Greater numbers of IT devices and more complex information systems require maturing IT support. In order to mature the city of San Marcos must assess current IT maturity. Presently the city has not assessed IT maturity. A focused assessment, such as this applied research project, shows the city a current maturity level so that it can create a plan to move to greater maturity levels.

⁸⁶ Outlined in a draft of the Strategic IT plan provided by the Technology Services Department

CHAPTER 4: Research Methodology

Chapter Purpose

This chapter describes the research methodology used to assess the IT governance maturity of the city of San Marcos. The chapter also discusses the operationalization as well as the use of case-study research.

Research Method

This applied research project uses a case study methodology because this methodology type focuses on an instance of IT governance maturity for the city of San Marcos, Texas (Babbie 2007, 298). IT governance maturity assessment lends itself to a case study methodology because of the depth of information gathered and the reliance on both qualitative and quantitative data to draw a reasonable conclusion (Yin 2009, Weill and Ross 2005, Babbie 1986, 91-92).

IT governance maturity assessment for the city of San Marcos uses a case study methodology. This methodology is similar to the process management an independent assessor would use to assess an organization's IT governance maturity (ISACA 2010). Therefore, this methodology represents a typical assessment project an organization assessing IT governance maturity would conduct (Yin 2009, 48).

In this assessment, six members of the Technology Services Department participated in one-on-one interviews. The interviews took place in an office in the Technology Services Department on March 3, 2010 and March 4, 2010. At the time of these interviews, the six staff members comprised the entire Technology Services Department. Each member answered questions pertaining to relevant operations and management processes⁸⁷. Each member discussed and provided examples of documents supporting the information provided. The

⁸⁷ For an in-depth discussion of the questions and creation please see Appendix I.

information given by the Technology Services Department staff provided raw data analyzed later in this paper.

Operationalization of the Conceptual Framework

This research operationalized the four COBIT domains and their objectives using structured interviews and document analysis. Table 4.1 summarizes the operationalization of the conceptual framework⁸⁸. The conceptual framework is divided into the four COBIT domains, each of which contains several objectives. Each domain contains four columns. The first column identifies the COBIT objective that supports the domain. The second column identifies the method used to collect data correlating with the COBIT objective. The third column identifies evaluated. The fourth column identifies what evidence supports the COBIT objective.

⁸⁸ For more about this process see Shields and Tajalli (2006) and Shields (1998)

TABLE 4.1: Operationalization Table

Operationalization of the Conceptual Framework			
COBIT Objective	Collection Method	Source of Data	Evidence
Plan and Organize			
PO1 - Define a Strategic IT Plan	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • Strategic IT planning documentation 	Verification of a formal strategic IT planning process or evidence informal long-term IT planning
PO10 – Manage Projects	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • Project management documentation 	Verification of a project management process through interview responses and documentation.
Acquire and Implement			
AI4 - Enable Operation and Use	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • IT support training and documentation 	Verification of a knowledge management process through interview responses and documentation.
AI6 - Manage Changes	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • Change management requests 	Verification of a change management process through interview responses and documentation.
Deliver and Support			
DS1 - Define and Manage Service Levels	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • Service Level Agreements 	Verification of a service level management process through interview responses and documentation.
DS7 - Educate and Train Users	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • User training documents 	Verification of a user training process through interview responses and documentation.
DS13 – Manage Operations	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • Operations management documentation 	Verification of an operations management process through interview responses and documentation.
Monitor and Evaluate			
ME1 - Monitor and Evaluate IT Performance	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • Performance Tracking documentation 	Verification of a performance management process through interview responses and documentation.
ME4 - Provide IT Governance	<ul style="list-style-type: none"> • Structured Interview • Document Analysis 	<ul style="list-style-type: none"> • Responses to interview questions • IT governance documentation 	Verification of an IT governance process through interview responses and documentation.

Structured Interviews

This study first uses structured interviews. For this Applied Research Project, members of the San Marcos Technology Services Department were interviewed. Since the Technology Services Department supports all IT components for the city of San Marcos, department employees are most knowledgeable about processes and procedures managing IT assets and services. The interviews were conducted on March 3, 2010 and March 4, 2010 the Technology Services Department offices. Staff members were interviewed individually for 15 to 20 minutes. Before each interview, the participant was informed that the interviews were voluntary and could end the interview at any time. Additionally, participants were encouraged to answer to the best of their ability.

Structured interviews add two key strengths to this study. First, questions about the COBIT objectives can be targeted to provide the best data. The interviews allow the respondent flexibility to provide in-depth knowledge that enhances the understanding of the IT governance maturity (Yin 2009, 102). Second, the structured interview allows respondents to speak candidly about experiences, enhancing reliability and clarity of the evidence for each objective (GAGAS 7.60(d)).

Structured interviews provide an effective means of data collection. IT, by nature, is complex and unique to the environment it serves. In order to collect data on which to base a reasonable conclusion, research must delve deep below the surface to extract meaningful information for each COBIT objective (Babbie 1989, 92). This research technique provides a basic level of information from which to further gather other types of information.

Questions for the interviews derived from information gathered in the literature review and from reviewing each COBIT objective's maturity model⁸⁹. The interview questions verify the existence of each management practices and gather information surrounding the processes for each management practice. Each objective contains questions geared specifically to that objective. In general, the first two questions verify the existence of the management practice and the processes surrounding it. The next two questions identify relevant documentation and management involvement. The last few questions address performance measures and continuous improvement.

Structured interviews provide some disadvantages, such as the introduction of bias. Interviews could suffer bias due to poorly developed interview questions, respondent bias, poor recall, reflexivity, and interviewer bias (Yin 2009, 102). To minimize the impacts of bias, this study also relies on document analysis.

Document Analysis

Documents analysis comprises the second method of data collection used in this study. The documents analyzed corroborate information gathered in the structured interviews and provide clarity of the level of IT Governance maturity. Additionally, documentary evidence adds to the reliability and strength of the evidence for each COBIT objective (Yin 2009, 102, GAGAS 2007, 7.60(c)).

This research uses document analysis to review documentation provided by the interview respondents. For each objective, documents are identified and collected, then reviewed and assessed for validity to the study.

⁸⁹ For a listing of all questions and a more in-depth discussion of how the questions were created and relate to the relate the individual maturity level please see Appendix I.

Human Subjects Protection

This study uses human subjects in structured interviews. The primary concerns associated with using human subjects in research include ensuring voluntary participation and avoiding harm to participants. To address the issues of voluntary participation and harm, participants were verbally told that information collected in this study would be summarized and would not uniquely identify subjects. Additionally, participants were told this was a voluntary interview and if at any time they felt uncomfortable, they could be excused. A consent form was considered when initially preparing for this study, however, the use of a consent form would require the participant to identify themselves and document participation in the study. This research project was approved and exempted from IRB review by the Texas State Institutional Review Board on January 26, 2010 (application number 2010R233)⁹⁰.

Chapter Summary

This chapter discusses the research methodologies in this study. A case study format with data collected through structured interviews and document analysis were used to operationaliz the conceptual framework. This chapter also addresses advantages and disadvantages to the relevant methodologies. The following chapter assesses the San Marcos IT Governance using criteria from COBIT discussed earlier in the project⁹¹.

⁹⁰ See Appendix III for the official approval email.

⁹¹ For similar ARPs please see Ruiz (2009), Bowman (2005), Ruiz (2010), Swift (2010), and O'Neill (2008)

Chapter 5: Results

Chapter Purpose

The previous chapters discuss IT governance, the link between IT governance, COBIT and IT management practices and the methods used to conduct a focused evaluation of IT governance. This section contains the results of the focused evaluation. This chapter takes each of the nine objectives and presents the results of the survey and the document analysis. The survey data and document analysis promote a score for each objective, indicating the objectives level of maturity.

The tables in this chapter contain interview results. The tables only indicate whether a question was answered positively, negatively, or neutrally. The tables also contain a general description of the survey question. For a complete listing of questions and how those questions relate the individual maturity level please see Appendix A. The tables provide a brief breakdown of the interview questions. The answers, as well as descriptions, and the document analysis all contribute to the final maturity level determination.

Plan and Organize (PO)

The Plan and Organize domain addresses the process of gathering information and using that information to make decisions. This domain is important because it sets the stage for subsequent decisions and the use of resources. The two objectives studied in this domain are particularly important because strategic planning defines long term plans that determine how resources are allocated and used. Furthermore, project management focuses on how resources key to that long term plan are used on a daily basis.

The two objectives studied for this domain are PO1 – Define a Strategic IT Plan and PO10 – Manage Projects. The objectives provide a more in-depth understanding about how the organization creates long term plans and carries out those plans.

PO1 - Define a Strategic IT Plan (Maturity Level 2)

This project consists of interview analysis, document analysis, and the final maturity level assignment. The final maturity level depends on interviewees' descriptions during structured interviews as well as support documents.

Structured Interview Analysis

This objective provided six structured interview questions which focused on the city of San Marcos's Strategic IT Plan and strategic planning process as related to IT governance. Table 5.1 contains the neutral, affirmative, and negative results from the six structured interviews.

TABLE 5.1: PO1 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
PO1									
Understand meaning of Strategic IT Plan	+	+	+	+	+	+	6	0	0
Verification of formal process documentation	-	+	+	+	+	-	4	2	0
Verification of all other process documents	-	+	+	+	+	-	4	2	0
Process development	-	+	+	+	+	-	4	2	
Verification of performance metrics	-	+	-	*	-	-	1	4	1
Verification of continuous improvement	-	-	-	-	*	-	0	5	1

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

The interviews alone support a maturity level of approximately 1. For questions one through four the majority of respondents answered in the affirmative, indicating that most understand the definition of strategic planning and a strategic plan. Additionally, this data suggests that strategic planning occurs and follows a structured approach that is documented and

known to at least some of the staff. Furthermore, at least half of the respondents stated that the Chief Technology Officer (CTO), in conjunction with a consultant, created the drafts of strategic plan. This implies that the current CTO values strategic planning and may make other changes as well.

The information from the surveys did not provide sufficient information to support a reasonably sound process for developing or evaluating the strategic IT plan. Additionally, the creation of the plan seems to be very recent and the implementation of the plan has not been proposed to individual levels of city management. The lack of survey data to support the use of metrics or evaluation of activities related to strategic planning leads preliminary analysis to rule out maturity levels 4 and 5. However, the interview data is only a part of the picture. In addition to the interviews, one document supports a higher maturity level that the interviews initially suggest.

Document Analysis

The city of San Marcos provided a draft of the strategic IT plan. The plan was extensive and provided a service delivery model and plans for expansion. The Strategic IT Plan linked to the city's goals and objectives, indicating a desire to align the plan with the overall strategic goals of the organization. The draft of the Strategic IT Plan is of good quality and addresses key IT topics. The plan appears to be the result of a planning group and not created by an individual.

Maturity Level

Based on the survey analysis and the results of the document analysis, sufficient evidence exists to support a maturity level of 2. The city operates good IT governance practice by conducting strategic planning, but the practice is not fully implemented. As strategic planning normalizes throughout the organization and different levels of management own specific parts of

the strategic plan, the city can generate feedback and involvement in strategic goals. This feedback advances the goals and objectives of the city as well as increases the maturity of the city's IT governance.

PO10 - Manage Projects (Maturity Level 2)

This section consists of interview analysis, document analysis, and the final maturity level. The final maturity level depends on interviewees' descriptions during structured interviews, as well as the existence of documents to support interviews statements.

Structured Interview Analysis

This objective contained seven structured interview questions which focus on the city of San Marcos's project management process as it relates to IT governance. Table 5.2 contains the preliminary results from the six structured interviews.

TABLE 5.2: PO10 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
PO10									
Verification of process documentation	+	+	+	+	+	+	6	0	0
Verification of process steps	+	+	+	+	+	-	5	1	0
Verification of project evaluation	+	+	+	+	-	-	4	2	0
Verification of management communication	-	*	+	+	+	-	3	2	1
Verification of performance metrics for incomplete projects	-	*	-	+	-	-	1	4	1
Verification of performance metrics for completed projects	-	+	*	+	*	-	2	2	2
Verification of continuous improvement	-	+	-	+	-	-	2	4	0

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

The majority of respondents answered questions one through three affirmatively. This consistency suggests the IT management understands the need for project management and communicates this need throughout the department. The evidence from the survey suggests that

some of the practices used to manage projects are based on standards, but the process is highly dependent on a few key individuals. In reference to the project management process, one interviewee stated that “some people use it and some don’t ... mostly it is used to see what they have to do and what is on their plate.”

Initial analysis seems to rule out maturity levels 3 through 5 since inconsistent and primarily negative responses were given for questions five through seven. This assessment is confirmed when analyzing question four. Question four was the backup question to ensure data reliability. Responses to question 4 indicate the city has some project management practices in place but those practices communicate only limited information.

Document Analysis

Provided documents support maturity level 2 for this objective. The Technology Services Department was able to produce a project list. The project lists is a printout of a spreadsheet used to keep track of all ongoing projects for Technology Services. This document is one legal sized page. Each projects is listed and grouped according to how long the project is expected to take to complete. Each group is color coded according to their time frame. The colors are described in a legend at the bottom of the project list. The time frames are as follows:

- 30 Days (Tan)
- 60 Days (Peach)
- 90 Days (Coral)
- 120 Days (Orange)
- 150 Days (Mint Green)
- 180 Days (Sage)
- 220-270 Days (Green)
- 365+ Days (Hunter)
- Non-funded Projects (Purple)

This document tracks only ongoing projects and does not schedule or tracking incoming or emergency projects. In addition to internal projects, the Technology Services Department supports project management of large technology-based projects for the city. An example is the Smart Metering Project for the city of San Marcos. The respondents briefly reviewed the

planning documentation for this project for the study. In addition, employees provided minutes from the Marcy 3, 2009 project development meeting. The project manager documents were of significant quality and the interviewees indicated project management standards from the Project Management Institute (PMI) were followed in the management of this and other projects. However, the process of documentation and application of the PMI standards was left to the discretion of the project managers, and not formalized across all projects.

Maturity Level

Based on the survey analysis and the results of the document analysis sufficient evidence exists to support a maturity level of 2. The city has in place some great project management practices and the fact that these practices are based on the PMI standards is promising. However, the responsibility is still on the individual project manager to ensure the process takes place effectively. As project management becomes more formalized and a uniform framework for documentation and review develops, project managers can focus on managing projects rather than managing the process of documentation, review, and reporting. Problems and opportunities may become more apparent as a more uniform process is developed and the IT governance maturity within the city increases.

Acquire and Implement (AI)

The previous COBIT domain addressed gathering information and planning. The Acquire and Implement domain addresses the process of gathering resources and implementing plans. This domain is important because it builds on the objectives from the previous domain. Simply put, the domain takes the plans and puts them into action. The two objectives studied in this domain are important because they address how the organization enables its members to use resources and how the organization manages changes that occur once the plan is underway.

The two objectives studied were AI4- Enable Operation and Use and AI6 – Manage Changes. The objectives provide information about how the organization prepares for daily use of the environment and how the organization deals with changes to the environment.

AI4 - Enable Operation and Use (Maturity Level 2)

This section consists of interview analysis, document analysis, and the final maturity level. The final maturity level depends on interviewees' descriptions during structured interviews, as well as supporting documents.

Structured Interview Analysis

This objective contains seven structured interview questions which focus on the city of San Marcos's knowledge management process as it relates to IT governance. Table 5.3 contains the preliminary results from the six structured interviews.

TABLE 5.3: AI4 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
AI4									
Verification of knowledge management process	+	-	+	+	-	-	3	3	0
Verification of documentation	-	+	+	-	+	+	4	2	0
Verification of process framework for operation	-	+	-	+	-	-	2	4	0
Verification of process framework for use	-	+	-	-	-	-	1	5	0
Verification of performance metrics	-	-	-	+	-	-	1	5	0
Verification of performance enhancement	-	-	-	+	-	-	1	5	0
Verification of continuous improvement	+	-	-	-	-	-	1	5	0

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

Responses to these questions were inconsistent. This inconsistency suggests that knowledge management is not well developed within the organization. One interviewee stated that “each division develops the training it needs” and sometimes Technology Services Department may deliver training on specific systems. The responses indicate the Technology

Services Department maintains some training for new users, as well as plans large training events for some specific programs. The responses also show that the training is not uniform or evaluated to determine its effectiveness. This analysis is supported by documents provided by the Technology Services Department.

Document Analysis

The Technology Services Department produced training documents for the “Track-It” Web-based ticketing system and Microsoft Outlook, both tools for new employees. Though the training documents were of significant quality, the documents demonstrate that the Technology Services Department does not manage or maintain knowledge resources consistently.

Maturity Level

Based on the survey analysis and the results of the document analysis, sufficient evidence exists to support a maturity level of 2. The city does produce good training documents regarding certain key systems. The city relies on different individuals or groups to create and maintain the documentation. Improving knowledge management requires improving employees’ access to resource and decreasing the time employees take to learn a system or process and do it. As the city formalizes knowledge management the IT governance maturity of the city will increase.

AI6 - Manage Changes (Maturity Level 2)

This section consists of interview analysis, document analysis, and the final maturity level. The final maturity level depends on interviewees’ descriptions during structured interviews, as well as supporting documentation.

Structured Interview Analysis

This objective contains four structured interview questions which focus on the city of San Marcos's change management process as related to IT governance. Table 5.4 contains the preliminary results from the six structured interviews conducted.

TABLE 5.4: AI6 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
AI6									
Verification of process	+	+	-	+	+	-	4	2	0
Verification of process documentation	-	-	-	-	-	-	0	6	0
Verification of performance metrics	-	-	-	-	-	-	0	6	0
Verification of continuous improvement	-	-	-	-	-	-	0	6	0

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

The results of these interviews are clear. Strong support exists in the responses one question one, indicating that a change management process exists. However, all responses were negative for questions two through four. This finding leads to the conclusion that change management is not well developed in this organization. One interviewee stated that the technicians “have a lot of freedom in their judgment.” Once technicians review the problem and determine a solution, they get approval and implement the solution. All of those interviewed agreed that little documentation is kept on IT changes. The best documented changes are those cost a lot, since big expenditures must go before the council. Despite the low maturity level the interview results suggest, the Technology Services Department does maintain some documentation of changes.

Document Analysis

The Technology Services Department produced a Change Request Form used in project management practices. This form contains a section that collects basic information about the

request, a section that state the change, a section to evaluate the request based on impact, and a section for sign-off and approval by the appropriate process owner. This document is an excellent example of the type of information necessary for technicians to determine what changes to make and how to make them. However, this document is not uniformly utilized across the Technology Services Department.

Furthermore, the Technology Services Department uses the *Track-It* ticketing system to manage service requests. This system is not consistently utilized. If fully engaged, *Track-It* could dramatically change the management process. Currently, only minimal information is kept in the *Track-It* system and that information is not uniformly collected by all divisions.

Maturity Level Analysis

Based on the survey analysis and the results of the document analysis, sufficient evidence exists to support a maturity level of 2. The city utilizes change management practices, which is excellent. However, the ability to track changes and see what has been done to key systems is vital to the operation of information systems. As the city formalizes change management the organization, metrics tracking changes will show reduction in errors, downtime, and number of unplanned changes. Once in place, improved change management will help stabilize IT systems and increase IT governance maturity.

Deliver and Support (DS)

The previous domains addressed planning and implementing the plan for IT components and services. The Deliver and Support domain makes up the bulk of the IT Governance Framework. This domain addresses the process of maintaining operations and delivering services. The three objectives studied here are important because they show how the

organization manages service levels, trains members of the organization to deliver and support services, and manages operations.

The three objectives for this domain are DS1 - Define and Manage Service Levels, DS7 - Educate and Train Users, and DS13 – Manage Operations. The objectives provide information about the organizations ability to define what services to provide and at what level, how the organization informs users about the operation within the working environment, and how the organization carries out daily activities.

DS1 - Define and Manage Service Levels (Maturity Level 1.5)

This section consists of interview analysis, document analysis, and the final maturity level. The final maturity level depends on structured interviews, as well as support documents.

Structured Interview Analysis

This objective features seven structured interview questions focusing on the city of San Marcos's service level management. Table 5.5 contains the preliminary results from the six structured interviews.

TABLE 5.5: DS1 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
DS1									
Verification of Process	+	+	-	+	+	-	4	2	0
Verification of documentation	+	+	+	+	+	+	6	0	0
Follow up for verification of process	-	*	-	+	-	-	1	4	1
Verification of management communication	+	+	-	+	-	-	3	3	0
Follow up on management communication	-	*	-	-	-	-	0	5	1
Verification of performance metrics	-	*	-	-	-	-	0	5	1
Verification of continuous improvement	-	*	-	-	-	-	0	5	1

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

The survey results for these questions appear to be inconsistent, emphasizing the importance of good qualitative information. The city uses service level agreements, but only with externally contracted services, and not between different departments. However, without qualitative data this information would not have been captured. Question number two received a 100% affirmative response. The question was: “Do you use service level agreements either with your clients, with contractors, or within your organization?” The question received a resounding “yes”, however, question four is a follow-up question to gain greater detail. The survey results for the rest of the questions vary. Question four received three negative responses and three affirmative responses. However, the descriptions were all consistent in that any service level agreements are only with large outside vendors. Those large service level agreements are negotiated as needed, and no assessment occurs before negotiations begin.

Document Analysis

The city’s large service level agreements are contracts with service providers, such as mobile phone providers. Service level agreements are not used internally between departments. The Technology Services Department did not provide documentation of service level agreements for this COBIT objective.

Maturity Level Analysis

Based on the survey analysis and the results of the document analysis sufficient evidence exists to support a maturity level of 1.5. Service level agreements are used sparingly; therefore, no formalized system exists to determine service level requirements or develop service level agreements. Currently, the internal IT services for large departments that require the majority of city resources are maintained by the same process used by all departments. Service level agreements assist in clarifying roles and responsibilities within a city and assist in developing

future services as technology changes. Once the city develops a service level management process, maturity of IT governance will increase.

DS7 - Educate and Train Users (Maturity Level 2)

This section consists of interview analysis, document analysis, and the final maturity level. The final maturity level depends on structured interview responses, as well as support documents.

Structured Interview Analysis

This section contains six structured interview questions which focused on the city of San Marcos's end-user training process. Table 5.6 contains the preliminary results from the six structured interviews.

TABLE 5.6: DS7 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
DS7									
Verification of user training process	-	+	+	+	-	+	4	2	0
Verification of process development	-	+	-	-	-	-	1	5	0
Verification of process implementation	-	-	-	-	-	-	0	6	0
Verification of documentation	-	-	-	-	-	-	0	6	0
Verification of performance metrics	-	-	-	-	-	-	0	6	0
Verification of continuous improvement	-	+	-	-	-	-	1	5	0

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

These results suggest that the city provides some training; however, the training program is informal. From these results, it appears the Technology Services Department does not employ a rigorous training program; however, as one interviewee states “the majority of our training is

done on the job”. With the exception of question one all of the answers in this section are predominately negative. The document analysis supports these results.

Document Analysis

The Technology Services Department produced two training documents, one for the *Track-It* online tracking system and the other for *Microsoft Outlook*. These training documents were well done but were not created or maintained using a uniform process. This result demonstrates that the city has an informal training program, and different groups produce various training resources on an as-needed basis.

Maturity Level

Based on the survey analysis and the results of the document analysis sufficient evidence exists to support a maturity level of 2. The city currently utilizes an informal training program that relies on different groups or individuals to develop, maintain, schedule, and deliver city-wide. As the city develops more unified training systems, metrics will show a reduction in errors and reduction in down time. Information on training effectiveness can advance the goals and objectives of the city and increase the IT governance maturity.

DS13 – Manage Operations (Maturity Level 2)

This section consists of interview analysis, document analysis, and the final maturity level assignment. The final maturity level depends on structured interview responses as well as supporting documents.

Structured Interview Analysis

This objective used six structured interview questions to focus the city of San Marcos’s IT service management or operations management practices. The following are the neutral,

affirmative, and negative results from the six surveys conducted. Table 5.7 contains the preliminary results from the six structured interviews conducted.

TABLE 5.7: DS13 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
DS13									
Verification of operations management process	-	+	+	*	+	-	3	2	1
Verification of process development	-	+	+	+	+	-	4	2	0
Follow up on process development	-	-	-	-	+	-	1	5	0
Verification of management communication	-	-	-	-	-	-	0	6	0
Verification of process review	-	+	-	-	-	-	1	5	0
Verification of performance metrics	+	+	-	-	-	-	2	4	0
Verification of continuous improvement	-	-	-	-	-	-	0	6	0

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

The interview results show that the Technology Services Department does have some operations management processes in place. The interviewees all identified some policies and procedures as well as a system to manage services and operations. However, since operations are not regularly documented, useful information may not make its way to upper management. One interviewee stated that “some procedures are learned on the job and are not written down.” The development of policies and procedures, as well as the maintenance of different processes depends greatly on the individual tasked with that process rather than on an organizational process. The documents provided support this analysis.

Document Analysis

The Technology Service Department produced the following documents: Termination Procedures, city of San Marcos Technology Purchasing Policy, Web Site Management Policy (Policies for Editing and Publishing the City Web Site), Appendix 1 Web Posting Procedures, Internet Use Policy, city of San Marcos Computer and Network Usage Policy, and the Computer

Reformat Policy. These documents outline the policies and procedures for different Technology Services Department operations carried out on a daily basis. These documents demonstrate the department has formalized processes. The policies and procedures are of good quality, but are not uniformly maintained. None of the policies contradict each other yet none of them show how they fit into a larger management scheme.

Maturity Level Analysis

Based on the survey analysis and the results of the document analysis sufficient evidence exists to support a maturity level of 2. The city does have good practices in place, however the practices are not uniformly developed or reviewed. Uniform structure of policies and procedures may not provide significant value to the Technology Services department specifically, however a framework of process review and development can highlight inconsistencies, redundancies, or flaws in current policies and procedures and make those flaws easier to track. Additionally, meaningful information that moves from the department to upper management demonstrates how the organization is meeting the strategic goals of the city. When top management reviews information and provides feedback, the quality of operations and IT governance maturity improves.

Monitor and Evaluate

The Monitor and Evaluate domain shows an organization where it has been and where it is going. By monitoring projects and management trends, the organization can see what has occurred over a period of time. By evaluating that information, the organization can make plans for future projects and resources. The two objectives in this domain are important because they

address how an organization monitors and evaluates IT performance, and how the organization delivers the IT governance needed to sustain the rest of the IT Governance Framework.

The two objectives for this domain are ME1 - Monitor and Evaluate IT Performance and ME4 - Provide IT Governance. These objectives provide information about how the organization tracks and analyze performance, and subsequently provides IT governance based on the assessment.

ME1 - Monitor and Evaluate IT Performance (Maturity Level 3)

This section consists of interview analysis, document analysis, and the final maturity level assignment. The final maturity level depends on structured interview responses as well as supporting documents.

Structured Interview Analysis

This objective contains seven structured interview questions focusing on how the city of San Marcos monitors and evaluates performance of IT projects. Table 5.8 contains the preliminary results of the structured interviews.

TABLE 5.8: ME1 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
ME1									
Verification of performance management process	+	+	+	+	+	+	6	0	0
Verification of performance management methodology	-	+	-	-	-	-	1	5	0
Follow up on performance management methodology	-	+	-	-	-	-	1	5	0
Verification of management communication	-	*	+	+	+	+	4	1	1
Verification of documentation	-	*	-	*	-	-	0	4	2
Verification of performance metrics	-	+	-	-	-	-	1	5	0
Verification of continuous improvement	-	+	+	+	-	-	3	3	0

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

For this objective the data is clear. The interview data alone indicates procedures to track performance of different projects exist. Respondents uniformly described the *Track-It* system, by which departments across the city input IT requests. This system tracks the project from open to close, and can provide different performance measurements. The Technology Services Department runs a monthly report to show what kind of projects were completed and for what departments, but the statistics generated by the *Track-It* system are not tied to any other evaluation or initiative to improve processes. Additionally, respondents experienced periodic employee evaluations. Uniformly, the respondents noted that they did not know if evaluations were tied to a larger evaluation, but if anyone received a poor evaluation, each department manager must to address the problem. The documents provided support this analysis.

Document Analysis

The Technology Services department provided the February Monthly Report as well as a blank employee evaluation form. Additionally, the interviewer was allowed to observe a demonstration the *Track-It* system and see how projects flow through the system. The February report provided a breakout of the different divisions that requested services, and how many requests each division made. Other statistics indicate how many requests were entered, completed, and remain open.

Maturity Level

The documents and interviews demonstrate that the monitoring process is formalized and understood by everyone. The evaluation process exists and could easily become part of a large evaluation methodology. The city definitely has a good foundation in place on which to build monitoring and evaluation processes, however, top management must indicate the process.

Based on the survey analysis and the results of the document analysis sufficient evidence exists to support a maturity level of 3. The city has good practices in place for monitoring performance; however, performance evaluations provide limited detail and therefore top management may not receive vital information. The process is understood by everyone in the department; however, documentation provided to upper management contains only limited information. As monitoring and evaluation processes are formalized, the city will realize cost savings and reduce inefficiencies or redundancies, depending on how the processes develop. The report generated by the Technology Services Department does not appear to be part of a larger plan to improve performance.

ME4 - Provide IT Governance (Maturity Level 0)

This section consists of interview analysis, document analysis, and the final maturity level assignment. The final maturity level depends on structured interviews, as well as the supporting documents.

Structured Interview Analysis

This objective contains six structured interview questions focusing on how the city of San Marcos provides IT governance. Table 5.9 contains the preliminary results from the six structured interviews.

TABLE 5.9: ME4 – Preliminary Interview Results

	I*-1	I-2	I-3	I-4	I-5	I-6	+	-	*
ME4									
Verification of IT governance framework	-	*	-	-	-	-	0	5	1
Verification of IT governance framework implementation	-	-	-	-	-	-	0	6	0
Verification of IT governance process	-	*	-	-	-	-	0	5	1
Verification of management participation	-	-	-	-	-	-	0	6	0
Verification of performance metrics	-	-	-	-	-	-	0	6	0
Verification of continuous improvement	-	*	-	-	-	-	0	5	1

* - I indicates interview

Rating Scale: + =Positive Response (yes) – =Negative Response (no) * =does not know

For this objective the evidence is clear. Respondents answered either in the negative or neutral. Clear that there is no formal IT governance structure in place, nor is IT governance evaluated. However, through the different interviews, Technology Services Department personnel did bring up different possible IT governance practices but did not refer to them as IT governance practices as most of were not familiar with the concept.

Document Analysis

The Technology Services Department did not provide documents specifically outlining an IT governance framework. Documentation did not affect the maturity level analysis, since there is no way to corroborate interview results.

Maturity Level

Based on current management practices, the interviews, and lack of documentation insufficient evidence exists to support maturity; therefore, the maturity level for this objective is 0. As the city begins to communicate about the different aspects of management practices and uses those practices to enforce the long-term goals of the organization, IT governance can assist by providing a framework for that interaction. As communication increases, so will performance and IT governance maturity.

Chapter Summary

Table 5.10 contains a summary of the nine COBIT objectives and the overall maturity level for the city of San Marcos. The maturity levels come from the COBIT maturity levels for each objective. This assessment provides the basis for the recommendations found in chapter six.

TABLE 5.10: Summary of Maturity Levels

Summary Table		
COBIT Objective	Maturity Assessment	Maturity Level
Plan and Organize		
PO1 - Define a Strategic IT Plan	Repeatable but Intuitive	2
PO10 – Manage Projects	Repeatable but Intuitive	2
Acquire and Implement		
AI4 - Enable Operation and Use	Repeatable but Intuitive	2
AI6 - Manage Changes	Repeatable but Intuitive	2
Deliver and Support		
DS1 - Define and Manage Service Level	Initial/Ad Hoc	1.5
DS7 - Educate and Train Users	Repeatable but Intuitive	2
DS13 – Manage Operations	Repeatable but Intuitive	2
Monitor and Evaluate		
ME1 - Monitor and Evaluate IT Performance	Defined	3
ME4 - Provide IT Governance	Non-existent	0
Overall Maturity	Repeatable but Intuitive	2

This chapter provided the results of the IT Governance maturity assessment case study of the city of San Marcos, Texas. The chapter presented the results from the interviews and the document analysis, and assigns a maturity level for each of the COBIT objectives. Overall, the maturity levels indicate the IT governance for the city of San Marcos are at a level of 2 and are “Repeatable but Intuitive”, meaning management processes are inconsistently applied and rely highly on the individual performing the activity. Additionally, the results support a level 2 maturity for most of the COBIT domains with the lowest levels of support for objectives DS1 - Define and Manage Service Level and ME4 - Provide IT Governance. The results show a high level of maturity for ME1 - Monitor and Evaluate IT Performance which is uncommon in IT departments unfamiliar with IT governance. The primary factor in the ME1 assessment was the use of an automated tracking and reporting system to communicate performance results to top

management. The following section provides some recommendations to improve the city's IT governance and conclusions based on these results.

Chapter 6: Recommendations and Conclusions

Chapter Purpose

The purpose of this research project is to conduct a focused evaluation using a modified COBIT IT Governance Framework to determine the IT governance maturity of the city of San Marcos. The following chapter presents recommendations and conclusions based on this case study.

This research project conducted a case study evaluating the IT governance maturity of the city of San Marcos. The research determined the overall maturity level for the city was a level 2. Based on a review of the literature⁹² the city of San Marcos is not unlike other public sector organizations of the same size, based on benchmark analysis. However, there is little to or research to indicate whether or not this level of maturity is appropriate. The following section concludes the research and makes recommendations based on each COBIT objective. Table 6.1 summarizes each recommendation for improvement based on measurement against the COBIT IT Governance Framework.

Plan and Organize

PO1 - Define a Strategic IT Plan

Conclusion: The city of San Marcos has in place a formal Strategic IT Plan, however the recent implementation of that plan means the plan may not have the support of management at all levels of the organization.

Recommendation: The city of San Marcos should continue developing a strategic IT plan. The city should also have different departments review the strategic IT plan regularly to assess

⁹² See the section titled *Examples of Maturity Model Research: Studies from the Literature* in Chapter 2

implementation success. The city should solicit feedback about the strategic IT plan in order to determine performance success and enhance future strategic plans.

PO10 – Manage Projects

Conclusion: The city of San Marcos does not uniformly apply project management resources or processes. The city uses professional project management practice only on projects requiring outside contractors. Though effective, the various internal project management practices are specific to the project manager handling each project and are not uniformly applied to all projects.

Recommendation: The city of San Marcos should work to develop and/or adopt a documented project management methodology and uniformly apply the policy to all projects. Projects should be assessed for impact and viability and should adhere to project guidelines such as, but not limited to, budget restrictions, timeline, and a defined project goal. Additionally, the city should define performance measures for projects to assess the completeness and quality of the end result.

Acquire and Implement

AI4 - Enable Operation and Use

Conclusion: The city of San Marcos does maintain system documentation in the form of user manuals and various operational use documents as well as training for IT support personnel. The documents are of varying quality and detail and do not appear to follow a uniform standard for development.

Recommendation: The city of San Marcos should develop and/or adopt an operation and use methodology. The methodology should be documented and support the needs of the city's IT assets. IT assets should be assessed to determine documentation need and to support training. Documentation should follow a uniform method for development, review, and approval. The city should also create a performance measure to assess methodology effectiveness and to assess future needs for IT assets.

AI6 - Manage Changes

Conclusion: The city of San Marcos does use an automated ticketing and tracking software package called *Track-It*. The software allows technicians to manage workflow and for clients to track project progress. The software package currently does not implement higher level functions of the change management process. For example, users input requests into *Track-It* and technicians update the conclusion once it is done. The technicians could use *Track-It* to input problems they had in the process, request approval, or route a change for review. Using *Track-It* in this manner generate richer information that managers can later analyze and use to improve organizational practices.

Recommendation: The city should continue to develop the Track-It asset. First, managers need to verify that all changes are processed through this system without exception. Second, changes tracked through the system should be uniformly categorized and prioritized. Third, personnel should track and assess changes for impact and validity. Fourth, changes should be scheduled according to priority and the resources available to the Information Technology Division and the requesting department. Fifth, IT management needs to assess changes post implementation and

determine effectiveness and success. Finally, IT management should develop performance to assess the effectiveness of changes and the change management process as a whole.

Deliver and Support

DS1 - Define and Manage Service Level

Conclusion: Service level management is not uniformly applied to critical services provided to the city or by the city to its departments. The city limits the use of service level agreements to outside vendors and does not use service level agreements internally.

Recommendation: The city should develop and/or adopt a service level management methodology. The methodology should be documented and applied uniformly to all IT services. IT management should assess internal and external services for criticality and apply an appropriate level of service level management. Additionally, the city should develop performance measures to assess the effectiveness of services and the service level management process.

DS7 - Educate and Train Users

Conclusion: The city of San Marcos does maintain and implement training for various IT systems. The training courses vary in quality and detail and do not follow a uniform standard of development.

Recommendation: The city of San Marcos should develop and/or adopt an end user training methodology. The methodology should be documented and support the city's needs. Training resources should follow a uniform method of development, review, and approval. The city

should also create performance measures to assess effectiveness of this methodology and to assess future training needs.

DS13 – Manage Operations

Conclusion: The city currently utilizes an operations management methodology. The current methodology is intuitive and known to those in the Information Technology Division, but the methodology is not well documented or uniformly applied to IT operations.

Recommendation: The city should expand current operation management methodology by mapping processes and implementing policies and procedures to support the methodology. Additionally, the city should create performance measures to track operation management process effectiveness.

Monitor and Evaluate

ME1 - Monitor and Evaluate IT Performance

Conclusion: The city does have an automated ticketing and tracking system. This system can produce metrics for requests entered or completed by department. This information is summarized in a report and used to discuss IT management functions among different management levels.

Recommendation: The city should expand upon the current system. The city should conduct additional analysis on requests to identify specific problem areas and address systemic problems on an organization-wide level. Additionally, the city can develop this system to improve overall performance and forecast potential problems.

ME4 - Provide IT Governance

Conclusion: The city does have some IT governance practices in place, but those practices are largely a management function and are not used primarily to govern IT. Additionally, the city has not created or adopted an IT governance framework.

Recommendation: The city should adopt an IT governance framework. The framework should be documented and supported by senior management. Senior management should coordinate with management at all levels of the organization to assess current management practices and begin implementing an IT governance practice.

Table 6.1 contains a summary of results and recommendations.

TABLE 6.1: Results and Recommendations

Maturity Assessment Results and Recommendations			
COBIT Objective	Maturity Assessment	Maturity Level	Recommendations
Plan and Organize			
PO1 - Define a Strategic IT Plan	Repeatable but Intuitive	2	Continue developing and improving strategic planning processes.
PO10 – Manage Projects	Repeatable but Intuitive	2	Uniformly apply project management practices to all projects.
Acquire and Implement			
AI4 - Enable Operation and Use	Repeatable but Intuitive	2	Document IT systems better and improve Technology Services Division staff training so less is done on the job.
AI6 - Manage Changes	Repeatable but Intuitive	2	Develop and organization-wide change management process.
Deliver and Support			
DS1 - Define and Manage Service Level	Initial/Ad Hoc	1.5	The city should develop and / or adopt a service level management methodology.
DS7 - Educate and Train Users	Repeatable but Intuitive	2	The city of San Marcos should develop and / or adopt an end user training methodology.
DS13 – Manage Operations	Repeatable but Intuitive	2	The city should expand upon its current operation management methodology.
Monitor and Evaluate			
ME1 - Monitor and Evaluate IT Performance	Defined	3	The city should expand upon its current system.
ME4 - Provide IT Governance	Initial/Ad Hoc	1	The city should adopt an IT governance framework.

Priority Recommendations

Table 6.1 provides general recommendations to improve each COBIT objective. Of these recommendations, three provide the greatest amount without large investments in new infrastructure or personnel.

The recommendation for AI6- Manage Changes is a recommendation that greatly benefit the city. The analysis shows that the city of San Marcos uses the *Track-It* ticketing system to input information for IT related issues. However, the *Track-It* system only contains information

about issues that require assistance from the Technology Services Department. The city could expand the use of this system to include changes in all divisions. With this kind of information, the city could analyze why changes occur and determine how to improve processes.

Additionally the city can eliminate redundant systems and see the additional benefits of one system to track this information.

The recommendation for PO10 – Manage Projects is another recommendation that would provide great benefit to the city. The Technology Services Department employs two project management professionals; however, the management practices are not applied thoroughly to internal projects. Currently, projects for various departments receive some type of timeframe for completion; however, the level of planning and analysis that goes into each project is limited. If additional analysis and planning went into each project, the city might find an underlying issue that, when addressed could reduce the overall amount of resources spent on individual issues.

The recommendation for DS7 – Educate and Train Users, is the third recommendation that would provide great benefit. The city of San Marcos currently offers training on various systems and processes; however, it is the responsibility of each department to maintain and administer training. The city could continue to require each department create and administer training, but a group of three to five employees could meet periodically to adopt training standards and review and approve training proposals to ensure uniformity and quality. Additionally, this group could maintain a listing of training documentation city could use to reduce the amount of duplicate training produced by each department.

These are three priority recommendations that would provide the most benefit to the city of San Marcos. Each of the recommendations in Table 6.1 could benefit the city of San Marcos,

but would take considerable time and effort to implement some of them. Table 6.2 contains the priority recommendations.

TABLE 6.2: Priority Recommendations

Priority Recommendations		
Priority	COBIT Objective	Recommendation
1	AI6 - Manage Changes	Develop and organization-wide change management process.
2	PO10 – Manage Projects	Uniformly apply project management practices to all projects.
3	DS7 - Educate and Train Users	The city of San Marcos should develop and / or adopt an end user training methodology.

Research Bias

As discussed in the research methodology chapter, structured interviews and document analysis can suffer various weaknesses. It is important to note that the results from this study should be interpreted with caution, as interviews are susceptible to bias due to poorly developed interview questions, response bias, poor recall, or reflexivity (Yin 2009, 102). Additionally, documents analyzed in this study were provided by the interview participants and additional documents and details may exist, which could have provided evidence to increase or decrease the maturity levels assigned to each COBIT objective.

Important Caveat

The research conducted in the applied research project contains responses only from the Technology Services Department Staff. Though this information gives insight into the operations related to IT governance in the city of San Marcos, more can be done to provide an even clearer picture. This research was conducted by one researcher, therefore this evaluation

yielded the best results through study of the Technology Services Division. Improvements to this study are discussed in the following section, *Future Research*.

Future Research

This research would greatly benefit from an analysis of the city of San Marcos's Management responses, as well as a more in-depth study of each division of the city of San Marcos.

Suggestions for future research also include replicating this study on other cities and public sector entities of various sizes to provide a better benchmark for IT maturity among public sector organizations. Additionally, more research must be done to determine appropriate levels of maturity for public sector organizations across all COBIT IT Governance Objectives.

Applying this type of research to other public sector entities would provide a better understanding of IT governance maturity and improve IT governance methodologies across the public sector.

Conclusion

The results show the existence of IT governance processes functioning within the city of San Marcos. Though some objectives were better implemented than others the level of maturity was on par with other public sector organizations similar in size and scope to the city of San Marcos. Improving these COBIT objectives will allow the city of San Marcos to reap the benefits that come from increased IT governance maturity. Not improving these and other COBIT objectives may take a toll on the city of San Marcos through marked deficiencies in overall service and productivity as the city grows and becomes a larger, more complex

organization. Overall, the city of San Marcos features a capable environment with much potential for improvement.

Chapter Summary

This chapter provided recommendations and conclusions based on the IT Governance Assessment case study for the city of San Marcos. The results show that the city of San Marcos implements some IT governance practices, with room for improvement. This chapter also discussed potential research bias as well as recommendations for future research.

Bibliography

- Ackoff, R.L. 1970. *A Concept of Corporate Planning*. New York, NY: Wiley-Interscience
- Adam, Everett E., and Paul M. Swamidass. 1989. Assessing operations management from a strategic perspective. *Journal of Management* 15(2):181-203
- Almaraz, Jeanne. 1994. Quality management and the process of change. *Journal of Organizational Change Management* 7(2):6-14.
- Altemeyer, Lynn. 2004. An assessment of Texas state government: implementation of enterprise risk management principles. *Applied Research Projects*, Texas State University-San Marcos. Paper 14. <http://ecommons.txstate.edu/arp/14>
- Ascott, Elizabeth J. 2006. A benefit-cost analysis of the wonder world drive overpass in San Marcos, Texas. *Applied Research Projects*, Texas State University-San Marcos. Paper 104. <http://ecommons.txstate.edu/arp/104>
- Au, Norman, and Eric W.T. Ngai, and T.C. Edwin Cheng. 2002. A critical review of end-user information system satisfaction research and a new research framework. *The International Journal of Management Science* :451-478.
- Babbie, Earl R.. 2007. *The Practice of Social Research*. 11 ed. Belmont, CA: Wadsworth Publishing Company.
- Babbie, Earl R.. 1986. *Observing Ourselves: Essays in Social Research*. New York, NY: Waveland Pr Inc,
- Bartczak, Summer E., and Aaron Blair, and Todd A. Peachy, and Jason M. Turner. 2010. KM capability assessment: a qualitative approach. *Proceedings of the Southern Association for Information Systems Conference, Atlanta, GA* :118-123.
- Berry, Frances Stokes and Barton Wechsler. 1995. State agencies' experience with strategic planning: findings from a national survey. *Public Administration Review* 55(2):159-168.
- Besner, Claude and Brian Hobbs. 2008. Project management practice, generic or contextual: a reality check. *Project Management Journal* 39(1): 16-33.
- Blakey, Peter, and Chris Phillips, and Julie Bunnell. 2000. Training methods and user characteristics in end user computing. *Journal of Systems and Information Technology* 4(2): 57-70.
- Booth, Andrew. 2006. Counting what counts: performance measurement and evidence-based practice. *Performance Measurement and Metrics* 7(2): 63-74.

- Boyd, Brian, and Elke Reububg-Elliott. 1998. Research notes and communications: a measurement model of strategic planning. *Strategic Management Journal* 19:181–192.
- Boynton, Andrew C, and Robert W Zmud and Gerry C. Jacobs. 1994. The influence of IT management practice on it use in large organizations. *MIS Quarterly* 18(3): 299-320
- Bowman, Anthony. 2005. A Descriptive Study of Manuscripts and Reviewers for the Armed Forces and Society Journal. *Applied Research Projects*, Texas State University. Paper 15. <http://ecommons.txstate.edu/arp/15>
- Brooks, James.1999. Using attitudes to assess the effectiveness of 360-degree performance appraisal in san marcos, texas. *Applied Research Projects*, Texas State University-San Marcos. Paper 176. <http://ecommons.txstate.edu/arp/17>
- Bryson, John M. 2004. *Strategic planning for public and nonprofit organizations: a guide to strengthening and sustaining organizational achievement*. 3rd ed. San Francisco, CA: Jossey-Bass.
- Chinowsky, Paul, and Patricia Carrillo. 2007. Knowledge management to learning organization connection. *Journal of Management in Engineering* 23(3): 122-124.
- Collerette, Pierre, and Paul Legris, and Marina Manghi. 2006. A successful IT change in a police service. *Journal of Change Management* 6(2): 159–179.
- Committee of Sponsoring Organizations of the Treadway Commission. 2004. *Enterprise Risk Management—Integrated Framework: Executive Summary*. PricewaterhouseCoopers LLP.
- Conley, Curtis A. and Wei Zheng. 2009. Factors critical to knowledge management success. *Advances in Developing Human Resources* 11(3): 334-348.
- Cooke-Davies, T,. 2002. The “real” success factors on projects. *International Journal of Project Management* 20:185–190.
- Cronan, Timothy P. and David E. Douglas. 1990. End-user training and computing effectiveness in public agencies: an empirical study. *Journal of Management Information Systems*. 6(4): 20-39.
- Damianides, Marios. 2005. Sabranes-Oxley and IT governance: new guidance on IT control and compliance. *Information Systems Management* 22(1): 77-85.
- Debreceeny, Roger. and Glen L. Gray. 2009. IT governance and process maturity. *ISACA Journal* 3:1-5.

- De Haes, Steven and Wim Van Grembergen. 2009. Guidelines for the implementation of enterprise governance. In *Enterprise Governance of Information Technology*. 201-212. New York, NY: Springer Science.
- De Haes, Steven and Wim Van Grembergen. 2009. COBIT as a framework for enterprise governance for IT. In *Enterprise Governance of Information Technology*. 137-164. New York, NY: Springer Science.
- De Haes, Steven and Wim Van Grembergen. 2009. Concepts of enterprise governance of it. In *Enterprise Governance of Information Technology*. 1-20. New York, NY: Springer Science.
- De Haes, Steven and Wim Van Grembergen. 2004. IT governance and its mechanisms. *Information Systems Control Journal*. 1: 1-7.
- Detlor, Brian. 1999. Leveraging the library through web user training. *Library Management* 20(7):393-400.
- Diefenbach, Thomas. 2005. The managerialistic ideology of organizational change management. *Journal of Organizational Change Management* 20(1):126-144
- Doughty, Ken, and John O'Driscoll. 2002. Information technology auditing and facilitated control self-assurance. *Information Systems Control Journal* 4: 1-12.
- Ebert C., and Dumke R., and Bundschuh M. 2004. *Best practices in software measurement: how to use metrics to improve project and process performance*. New York, NY: Springer
- Ehms, Karsten, and Manfred Langen. 2002. *Holistic Development of Knowledge Management with KMMM*. Siemens AG
- Evans, Jo, and Charlie Weir. 1995. Decision processes, monitoring, incentives and large firm performance in the UK. *Management Decision* 33(6): 32-38.
- Freeze, Ronald, and Uday Kulkarni. 2005. Knowledge management capability assessment: validating a knowledge assets measurement instrument, *Proceedings of the 38th Annual Hawaii International Conference on System Sciences* 8:251a
- GAO. 2010. *DOD's high-risk areas: observations on DOD's progress and challenges in strategic planning for supply chain management*.
- Gellings, Cornelia. 2007. Outsourcing relationships: the contract as IT governance tool. *HICSS 2007 40th Annual Hawaii International Conference on System Science*. :236c - 236c.
- Goo, Jahyun. 2008. Structure of service level agreements (SLA) in IT outsourcing: the construct and its measurement. *Information Systems Frontiers* 12(2):185-205.

- Goo, Jahyun, and Rajiv Kishore, and H. R. Rao, and Kichan Nam. 2009. The role of service level agreements in relational management of information technology outsourcing: an empirical study. *MIS Quarterly* 33(1): 119-145.
- Government Auditing Standards (GAS)*, 2007. 2007. Revised ed. Washington, DC: Government Accountability Office,
- Grönroos, Christian. 1994. From scientific management to service management a management perspective for the age of service competition. *International Journal of Service Industry Management* 5(1):5-20.
- Guledntops, Erik. 2004. Governing information technology through cobit. In *Strategies for Information Technology Governance*, ed. Wim Van Grembergen, 269-288. Hershey, PA: Idea Group Publishing.
- Guldentops, Erik and Wim Van Grembergen and Steven De Haes. 2004. Structures, processes and relational mechanisms for it governance. In *Strategies for Information Technology Governance*, ed. Wim Van Grembergen, 1-36. Hershey, PA: Idea Group Publishing.
- Guldentops, Erik and Wim Van Grembergen and Steven De Haes. 2002. Control and governance maturity survey: establishing a reference benchmark and a self-assessment tool. *Information Systems Control Journal* 6: 1-7.
- Gupta, Atul and Susan T. Sadowski. 1998. End-user training in the service industry. *Managing Service Quality* 8(3):212-218.
- Harrison. Frank E. 1995. Strategic planning maturities. *Management Decision* 33(2):48-55.
- Harkins, James S. 2010. An ideal sustainable energy model for local utilities: an assessment of the city of san marcos, texas. *Applied Research Projects*, Texas State University-San Marcos. Paper 330. <http://ecommons.txstate.edu/arp/330>
- Hartman, Francis, and Greg Skulmosk. 1998. Project management maturity. *Project Management* 4(1):74-78
- Ibbs, C. William, and Young Hoon Kwak. 2000. Assessing project management maturity. *Project Management Journal* 31(1):32-43.
- Information Systems Audit and Control Association (ISACA) Standards Board. 2002. Effect of third parties on an organization's it controls. *Information Systems Control Journal* 4:1-6.
- Information Systems Audit and Control Association (ISACA). 2010. *Monitoring Internal Control Systems and IT* Rolling Meadows, IL: ISACA.

- Institute of Internal Auditors. 2009. *International Professional Practices Framework (IPPF)*. 1st ed. Altamonte Springs, FL: The IIA Research Foundation.
- IT Governance Institute. 2007. *COBIT 4.1*. Rolling Meadows, IL: ITGI.
- Johnston, Robert. 1994. Operations: from factory to service management. *International Journal of Service Industry Management* 5(1):49-63.
- Judgev, Kam, and Janice Thomas. 2002. Project management maturity models - the silver bullets of competitive advantage. *Project Management Journal* 33(4):4-14.
- Kans, Mirka. 2009. The advancement of maintenance information technology. *Journal of Quality in Maintenance Engineering* 15(1):5-16.
- Khaiata, Mohammed, and Imran A Zualkernan. 2009. A simple instrument to measure IT-business alignment maturity. *Information Systems Management* 26(2): 138-152.
- Khatri, Vijay and Carol V. Brown. 2010. Designing data governance. *Communications of the ACM* 53(1): 148 – 152.
- Kipley, Dan H, and Alfred O Lewis, and Roxanne Helm. 2008. Achieving strategic advantage and organizational legitimacy for small and medium sized NFPs through the implementation of knowledge management. *Business Renaissance Quarterly* 3(3): 21–43.
- Koenig, Michael. 2003. Knowledge management, user education and librarianship. *Library Review* 52(1):10-17.
- Kopycinski, Julie E. 2005. An analysis of the san marcos police departments 2004-2005 use of force data. *Applied Research Projects*, Texas State University-San Marcos. Paper 116. <http://ecommons.txstate.edu/arp/116>
- Kordel, Luc. 2004. IT Governance hands-on: using cobit to implement it governance. *Information Systems Control Journal*. 2: 1-8.
- Kulkarni, Madhav. 2003. Applying COBIT framework in change management. *Information Systems Control Journal* 5:1-4
- Kulkarni, Uday, and Ronald Freeze. 2006. Measuring Knowledge Management Capabilities. in *Encyclopedia of Knowledge Management*, ed. David G. Schwartz. 605-613. Hershey, PA: Idea Group Reference
- Larson, Kent D. 1998. The role of service level agreements in IT service delivery. *Information Management and Computer Security* 6(3):128–132.
- Lederer, Albert L. and Vijay Sethi. 1996. Key prescriptions for strategic information systems planning. *Journal of Management Information Systems* 13(1): 35–62.

- Legris, Paul, and Pierre Colletette. 2006. A roadmap for it project implementation: integrating stakeholders and change management issues. *Project Management Journal* 37(5): 64-75.
- Lee, AHI, and HH Chen, and H-Y Kang. 2009. Operations management of new project development: innovation, efficient, effective aspects. *Journal of the Operational Research Society* 60:797-809.
- Lester, Nina.2005. Assessing economic development incentives: central texas city: managers perspectives. *Applied Research Projects*, Texas State University-San Marcos. Paper 6. <http://ecommons.txstate.edu/arp/>
- Linn, Mott. 2008. Library strategies planning strategically and strategic planning. *The Bottom Line: Managing Library Finances* 21(1):20-23.
- Luftman, Jerry. 2004. Assessing business-it alignment maturity. In *Strategies for Information Technology Governance*, ed. Wim Van Grembergen, 99-126. Hershey, PA: Idea Group Publishing.
- Margherita, Alessandro, and Claudio Petti. 2010. ICT-enabled and process-based change: an integrative roadmap. *Business Process Management Journal* 16(3):473-491
- Marques, Filipe, and Jacques Sauve´ and J. Antao B. Moura. 2009. SLA design and service provisioning for outsourced services. *Journal of Network and Systems Management* 17(1-2): 73-90.
- McNaughton, Blake, and Pradeep Ray, and Lundy Lewis. Designing an evaluation framework for IT service management. *Information and Management* 47:219-225
- Mintzberg, Henry. 1994. The rise and fall of strategic planning. *Harvard Business Review* January-February: 107-114
- Mishra, Sushma and Heinz Roland Weistroffer. 2007. A framework for integrating Sarbanes-Oxley compliance into the systems development process. *Communications of AIS* 20: 712-727
- Nelson, R. Ryan. 1991. Educational needs as perceived by is and end-user personnel: a survey of knowledge and skill requirements. *MIS Quarterly* 15(4):502-525.
- O'Neill, Brian. 2008. A Model Assessment Tool for The Incident Command System: A Case Study of the San Antonio Fire Department. *Applied Research Projects*, Texas State University. Paper 270. <http://ecommons.txstate.edu/arp/270>
- Office of Personnel Management. 2001. *A Handbook for Measuring Employee Performance*.

- Parker, Robert G. 2010. Business skills for the IT audit and assurance professional. *ISACA Journal* 3:1-8.
- Pederiva, Andrea. 2003. The COBIT maturity model in a vendor evaluation case. *Information Systems Control Journal* 3:1-4.
- Peterson, Ryan. 2004. Integration strategies and tactics for information technology governance. In *Strategies for Information Technology Governance*, ed. Wim Van Grembergen, 37-80. Hershey, PA: Idea Group Publishing.
- Petter, Stacie, and William DeLone, and Ephraim McLean. 2008. Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems* 17:236–263.
- Petter, Stacie, and Adriane B. Randolph. 2009. Developing soft skills to manage user expectations in it projects: knowledge reuse among it project managers. *Project Management Journal* 40(4):45–59.
- Pintelon, Liliane, Niek Du Preez, and Frank Van Puyvelde. 1999. Information technology: opportunities for maintenance management. *Journal of Quality in Maintenance Engineering* 5(1):9-24.
- Poister, Theodore H and Gregory Streib. 2005. Elements of strategic planning and management in municipal government: status after two decades. *Public Administration Review* 65(1):45-57.
- Reboucas, Rodrigo, and Jacques Sauve, and Antão Moura, and Claudio Bartolinil, and David Trastour. 2007. A decision support tool to optimize scheduling of IT changes. *Integrated Network Management* 1: 343-352.
- Reich, Blaize Horner, 2007. Managing knowledge and learning in it projects: a conceptual framework and guidelines for practice. *Project Management Journal*. 38(2):5-17.
- Rosacker, Kirsten M., and David L. Olson. 2008. An empirical assessment of IT project selection and evaluation methods in state government. *Project Management Journal* 39(1): 49–58.
- Rose, Donna L. 1996. Fit to fight fires? an assessment of mandatory participation in exercise programs and mandatory fitness stan. *Applied Research Projects*, Texas State University-San Marcos. Paper 194. <http://ecommons.txstate.edu/arp/194>
- Ruiz, Moses T. 2009. Sharpening the spear: the united states' provincial reconstruction teams in afghanistan. *Applied Research Projects*, Texas State University. Paper 297. <http://ecommons.txstate.edu/arp/297>

- Ruiz, Victor. 2010. A knowledge taxonomy for army intelligence training: an assessment of the military intelligence basic officer leaders course using lundvall's knowledge taxonomy. *Applied Research Projects*, Texas State University. Paper 331, <http://ecommons.txstate.edu/arp/331>
- Saka, Ayse. 2003. Internal change agents' view of the management of change problem. *Journal of Organizational Change Management* 16(5):480-496.
- Sallé, Mathias, and Steve Rosenthal. 2005. Formulating and implementing an HP IT program strategy. *Proceedings of the 38th Hawaii International Conference on System Sciences* :236c-236c.
- San Marcos, 2009 – 2010 Annual Budget. http://www.ci.san-marcos.tx.us/departments/finance/Docs/2010_Proposed_Budget.pdf
- San Marcos, *Technology Services Strategic Plan 2009 – 2014 Draft V 0.2*
- Sarup, Deepak. 2002. Surfing @ the razor's edge: governance and managing change. *Information Systems Control Journal* 6:1-5
- Schneider-Cowan, Joy. 2007. A case study of the san marcos main street program. *Applied Research Projects*, Texas State University-San Marcos. Paper 268. <http://ecommons.txstate.edu/arp/26>
- Schwalbe, Kathy. 2010. *Information Technology Project Management*. 6th ed. Boston, MA: Course Technology.
- Shenhar, Aaron J., and Ofer Levy, and Dov Dvir. 1997. Mapping dimensions of projects success. *Project Management Journal* 28(2):5-13.
- Shields, Patricia M. and Hassan Tajalli, 2006. The missing link in student scholarship. *Journal of Public Affairs* (12)3: 313-334. <http://ecommons.txstate.edu/polsfacp/39/>
- Shields, Patricia M. 1998. Pragmatism as philosophy of science: A tool for public administration. *Research in Public Administration* 4: 195-225. <http://ecommons.txstate.edu/polsfacp/33/>
- Sibley, Edgar H. 1988. Growth stages of end user computing. *Communications of the ACM* 31(5):542-550.
- Sidorko, Peter Edward and Esther Woo. 2008. Enhancing the user experience: promoting a service culture through customized staff training. *Library Management* 29(8/9): 641-656
- Simonsson, Marten and Pontus Johnson. 2005. Defining IT governance – a consolidation of literature. *EARP Working Paper MS103*, Stockholm, Sweden: Royal Institute of Technology (KTH).

- Steiner, G.A. 1979. *Strategic Planning*. New York, NY: Free Press.
- Swift, James T. 2010. Exploring Capital Metro's Sexual Harassment Training using Dr. Bengt-Ake Lundvall's Taxonomy of Knowledge Principles. *Applied Research Projects*. Texas State University. Paper 326. <http://ecommons.txstate.edu/arp/326>
- Tanous, William Brandon. 2007. A benefit-cost analysis of the san marcos conference center in san marcos, texas. *Applied Research Projects*, Texas State University-San Marcos. Paper 266. <http://ecommons.txstate.edu/arp/266>
- Town, J. Stephen. 2000. Performance or measurement?. *Performance Measurement and Metrics* 1(1): 43–54.
- Taylor Richard, and Chris Tofts. 2005. Death by a thousand SLAs: a short study of commercial suicide pacts. *HP Technical Report, January 2005*.
- Van Grembergen, Wim, and Steven De Haes. 2009. *Enterprise Governance of Information Technology: Achieving Strategic Alignment and Value*. 1st ed. New York, NY: Springer.
- Van Grembergen, Wim and Steven De Haes. 2005. Measuring and improving IT governance through the balanced scorecard. *Information Systems Control Journal* 7: 1-8.
- Voss, Chris, and Nikos Tsikriktsis, and Mark Frohlich. 2002. Case research in operations management. *International Journal of Operations and Production Management* 22(2):195-219.
- Wan, Stewart H.C., and Yuk-Hee Chan. 2008. Improving service management in campus IT operations. *Campus-Wide Information Systems* 25(1):30-49.
- Wang, Eric, and Gary Klein, and James J. Jiang. IT support in manufacturing firms for a knowledge management dynamic capability link to performance. *International Journal of Production Research* 45(11): 2419 – 2434.
- Wiederkehr, Bruno. 2000. *COBIT case study: Swiss Life/Rentenanstalt*. Rolling Meadows, IL: IT Governance Institute
- Weill, Peter, and Jeanne W. Ross. 2004. *IT Governance How Top Performers Manage IT Decision Rights for Superior Results*. Boston, MA: Harvard Business School Press.
- Wustenhoff, Edward, and Michael J. Moore, and Dale H. Avery. 2005. *Operations Management Capabilities Model*. Santa Clara, CA: Sun Microsystems.
- Yin, Robert K. 2009. *Case study research: Designs and methods*. London: Sage Inc.

Yuwono, Budi, and Muhammad Nasri, and Rein Nusa Triputra. 2009. Measuring the effectiveness of a simplified COBIT-based IT process maturity assessment method. *Jurnal Sistem Informasi Fakultas Ilmu Komputer* 5(1): 55-60.

Appendix A: Structured Interview Questions

PO1 - Define a Strategic IT Plan

PO1 - Define a Strategic IT Plan
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Do you know what is meant by the term strategic IT plan?<ul style="list-style-type: none">○ The long term plan for IT in relation to the organizations goals and objectives.2. Do you have a strategic IT plan?<ul style="list-style-type: none">○ Please describe:3. Is your strategic IT plan documented?<ul style="list-style-type: none">○ Please describe:4. Who develops your strategic IT plan?<ul style="list-style-type: none">○ Please describe:5. Are there any metrics used to evaluate your strategic IT plan?<ul style="list-style-type: none">○ Please describe:6. Are there any metrics used to better the performance of your strategic IT plan?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">• A written strategic IT plan• A business plan outline in which IT is integrated• An IT portfolio showing IT project plans• IT project planning meeting memos and notes• Business continuity plan• Any document (either outline or detailed) that shows the overall plan for IT.

For this objective, interview question 1 establishes a basic knowledge of a Strategic IT Plan. The definition from COBIT is provided to give to the respondent should he or she not know that what it is or how to define it. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a definition in line with the COBIT definition then level 0 is disproven and the maturity for the COBIT objective must be greater than 0.

Interview question 2 establishes whether a Strategic IT Plan exists in any form. The respondent is asked to describe the strategic IT plan in order to understand how it is developed, who develops it and whether the organization has the knowledge and expertise to develop a Strategic IT Plan. This corresponds with maturity level 1 and possibly maturity level 2. The

purpose of this question is to understand how the Strategic Plan is developed and implemented. If the plan is not documented but managers and employees follow an agreed upon set of standards and practices then the maturity might move into level two. If the description provides evidence of repeatability and common techniques then the objective meets a solid maturity level 2. If the description provides evidence that the Strategic IT Plan is documented, provides alignment with the city's goals and objectives, and provisions for long-term development plans outlined in the end of maturity level 3 then the objective meets a level 3 maturity.

Interview question 3 confirms that the Strategic IT Plan is documented and the description is used to get a sense of how the Strategic IT Plan is used. The description is looking for how the plan is documented and if responsibilities are defined. This ensures a solid level 3 maturity and gathers information for a possible level 4 maturity level.

Interview question 4 establishes monitoring and measurement of the COBIT objective. By asking the respondent to describe how the objective is measured the interviewer is trying to establish how the measurements are used in maintenance and development of future IT plans as well as what practices are used for gathering the measurements and how that is used in outsourcing of IT functions should that apply. This question establishes a weak level 4 maturity level.

Question 5 establishes a strong level 4 maturity level and gathers information for a level 5 maturity level. This question focuses on how IT measurements are used in communicating the Strategic IT Plan to the rest of the city. The description should focus on how measurements and analysis is communicated to senior management and how senior management is involved in making decisions based on that information. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 6 focuses on how IT measurements are continuously used to improve the Strategic IT Plan. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement of the plans established in the Strategic IT Plan. If data and analysis are communicated to all senior management as well as data and analysis are used to continuously improves the Strategic IT Plan then a strong level 5 maturity level is appropriate.

In addition to conducting the interview, the researcher should ask for documentation that would support the evidence obtained in the interview. For this objective, the most ideal documentation is a strategic IT plan. If the organization does not have a document called *Strategic IT Plan* and does not have any documentation to demonstrate strategic planning then there is not documentation to support the description therefore a level 3 – 5 maturity level cannot be established. However, documentation that demonstrates that long-term planning of significance occurs periodically is evaluated to determine the appropriate maturity level. If the organization can demonstrate that some strategic planning takes place then a level 0 maturity level cannot be assigned and the researcher must determine the appropriate evaluation based on the testimonial and documentary evidence.

PO10 - Manage Projects

PO10 - Manage Projects
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Are you able to list or do you have a document that lists current IT projects?<ul style="list-style-type: none">○ Please describe:2. Do you know what it will take to complete your current IT projects?3. Are IT projects evaluated prior to completion?4. Are reports prepared for senior management on the progress of uncompleted IT projects?5. Are there any metrics used to evaluate uncompleted IT projects?<ul style="list-style-type: none">○ Please describe:6. Are the metrics used to better manage IT projects?<ul style="list-style-type: none">○ Please describe:7. Are metrics gathered and then used to make the management process better?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">• IT management framework in department manual• IT project list• Reports to senior staff on the progress of IT projects• Meeting notes and memos regarding IT management• Any other documents that outline or report the management of IT projects

For this objective, interview question 1 establishes whether or not the organization can track projects. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a description of project management practices then level 0 maturity is not appropriate and the maturity for the COBIT objective must be greater than 0.

Interview question 2 establishes whether the organization has a common understanding of the project management process. The respondent is asked to describe the project management process. If most of the respondents can provide a reasonable similar description then maturity level 1 and possibly maturity level 2 may be appropriate. The purpose of this question is to gain an understanding of how projects are generally managed within the organization. If the management practices are not documented but managers and employees follow an agreed upon

set of standards and practices then the maturity might move into level two. Also, it is important to listen to see if there is any communication with upper management in the description. This along with evidence of repeatability and common techniques then it begins to support a maturity levels 3 – 5.

Interview question 3 confirms that projects are evaluated prior to completion. The description is looking to see if criteria are evaluated before the project is completed. The description should contain information about goal setting, timelines and objective setting. If the description contains those things and the respondent demonstrates that the information is communicated in some form to upper management then maturity level 3 may be appropriate. If the respondent can establish that the projects are managed as portfolios then maturity level 3 is established and possibly maturity level 4.

Interview question 4 is a backup question and used to make sure previous questions were answered without misunderstanding. This question asks the previous two questions in a different way. This question asks about how uncompleted projects are managed. This question requires the respondent to evaluate those same management practices for a project that may not have had an outcome. This question will assist the analysis to and ensure that other factors of project management were considered. This question does not establish a maturity level but supports other maturity level evaluations.

Question 5 and 6 are used to establish a strong level 4 maturity level and gathers information for a level 5 maturity level. This question focuses on how IT project management performance measures, or metrics, are used in communicating the project statuses and goal completion to upper management. The description should focus on how measurements and analysis is communicated to senior management and how senior management is involved in

making decisions based on that information. The description should contain some information about the involvement in stakeholders and project owners. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 7 focuses on how IT measurements are continuously used to improve the project management practice. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement project management standards and practices. If data and analysis are communicated to all senior management as well as data and analysis are used to continuously improves project management then a strong level 5 maturity level is appropriate.

In addition to conducting the interview, the respondent should produce documentation that would support the evidence obtained in the interview. For this objective, the most ideal documentation is difficult to define since there are many solutions for project management. Ideally there should be some document that standardizes internal project management practices and ensure that all project are managed the same way every time as well as instruction for how to manage exceptions. Additionally, any documentation that can demonstrate the project life cycle and that the projects were managed according to the organizations standards and that the information is raised top management for use in decision making that would be most ideal. If the organization does not have a document any documentation to demonstrate project management then there is not documentation to support the description therefore a level 3 – 5 maturity level cannot be established. However, documentation demonstrating the occurrence of project management is evaluated to determine the appropriate maturity level. If the organization can demonstrate that projects are managed then a level 0 maturity level cannot be assigned and the

researcher must determine the appropriate evaluation based on the testimonial and documentary evidence.

AI4 - Enable Operation and Use

AI4 - Enable Operation and Use
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Is there any training offered over the organization IT systems?<ul style="list-style-type: none">○ Please describe:2. Does IT or management provide documentation of proper use of IT resources?<ul style="list-style-type: none">○ Please describe:3. Is there a framework that outlines the operation of IT resources?<ul style="list-style-type: none">○ Please explain:4. Is there a framework that outlines the use of IT resources?<ul style="list-style-type: none">○ Please explain:5. Are there any metrics used to determine the effectiveness of the operation and use of IT resources?<ul style="list-style-type: none">○ Please describe:6. Are metrics used to make operation and use of IT resources better?<ul style="list-style-type: none">○ Please describe:7. Are metrics used to make the operation and use processes better?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">● Operations manuals● User feedback surveys● Helpdesk functions● Meeting notes and memos regarding operation and use of IT resources● Documentation of and operation / use framework for IT resources<ul style="list-style-type: none">○ Eg: flowchart○ Legal, Adopted, or internally developed framework

For this objective, interview question 1 establishes whether or not the organization can maintain documentation and training for its systems. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a description of knowledge management practices then level 0 maturity is not appropriate and the maturity for the COBIT objective must be greater than 0.

Interview question 2 establishes whether the organization has a common understanding of the knowledge management process. The respondent is asked to describe the knowledge management resources maintained by the organization. If most of the respondents can provide a

reasonable similar description then maturity level 1 and possibly maturity level 2 may be appropriate. The purpose of this question is to gain an understanding of how knowledge of information systems is generally managed within the organization. If the management practices are not documented but managers and employees follow an agreed upon set of standards and practices then the maturity might move into level 2. Also, it is important to listen to see if there is any communication with upper management in the description. This along with evidence of repeatability and common techniques, the evidence begins to supports a maturity levels 3 – 5.

Interview question 3 confirms that the organization uses a common framework for creation and management of knowledge management resources. The description should provide information about creation and maintenance of knowledge resources. Resources should be reviewed, updated, and corrected periodically. If the description contains these things and the respondent demonstrates that the information is communicated in some form to upper management then maturity level 3 may be appropriate. If the respondent can establish that uniformity and regular scheduling of training events, maintenance, retention then the evidence begins to support a maturity level 4.

Interview question 4 is a backup question and used to make sure previous questions were answered without misunderstanding. This question asks the previous two questions in a different way. This question asks about a framework for creating of knowledge management materials regarding system use, in general, rather than system operation. This questions requires the respondent to evaluate those same management practices for all training or system information materials rather than focusing on what he or she might refer to as operational information. This question assists the analysis to ensure that other aspects of knowledge management were

considered. This question does not establish a maturity level but supports other maturity level evaluations.

Question 5 and 6 are used to establish a strong level 4 maturity level and gathers information for a level 5 maturity level. This question focuses on how knowledge management performance measures, or metrics, are used in communicating the outcomes from knowledge management activities and maintenance to upper management. The description should focus on how measurements and analysis is communicated to senior management and how senior management is involved in making decisions based on that information. The description should contain some information about the involvement in data system owners and end-user feedback. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 7 focuses on how IT measurements are continuously used to improve the knowledge management practices. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement knowledge management standards and practices. If data and analysis are communicated to all senior management and that analysis is used to continuously improve project management then a strong level 5 maturity level is appropriate.

In addition to conducting the interview, the respondent should produce documentation that would support the evidence obtained in the interview. For this objective, the most ideal documentation is difficult to define since there are many solutions for knowledge management. Ideally there should be some sort of library system in place where uniform information resources are catalogued and maintained. Additionally, any documentation that can demonstrate creation and maintenance was performed according to the organizations standards and that the

information is raised top management for use in decision making that would be most ideal. If the organization does not have a document any documentation to demonstrate knowledge management then there is not documentation to support the description therefore a level 3 – 5 maturity level cannot be established. However, documentation demonstrating the existence of knowledge management is evaluated to determine the appropriate maturity level. If the organization can demonstrate that knowledge of information resources are maintained and created then a level 0 maturity level cannot be assigned and the researcher must determine the appropriate evaluation based on the testimonial and documentary evidence.

AI6 - Manage Changes

AI6 - Manage Changes
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Does an individual or group assess the changes to software or hardware prior to implementation?<ul style="list-style-type: none">○ Please describe:2. Is a change management process outlined and defined?<ul style="list-style-type: none">○ Please describe:3. Are there any metrics gathered to determine the effectiveness of the change management process?<ul style="list-style-type: none">○ Please describe:4. Are metrics used to make the changed management processes better?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">• System change management documentation• Change management outline in a manual• Meeting notes or memos regarding the evaluation of changes to the organizations IT resources

For this objective, interview question 1 establishes whether or not change management, (IT maintenance management) occurs in the organization. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a description of change management practices then level 0 maturity is not appropriate and the maturity for the COBIT objective must be greater than 0.

Interview question 2 establishes whether the organization has a common understanding of the change management process and that it is standardized somehow. The respondent is asked to describe the knowledge management resources maintained by the organization. If most of the respondents can provide a reasonable similar description then maturity level 1 and possibly maturity level 2 may be appropriate. The purpose of this question is to gain an understanding of the change management process within the organization. If the management practices are not documented but managers and employees follow an agreed upon set of standards and practices

then the maturity might move into level 2. Also, it is important to listen to see if there is any communication with upper management in the description. Interviews should listen for any references to a common framework or standards for change management practices. Along with evidence of repeatability and common techniques, the evidence begins to support maturity levels 3 – 5.

Question 3 establishes a strong level 4 maturity level and gathers information for a level 5 maturity level. This question focuses on how change management performance measures, or metrics, are used in communicating the outcomes from changes and IT maintenance to upper management. The description should focus on how measurements and analysis is communicated to senior management and how senior management is involved in making decisions based on that information. The description should contain some information about the involvement of stakeholders, process owners, data system owners, and end-user acceptance. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 7 focuses on how IT measurements are continuously used to improve the knowledge management practices. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement of change management standards and practices. If data and analysis are communicated to all senior management and that analysis is used to continuously improve project management then a strong level 5 maturity level is appropriate.

In addition to conducting the interview, the respondent should produce documentation that would support the evidence obtained in the interview. For this objective, the most ideal documentation should consist of change management logs, maintenance logs, a manual or framework for change management, as well as communications and sign-offs from upper

management, data system owners, or process owners. Additionally, any documentation that can demonstrate that changes were performed according to the organizations standards and that the information is raised top management for use in decision making that would be most ideal. If the organization does not have a document any documentation to demonstrate change management then there is not documentation to support the description therefore a level 3 – 5 maturity level cannot be established. However, documentation demonstrating the existence of change management is evaluated to determine the appropriate maturity level. If the organization can demonstrate that knowledge of information resources are maintained and created then a level 0 maturity level cannot be assigned and the researcher must determine the appropriate evaluation based on the testimonial and documentary evidence.

DS1 - Define and Manage Service Levels

DS1 - Define and Manage Service Levels
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Does someone set service levels prior to the start of an IT project?<ul style="list-style-type: none">○ Please describe:2. Do you use service level agreements either with your clients, with contractors, or within your organization?<ul style="list-style-type: none">○ Please describe:3. Is there a framework for managing service levels?<ul style="list-style-type: none">○ Please describe:4. Are service levels ever discussed or set prior to the implementation of a contract or interdepartmental project?<ul style="list-style-type: none">○ Please describe:5. Is there a committee or management that evaluates service levels prior to implementation, during implementation, or post implementation of an IT project?<ul style="list-style-type: none">○ Please describe:6. Are there metrics used to measure service levels in IT projects?<ul style="list-style-type: none">○ Please describe:7. Is analysis of service levels used to make service level evaluation better?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">• Service Level Agreements within the organization or in contracts• Service level framework in a manual• Service level analysis documentation• Business continuity plan• Meeting notes or memos covering service level management

For this objective, interview question 1 establishes whether or not the organization uses service levels or service level agreements. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a description of knowledge management practices then level 0 maturity is not appropriate and the maturity for the COBIT objective must be greater than 0.

Interview question 2 establishes whether the organization has a common understanding of the service level management process. The respondent is asked to describe how the organization uses service level agreements. If most of the respondents can provide a reasonably

similar description then maturity level 1 and possibly maturity level 2 may be appropriate. The purpose of this question is to gain an understanding of how service levels are generally managed by the organization. If the management practices are not documented but managers and employees follow an agreed upon set of standards and practices then the maturity might move into level 2. Also, it is important to listen to see if there is any communication with upper management in the description. This along with evidence of repeatability and common techniques, the evidence begins to supports a maturity levels 3 – 5.

Interview question 3 confirms that the organization uses a common framework for creation and management of service level agreements. The description should provide information about creation and maintenance service levels. Service levels should be reviewed as well as discussed periodically with the data system owner or process owner, and the service provider. If the description contains these things and the respondent demonstrates that the information is communicated in some form to upper management then maturity level 3 may be appropriate. If the respondent can establish that uniformity and regular scheduling of upkeep of service levels are established then the evidence begins to support a maturity level 4.

Interview question 4 is a backup question and used to make sure previous questions were answered without misunderstanding. This question asks the previous two questions in a different way. This question asks about the use of service level agreements instead of asking if they are set or if a framework exists. This question requires the respondent to reflect on past experiences rather than rely on knowledge of service level management procedures and practices. This question assists the analysis to ensure that other aspects of service level management were considered. This question does not establish a maturity level but supports other maturity level evaluations.

Question 5 and 6 are used to establish a strong level 4 maturity level and gathers information for a level 5 maturity level. This question focuses on how service level management performance measures, or metrics, are used in communicating the progress or results of service level, service level agreements, or other service level management activities to upper management. The description should focus on how measurements and analysis is communicated to senior management and how senior management is involved in making decisions based on that information. The description should contain some information about the communication between the data system owner or process owner, and the service provider. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 7 focuses on how IT measurements are continuously used to improve service level management practices. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement service level management standards and practices. If data and analysis are communicated to all senior management and that analysis is used to continuously improve project management then a strong level 5 maturity level is appropriate.

In addition to conducting the interview, the respondent should produce documentation that would support the evidence obtained in the interview. For this objective, the most ideal documentation is difficult to define since there are many solutions for service level management. Ideally there should be some sort of service level standards and perhaps a framework for creating and reviewing service level agreements. Documentation should also include examples of service level agreements, records of communication between the data system owner or process owner, and the service provider. Documentation should also include communications between IT management and upper management. Additionally, any documentation that can demonstrate that

service levels were created and maintained according to the organizations standards and that the information is raised top management for use in decision making that would be most ideal. If the organization does not have a document any documentation to demonstrate knowledge management then there is not documentation to support the description therefore a level 3 – 5 maturity level cannot be established. However, documentation demonstrating the existence of knowledge management is evaluated to determine the appropriate maturity level. If the organization can demonstrate that knowledge of information resources are maintained and created then a level 0 maturity level cannot be assigned and the researcher must determine the appropriate evaluation based on the testimonial and documentary evidence.

DS7 - Educate and Train Users

DS7 - Educate and Train Users
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Is any training provided to new or existing employees regarding the use of IT resources?<ul style="list-style-type: none">○ Please describe:2. Is there a group that plans IT training for the organization (does not have to be internal)?<ul style="list-style-type: none">○ Please describe:3. Is there a group that implements IT training for the organization (does not have to be internal)?<ul style="list-style-type: none">○ Please describe:4. Must any employee maintain a continuing education requirement in IT related areas?<ul style="list-style-type: none">○ Please describe:5. Are there any metrics used to evaluate the effectiveness of a training program?<ul style="list-style-type: none">○ Please describe:6. Is there an overall training evaluation used to improve the training process?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">• Training manuals• Automated training• CPE certificate (or documentation of CPE credits)• New employee handbook

This objective is related to the knowledge management objective, AI4 - Enable Operation and Use. Knowledge resources created and maintained by the organization should be used in the training and professional education of the organization's users. If the information for this objective does not match the information for AI4 - Enable Operation and Use the interviewer may want to inquire further in order to gain a clear understanding.

For this objective, interview question 1 establishes whether or not the provides training for new users. Often new user training is the most common type of user training in an organization. Since most employees go through some time if new user training asking for a description of this training allows the respondent to provide information from firsthand experience. The description should generally outline how the training was conducted and what

the type of training was given. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a description of knowledge management practices then level 0 maturity is not appropriate and the maturity for the COBIT objective must be greater than 0.

Interview question 2 addresses how the training is administered and maintained. The respondent is asked to describe the training development process and whether it is part of the organization as a whole or if training is developed by individual groups for their own purposes only. The description should include information about who plans events and how those events take place. If the description illustrates that different groups within the organization plan and execute different training plans for different types of information then the evidence supports a level 2 maturity level. If the description demonstrates that the organization has a formal training program with formal schedules, budget, where classes are conducted on such common topics as ethical conduct and system security awareness and practices then the evidence supports a level 3 and possibly level 4 maturity level.

Question four is a backup question for question three. A lot of information needs to be gathered by question three alone so question four asks almost the same question in a slightly different way. This allows the interviewer some latitude to provide clarification of the objective and to gain more information about this objective. This question does not establish a maturity level but provides reassurance for other maturity levels.

Question 5 establishes a strong level 4 maturity level and gathers information for a level 5 maturity level. This question focuses on how training performance measures, or metrics, are used in communicating the outcomes from knowledge management activities and maintenance to upper management. The description should focus on how measurements and analysis is

communicated to senior management and how senior management is involved in making decisions based on that information. The description should contain some information about the involvement in data system owners and end-user feedback. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 6 focuses on how IT measurements are continuously used to improve training practices. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement of training standards and practices. If data and analysis are communicated to all senior management and that analysis is used to continuously improve training. Descriptions should include information about budgets and how the training process is tied to employment as well a automation and efficiency improvements. These things support a strong level 5 maturity level.

In addition to conducting the interview, the respondent should produce documentation that would support the evidence obtained in the interview. For this objective, the most ideal documentation is the training itself, schedules, budgets, timelines as well as information about how training is tied to employment and how upper management uses this information in strategic planning. This evidence supports a level 5 maturity level. If no documentation to support the information in the interviews exists then level 5 maturity cannot be established. However, documentation demonstrating the existence of some kind of training and training practices is evaluated to determine the appropriate maturity level. If the organization can demonstrate that training of users exists at some level then a level 0 maturity level cannot be assigned and the researcher must determine the appropriate evaluation based on the testimonial and documentary evidence.

DS13 – Manage Operations

DS13 – Manage Operations
Questions
<ol style="list-style-type: none">1. Do policies and procedures exist for the day to day operations of the IT Department?2. Are these policies and procedures developed by an individual or a group?3. If policies and procedures are developed by a group, does this group contain non-IT personnel?4. If policies and procedures are developed by a group, does the group contain any non-IT members from senior management?5. Are policies and procedures reviewed periodically for relevance?6. Are there any metrics generated that are used in managing operations within the IT department?7. Are these metrics used to increase the operations of the IT department?

For this objective, interview question 1 establishes whether or not the organization has a IT service management process. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a description of knowledge management practices then level 0 maturity is not appropriate and the maturity for the COBIT objective must be greater than 0.

Interview question 2 establishes whether the organization has a common understanding of the service management process. How the IT service operations function on a daily basis and which staff conduct what kind of functions within the organization. If most of the respondents can provide a reasonably similar description then maturity level 1 and possibly maturity level 2 may be appropriate. The purpose of this question is to gain an understanding of how services are generally managed by the organization. If the management practices are not documented but managers and employees follow an agreed upon set of standards and practices then the maturity might move into level 2. Also, it is important to listen to see if there is any communication with upper management in the description. This along with evidence of repeatability and common techniques, the evidence begins to supports maturity levels 3 – 5.

Interview question 3 confirms that the organization recognizes the need for service management practices. The description should provide information about the practices used, data captured, scheduling of events, and communication with upper management. The respondent should provide information about maintenance and service agreements as well. If the description contains these things and the respondent demonstrates that the information is communicated in some form to upper management then maturity level 3 may be appropriate. If the respondent can establish that uniformity and regular scheduling and automation of scheduling services and efforts to reduce unscheduled events then the evidence begins to support a maturity level 4.

Interview question 4 is a backup question and used to make sure previous questions were answered without misunderstanding. This question asks the previous two questions in a different way. This question asks about the creations of IT service management practices. This question requires the respondent to reflect on a different aspect of those practices and provide information from a different point of view. This question assists the analysis to ensure that other aspects of IT service management were considered. This question does not establish a maturity level but supports other maturity level evaluations.

Question 5 and 6 are used to establish a strong level 4 maturity level and gathers information for a level 5 maturity level. This question focuses on how IT service management performance measures, or metrics, are used in communicating the status of services provided through the operation of the department. The description should focus on how measurements and analysis is communicated to senior management and how senior management is involved in making decisions based on that information. The description should contain some information about the communication between the data system owner or process owner, and the service

provider. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 7 focuses on how measurements are continuously used to improve IT service management practices. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement IT service level management standards and practices. If data and analysis are communicated to all senior management and that analysis is used to continuously improve project management then a strong level 5 maturity level is appropriate.

In addition to conducting the interview, the respondent should produce documentation that would support the evidence obtained in the interview. For this objective, the most ideal documentation is difficult to define since there are many solutions for IT service management and operations management that could be used. Ideally there should be a service manual, service log of work done for different data and system owners, a system to track incoming and upcoming events, and a measure of progress or efficiency. Documentation should also include communications between IT management and upper management. Additionally, any documentation that can demonstrate that IT services and operations were maintained according to the organizations standards and that the information is raised top management for use in decision making that would be most ideal. If the organization does not have a document any documentation to demonstrate IT service management then there is not documentation to support the description therefore a level 3 – 5 maturity level cannot be established. However, documentation demonstrating the existence of IT service management is evaluated to determine the appropriate maturity level. If the organization can demonstrate that IT service are maintained

then a level 0 maturity level cannot be assigned and the researcher must determine the appropriate evaluation based on the testimonial and documentary evidence.

ME1 - Monitor and Evaluate IT Performance

ME1 - Monitor and Evaluate IT Performance
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Is there an individual that evaluates the performance of IT?<ul style="list-style-type: none">○ Please describe:2. Is there a framework for evaluating IT performance?<ul style="list-style-type: none">○ Please describe:3. Is there a group that evaluates IT based on a defined framework?<ul style="list-style-type: none">○ Please describe:4. Is senior management ever notified of the evaluation of IT?<ul style="list-style-type: none">○ Please describe:5. Does senior management ever offer their evaluation of IT?<ul style="list-style-type: none">○ Please describe:6. Are there metrics used to evaluate IT performance?<ul style="list-style-type: none">○ Please describe:7. Is there a process where evaluation of IT performance is used to increase overall IT performance?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">• IT performance evaluation framework• Meeting notes or memos regarding IT evaluation• Documentation of IT optimization processes and procedures• Meeting notes and memos to senior management regarding IT evaluations• Meeting notes and memos from senior management regarding IT evaluations• User surveys• Any documentation of the IT evaluation process

For this objective, interview question 1 establishes whether or not the organization has a way to monitor and evaluate IT performance. This question provides either positive or negative assurance of maturity level 0. If the respondent answers in the affirmative and provides a description of knowledge management practices then level 0 maturity is not appropriate and the maturity for the COBIT objective must be greater than 0.

Interview question 2 establishes whether the organization has a common understanding of the performance management process. Important information is how IT performance data is collected and verified the organization. If most of the respondents can provide a reasonably

similar description then maturity level 1 and possibly maturity level 2 may be appropriate. The purpose of this question is to gain an understanding of performance is managed by the organization. If the management practices are not documented but managers and employees follow an agreed upon set of standards and practices then the maturity might move into level 2. Also, it is important to listen to see if there is any communication with upper management in the description. This along with evidence of repeatability and common techniques, the evidence begins to supports maturity levels 3 – 5.

Interview question 3 uncovers more about the structure of the process. If the performance management is the project of one person then the process may not be as evolved and therefore would have a lower maturity. However, if the performance management process is integrated into a larger system overseen by a group then there the maturity may be higher. From this question the interviewer can ask some follow up questions about documentation and organization. If the process is developed to increase performance over time then maturity level 3 or 4 may be appropriate.

Interview question 4 is similar to question 3 since it looks at the flow of information. This question focuses on pushing information from the process level up to upper management so that better decisions can be made. If upper management is informed and the information is used in ongoing decision making then a strong level 3 and possibly level 4 maturity level may be appropriate.

Question 5 and 6 are used to establish a strong level 4 maturity level and gathers information for a level 5 maturity level. These questions focus on how the organization uses IT performance measures or metrics to communicate the performance of the division and how that is used to make decisions. The description should focus on how measurements and analysis is

communicated to senior management and how senior management is involved in making decisions based on that information. The description should contain some information about the communication between the various levels of management. This establishes a strong level 4 maturity level and gathers information for a level 5 maturity level.

Question 7 focuses on how measurements are continuously used to improve IT performance management practices. The description should focus on how IT management and senior management are involved in continuous improvement and enforcement IT service level management standards and practices. If data and analysis are communicated to all senior management and that analysis is used to continuously improve project management then a strong level 5 maturity level is appropriate.

In addition to conducting the interview, the respondent should produce documentation that would support the evidence obtained in the interview. Any documentation showing how the performance is tracked and communicated can establish a strong level 2 or 3 maturity. Documents showing management responses, decisions made based of the responses, and long term plans made can support levels 4 and 5.

ME4 - Provide IT Governance

ME4 - Provide IT Governance
Questions
<p>Interview Questions:</p> <ol style="list-style-type: none">1. Has your organization adopted or created an IT governance framework?<ul style="list-style-type: none">○ Please describe:2. Does your organization implement the IT governance framework?<ul style="list-style-type: none">○ Please describe:3. Is there a group that evaluates IT governance?<ul style="list-style-type: none">○ Please describe:4. Does senior management reinforce IT governance within the organization?<ul style="list-style-type: none">○ Please describe:5. Are there any metrics used to evaluate the use of the IT governance framework?<ul style="list-style-type: none">○ Please describe:6. Is there a process that evaluates IT governance within your organization in order to better implement IT governance?<ul style="list-style-type: none">○ Please describe: <p>Ideas for documentation to identify and analyze:</p> <ul style="list-style-type: none">• Organization IT governance framework• IT governance implementation process• Meeting notes or memos showing the integration of IT governance by senior management• IT governance evaluation documentation• Any documentation outlining the IT governance framework and the subsequent implementation of the framework.

For this objective all six of these questions are trying to establish the existence and performance of an IT governance framework. Even though a framework exists it may not be communicated at all levels of the organization. Therefore, lower levels of the organization may not be aware of its existence. By asking the same question in slightly different ways the interviewee can provide information that may lead to other forms of evidence. If all questions are answered negatively then a maturity level of 0 is most likely. If the interviewee can provide a description of the process and show how it is documented and used regularly then a level 2 or 3 may be appropriate. If all levels of management are involved, it is used organization wide, and it is continuously improved then a level 4 or 5 may be appropriate.

Additionally, the interviewee should be able to provide documents showing how the IT Governance framework is documented and applied as well as how it is communicated to other levels of management.

Appendix B: City of San Marcos Documents

Document Number	Title
Document 1	Termination Procedures, August 2007
Document 2	City of San Marcos Technology Purchasing Policy
Document 3	Web Site Management Policy (Policies for Editing and Publishing City Web Site)
Document 4	Appendix 1 Web Posting Procedures
Document 5	Internet Use Policy
Document 6	City of San Marcos Computer and Network Usage Policy
Document 7	Computer Reformat Policy
Document 8	Performance Evaluation Form
Document 9	Change Request
Document 10	ATTACHMENT G Authorization of change in services
Document 11	Technology Services _ February Monthly Report
Document 12	Smart Metering Project Deployment Meeting Minutes March 3, 2010
Document 13	Track-It Web Training
Document 14	Outlook Training Outline
Document 15	City Council Goals
Document 16	Project List
Document 17	Technology Services Strategic Plan 2009 _ 2014 Draft v 0.2

Document 1 - Termination Procedures, August 2007

David J. Wood 5397 Applied Research Project Termination Procedures, August 2007	W/P Ref: DOC 1
	DW 03/07/10

Source:

The source of this document is the Termination Procedures dated August 2007 provided to me by the City of San Marcos Technology Services Department.

Purpose:

The purpose of this document is to summarize the content of the Termination Procedures document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the Termination Procedures and the conclusion will state where it fits in the research framework.

Results:

Description Termination Procedures, August 2007

Termination Procedures, August 2007 begins with the purpose is the procedures to follow when employee leaves or is terminated by the City of San Marcos.

The purpose is followed by a general overview of the procedure and its implementation.

The general information is followed by a step by step procedure to follow once an employee is terminated. On page two is a procedure to follow if the terminated employee is a power user.

Relevance from the Interviews

50% of those interviewed stated that there were policies and procedures for day to day operations. Document 1a is one such procedure. When asked to describe the policies and procedures regarding day to day operations all respondents that answered this question stated that the department had very few policies and procedures written down. Those written policies and procedures were not all in one place and were not organized uniformly.

Conclusion:

This document support DS13 from the research framework. This is a procedure outlining a function in the daily operation in the Technology Services department for the City of San Marcos.

Document 2 - City of San Marcos Technology Purchasing Policy

David J. Wood 5397 Applied Research Project City of San Marcos Technology Purchasing Policy acquisition of automated information systems equipment and supplies	W/P Ref: DOC 2
	DW 03/07/10

Source:

The source of this document is the City of San Marcos Technology Purchasing Policy provided to me by the City of San Marcos Technology Services Department. This document was created on September 09, 2009. The date stamp for this document can be found in the bottom left hand corner of the page.

Purpose:

The purpose of this document is to summarize the content of the City of San Marcos Technology Purchasing Policy document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the city of San Marcos Technology Purchasing Policy and the conclusion will state where it fits in the research framework.

Results:

Description of City of San Marcos Technology Purchasing Policy

This is a one page document with seven points ordered A through G. Each point states the policy for purchasing information technology services, hardware, and software. The policy states the standards, when they are to be applied, limitations, exceptions and exclusions.

Conclusion:

This document support DS13 from the research framework. This is a procedure outlining a function in the daily operation in the Technology Services department for the city of San Marcos.

Document 3 - Web Site Management Policy (Policies for Editing and Publishing City Web Site)

David J. Wood 5397 Applied Research Project Web Site Management Policy (Policies for Editing and Publishing City Web Site)	W/P Ref: DOC 3 DW 03/07/10
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Source:

The source of this document is the Web Site Management Policy (Policies for Editing and Publishing City Web Site) document provided to Mr. David Wood by the City of San Marcos Technology Services Department. This document has an effective date of September 4, 2007.

Purpose:

The purpose of this document is to summarize the content of the Web Site Management Policy (Policies for Editing and Publishing City Web Site) document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the Web Site Management Policy (Policies for Editing and Publishing City Web Site) and the conclusion will state where it fits in the research framework.

Results:

Web Site Management Policy (Policies for Editing and Publishing City Web Site) begins with the Mission and Purpose which are indicated as 1.1 and 1.2 respectively.

Web Site Policies (Section 2), which make up the bulk of the document, and Legal Notices (Section 3) follow the Mission and Purpose.

The last section of the document, section 4.1, included an ADA requirement. A sign off section and than a list of Appendices follows this.

Conclusion:

This document support DS13 from the research framework. This is a procedure outlining a function in the daily operation in the Technology Services department for the City of San Marcos.

Document 4 - Internet Use Policy

David J. Wood	W/P Ref: DOC 4
5397 Applied Research Project	DW 03/07/10
Appendix 1: Web Posting Procedures	

Source:

The source of this document is Appendix 1: Web Posting Procedures, which is an appendix to Document 1c – Web Site Management Policy (Policies for Editing and Publishing City Web Site).

Purpose:

The purpose of this document is to summarize the content of the Appendix 1: Web Posting Procedures document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the Appendix 1: Web Posting Procedures and the conclusion will state where it fits in the research framework.

Results:

Web Site Management Policy (Policies for Editing and Publishing City Web Site) is broken into the three following sections:

Section 1: Submitting information for Posting

Section 2: Broken Links

Section 3: Website Roles and Responsibilities

Each section has an outline of what is required and how to complete a task. However, requirements and responsibilities are included throughout the sections and there is no complete progression from a definite beginning to a definite end of the process. This appendix serves more as an in depth companion to the main body of information, Document 1c – Web Site Management Policy (Policies for Editing and Publishing City Web Site).

Conclusion:

This document support DS13 from the research framework. This is a process outlining a function in the daily operation in the Technology Services department for the City of San Marcos.

Document 5 - Internet Use Policy

David J. Wood 5397 Applied Research Project Internet Use Policy	Ref: DOC 5
	DW 03/07/10

Source:

The source of this document is the Internet Use Policy for the City of San Marcos provided to Mr. David Wood by the Technology Serviced Department. This policy has an effective date of September 4, 2007, and was signed by Dan O’Leary, City Manager at that time.

Purpose:

The purpose of this document is to summarize the content of the Internet Use Policy document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the Internet Use Policy and the conclusion will state where it fits in the research framework.

Results:

Description of Internet Use Policy

The first section of this document has no label and covers sections 1.1 to 1.3. This section gives a general overview of the policy, the expectation of the policy, and the purpose of the policy.

Section II, Internet Access Rules, set how the internet shall and shall not be used.

Section 3, Internet Procedures, is a set of responsibilities and requirements for internet access and usage. Nowhere is this section is a procedure discussed.

The final section of this documents provides a sign off for the employ to show that he or she has read, understood, and agrees to the terms and conditions set in the document.

Conclusion:

This document support DS13 from the research framework. This is a procedure outlining a function in the daily operation in the Technology Services department for the City of San Marcos.

Document 6 - City of San Marcos Computer and Network Usage Policy

David J. Wood 5397 Applied Research Project City of San Marcos Computer and Network Usage Policy	Ref: DOC 6
	DW 03/07/10

Source:

The source of this document is the City of San Marcos Computer and Network Usage Policy provided to Mr. David Wood by the Technology Services department.

Purpose:

The purpose of this document is to summarize the content of the City of San Marcos Computer and Network Usage Policy document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the City of San Marcos Computer and Network Usage Policy and the conclusion will state where it fits in the research framework.

Results:

City of San Marcos Computer and Network Usage Policy is divided into the following sections

1. Purpose
2. Applicability
3. Locally Defined and External Conditions of Use
4. Policies
 - A. Copyrights and Licenses
 - B. Integrity of Information Resources
 - C. Unauthorized Access
 - D. Usage
 - E. Political and Commercial Use
 - F. Understanding
 - G. Gaining computer and Network Resources Access

This document is well laid out. The purpose sets the purpose of the document and of computer and network usage. The applicability section defines who this policy applies to, in this case it is all City of San Marcos employees. The Locally Defined and External Conditions of Use section allows departments to set their own localized policies but in the event of a conflict, this policy supersedes all policies. The policies section clearly defines allowable computer and network usage.

Conclusion:

This document support DS13 from the research framework. This is a procedure outlining a function in the daily operation in the Technology Services department for the City of San Marcos.

Document 7 - Computer Reformat Policy

David J. Wood 5397 Applied Research Project Computer Reformat Policy	Ref: DOC 7
	DW 03/08/10

Source:

The source of this document is Computer Reformat Policy provided to Mr. David Wood by the City of San Marcos Technology Services department.

Purpose:

The purpose of this document is to summarize the content of the Computer Reformat Policy document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the Termination Procedures and the conclusion will state where it fits in the research framework.

Results:

Computer Reformat Policy is a one page policy that outlines computer reformatting for the City of San Marcos.

The policy consists of three parts:

1. Purpose
2. Applicability
3. Policies

The purpose lays out why the policy exists.

The applicability determines to whom and to what this policy applies. In this case the policy applies to all city employees and all laptops and workstations.

The policies outline how long a hard drive will remain untouched once a new machine is issued and what will happen to that hard drive after the appropriate period of time..

Conclusion:

This document support DS13 from the research framework. This is a procedure outlining a function in the daily operation in the Technology Services department for the City of San Marcos.

Document 8 - Performance Evaluation Form

David J. Wood 5397 Applied Research Project Performance Evaluation Forms	W/P Ref: DOC 8
	DW 03/08/10

Source:

The source of this document are blank employee evaluation forms provided to me by the San Marcos Technology Services Department.

Purpose:

The purpose of this document is to summarize the contents and use of the employee evaluation form.

Procedure:

The results of this document will summarize the blank Performance Evaluation form and then provide a summary of relevance from the interviews. The conclusion of this document will determine how this document fits into the research framework.

Results:

Performance Evaluation Forms are performance evaluation forms for the City of San Marcos. There are three different forms but each has the same format. The forms are as follows

1. Form #8: Professional
2. Form #9: Manager / Supervisor
3. Form #10: Technically Skilled

Each form begins with the employee's name, job title, department, review period, evaluator's name, evaluator's job title, data of evaluation, and evaluator percentage.

The introductory information is followed by the purpose of the document, which is:

1. Promoting communication between supervisor and employee
2. Recognizing achievements
3. Identifying areas that need strengthening and resources, such as training or alternate work methods to meet the identified needs
4. Establishing goals for the next year or next evaluation period

Following the purpose statement is the evaluation scale and explanation of each level. The scale is broken down as follows:

- 1-2: Unacceptable
- 3-4: Needs Improvement
- 5-6: Meets Expectations
- 7-8: Exceeds Expectations
- 9-10: Clearly Outstanding

Each level of the scale has a brief description beneath it.

Each of the pages following the first page of Document 2a expands upon a specific dimension of the professional's job. The pages are as follows:

Page 2: Dimension 1 – Work Standards

Page 3: Dimension 2 – Communication And Customer Service

Page 4: Dimension 3 – Work Skills

Page 5: contains evaluator comments, employee comments and sign off from evaluator, director, and employee.

Excluding page 5, page 2 through 4 have an area for evaluation and rating. Each page has several objectives for each dimension. The evaluation for professionals has 22 objectives over all. Each objective has a priority weight, a statement of the objective and a place for the evaluator to place a rating. The box containing the priority weight determines how much weight each objective carries in the evaluation. The box containing the objective contains a statement of the objective and then several statements to evaluate the objective along with a place to place a check next to each statement. The rating box allows the evaluator to place ascribe a rating to the objective.

One each page, following the objectives, is a remarks section for each dimension. Each remarks section requires that the evaluator input a minimum of three statements to give more detail or examples of how the employee meets each dimension.

Page 5 contains a section for the evaluator to list achievements for the current evaluation period as well as a section to list goals for the next evaluation period / action for improvement. Following this section is an area for sign off from the evaluator and the director. Following the sign off is an area for the employee to list career development goals / comments as well as a section for the employee to sign off on the evaluation.

Relevance from the Interviews

All six interviews recognized this form and the evaluation processes as the primary way the city of San Marcos evaluates the performance of Technology Services performance. However, when asked to describe how this processes is used to increase the effectiveness of the department there were widely varying answers. On conclusion that can be drawn from this is that the evaluation process is not applied uniformly across the City of San Marcos.

Conclusion:

This document supports section ME1 of the research framework. This is an evaluation tool of the Technology Services department for the City of San Marcos.

One recommendation is that Senior and Middle management enforce the application and use of the evaluation process and make that process repeatable year after year. This process should be made clear to all employees.

This process is useful and the tool developed by the City of San Marcos has a detailed record that can add some great value to the management of the Technology Services department as well as the entire city.

Document 9 - Change Request

David J. Wood 5397 Applied Research Project Change Request	Ref: DOC 9
	DW 03/08/10

Source:

The source of this document is the Change Request document provided to Mr. David Wood by the Technology Services department.

Purpose:

The purpose of this document is to summarize the content of the Change Request document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the Change Request and the conclusion will state where it fits in the research framework.

Results:

Change Request is a four-page document. This document is the initial step in changing anything involving Technology Services. The individual department initiates all changes for the City of San Marcos. The department then owns the process and is responsible for following it through to the end. The department will fill out this request, have it approved, and then the project manager will coordinate with the department to through the completion of the project.

The document is broken up into five sections:

1. Change Request
2. Request Section
3. Evaluation Section
4. Action Section

Section 1. Change Request contains the following fields:

- Change Request No:
- Project Name:
- Requestor
- Request Date

Section 2. Request Section contains the following fields:

- Description of Change
- Rational of Change
- Benefit of Change
- Anticipated Cost or Savings
- Evaluation Urgency

Section 3. Evaluation Section contains the following fields

- Implication for Project
- Will this change shorten, lengthen, or have no change on the implantation date of the project?

- Resource Impact Statement
- Verification Statement
- Estimated Impact

Section 4. Action Section contains three boxes marked Approved, Rejected, and Deferred. This is followed by an area for a signature and date of a board member.

Conclusion:

This is a change management process. It is owned by the departments. It is documented therefore it falls between level 2 and 3 of the maturity models.

Document 10 - ATTACHMENT G Authorization of change in services

David J. Wood	Ref: DOC 10
5397 Applied Research Project	DW 03/08/10
ATTACHMENT G Authorization of Change in Services	

Source:

Purpose:

The purpose of this document is to summarize the content of the ATTACHMENT G Authorization of Change in Services document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the ATTACHMENT G Authorization of Change in Services and the conclusion will state where it fits in the research framework.

Results:

ATTACHMENT G Authorization of Change in Services is a one page document that states the change in service from a vendor. In this document the project and vendor lines are filled out. The project is Advanced Metering Infrastructure Project and the vendor is Eka Systems, Inc.

This document has two sections. The first section has a space to describe the “work to be added to or deleted from the scope of the services.”

The second section contains the following fields:

- Previous contract amount
- Net increase / decrease in contract amount
- Revised contract amount
- Requested by
 - Eka Systems
 - By
 - Date
- Approved by
 - City of San Marcos
 - Date
 - By (Collette Jamison, City Manager)

Conclusion:

This document can be used to manage changes between vendors and it can track the change in service level agreements.

PO10 and AI6

Document 11 - Technology Services _ February Monthly Report

David J. Wood	Ref: DOC 11
5397 Applied Research Project	DW 03/09/10
Technology Services – February Monthly Report	

Source:

The source of this document is the Technology Services monthly report for February 2010 provided to Mr. David Wood by Technology Services.

Purpose:

The purpose of this document is to summarize the content of the Technology Services – February Monthly Report document and determine how it fits into the research framework.

Procedure:

The results section of this document will summarize the content of the Technology Services – February Monthly Report and the conclusion will state where it fits in the research framework.

Results:

The Technology Services – February Monthly Report is a two page document generated using the *Track It* ticket system. This document consists of three primary sections.

The first section is a graphic breakdown of all of the tickets closed between February 1, 2010 and February 28, 2010. In this particular report, 375 tickets were closed. In the center of the first section is a pie chart that shows the number of tickets closed and for which departments.

The second section contains a breakdown the percent of closed tickets from each department.

The last section of the document contains a list of all of the open tickets as of February 2010.

Relevance from the Interviews

In several interviews the Track It system was cited as a source of project management and a source of metrics for evaluating projects.

Conclusion:

This document supports DS 13 and ME 1. This is a documented source metrics and project management. This fits solidly into Maturity Level 3.

Document 12 - Smart Metering Project Deployment Meeting Minutes March 3, 2010

David J. Wood	Ref: DOC 12
5397 Applied Research Project	DW 03/09/10
Smart Metering Project Deployment Meeting Minutes March 3, 2010	

Source:

The source of this document is minutes from the Smart Metering Project Deployment Meeting held on March 3, 2010. Technology Services provided the Smart Metering Project Deployment Meeting Minutes to Mr. David Wood.

Purpose:

The purpose of this document is to summarize the content of the Smart Metering Project Deployment Meeting document and determine how it fits into the research conceptual framework.

Procedure:

The results section of this document will summarize the content of the Smart Metering Project Deployment Meeting and the conclusion will state where it fits in the research conceptual framework.

Results:

The Smart Metering Project Deployment Meeting Minutes March 3, 2010 is broken down into five sections.

- Attendance
- Summary
- Old Business
- Smart Metering Project Report
- New Business

The first section, attendance, lists all members of Public Services, Customer Services, Technology Services, and Eka Systems and whether or not they were in attendance.

The second section, summary, gives an overall summary of the status of the project.

The third section, Old Business, give an update of any unfinished parts of the projects since the last meeting.

The fourth section, Mart Metering Project Report, provides a report of the implementation of the Smart Meters. This spreadsheet contains the following sections:

- Number of Smart Meter Inquiries
- Number of Installed Smart Meters
- Number of Activated Smart Meters
- Meters w/ Quality Reads
- Number of SM Routes Now Being Billed

The fifth section, New Business, outlines business for discussion during this meeting.

Relevance from the Interviews

This process was discussed in the interviews for defining and managing service levels.

Conclusion:

This meeting demonstrates how service levels are managed. This process is documented and involves individuals from all section of the city. This fits into Maturity Level 3 of DS 1. This can also support DS13.

Document 13 - Track-It Web Training

David J. Wood 5397 Applied Research Project Track-It Web Training	Ref: DOC 13
	DW 03/09/10

Source:

The source of this document is the Track-It Web Training provided to Mr. David Wood by Technology Services.

Purpose:

The purpose of this document is to summarize the content of the Track-It Web Training document and determine how it fits into the conceptual framework.

Procedure:

The results section of this document will summarize the content of the Track-It Web Training and the conclusion will state where it fits in the conceptual framework.

Results:

Track-It Web Training is a five-page document describing the proper use of the Track-It Web. This document begins with the following descriptions:

- Who will be able to use the Track-It Web?
- What is the purpose for using Track It Web?
- What is the benefit of using Track-It Web vs. calling 8228 or emailing the IT Helpdesk?
- How do I get the URL for Track-It Web?
- When will users be able to start using Track-It Web?

The rest of the document is a step by step process of how to use the Track-It Web.

Relevance from the Interviews

Training is referenced in the interviews. This is an example of the training provided to everyone in the city.

Conclusion:

This training supports DS7. Technology Services created this training with no outside input. This supports Maturity Level 2.

Document 14 - Outlook Training Outline

David J. Wood 5397 Applied Research Project Outlook Training	Ref: DOC 14
	DW 03/09/10

Source:

The source of this document is the Outlook Training Outline provided to Mr. David Wood by Technology Services.

Purpose:

The purpose of this document is to summarize the content of the Outlook Training document and determine how it fits into the conceptual framework.

Procedure:

The results section of this document will summarize the content of the Outlook Training and the conclusion will state where it fits in the conceptual framework.

Results:

Outlook Training is a 13 page document the covers the following topics:

- Understanding your mailbox
- Benefits of archiving
- How to archive
- Setting up public folder favorites
- Creating signatures

The first page of the document contains the outlined, shown above, and the remaining pages contain a step by step explanation of each section of the outline.

Relevance from the Interviews

Training is referenced in the interviews. This is an example of the training provided to everyone in the city.

Conclusion:

This training supports DS7. Technology Services created this training with no outside input. This supports Maturity Level 2.

Document 15 - City Council Goals

David J. Wood 5397 Applied Research Project City Council Goals	Ref: DOC 15
	DW 03/10/10

Source:

The source of this document is the City Council Goals sheet provided to Mr. David Wood by Technology Services.

Purpose:

The purpose of this document is to summarize the content of the City Council Goals document and determine how it fits into the conceptual framework.

Procedure:

The results section of this document will summarize the content of the City Council Goals document and the conclusion will state where it fits in the conceptual framework.

Results:

“The City Council Goals” is a one page document with four sections. Each section is a goal with action items beneath each goal. The document contains the following goals:

- A. Expand Economic Development
- B. Improve the image of the City of San Marcos
- C. Enhance region’s transportation grid
- D. Improve collaboration between the City of San Marcos and regional entities

Relevance from the Interviews

The strategic plan was referenced consistently across the interviews. The strategic plan stems from these goals.

Conclusion:

This document supports PO1. Other than being documented and providing a basis for document 9 it does not assist in placing PO1 at any Maturity Level.

Document 16 - Project List

David J. Wood 5397 Applied Research Project Project List	Ref: DOC 16
	DW 03/09/10

Source:

The source of this document is the projects list provided to Mr. David Wood by Technology Services.

Purpose:

The purpose of this document is to summarize the content of the project list and determine how it fits into the conceptual framework.

Procedure:

The results section of this document will summarize the content of the project list and the conclusion will state where it fits in the conceptual framework.

Results:

The Project List is a printout of a spreadsheet used to keep track of all of the ongoing projects for Technology Services. This document is one legal sized page. Each of the projects is listed and grouped according to how long the project is expected to take to complete. Each group is color coded according to their time frame. The colors are described in a legend at the bottom of the page. The time frames are as follows:

- 30 Days
- 60 Days
- 90 Days
- 120 Days
- 150 Days
- 180 Days
- 300 Days
- 365 or Greater
- Non-funded Projects

Relevance from the Interviews

This document was mentioned consistently in the interviews as one of the primary ways projects management is documented.

Conclusion:

This document supports PO10. Since it is documented consistently and used extensively it supports a Maturity Level of 3. However, the process for updating and maintaining this document is not documented making it less likely that this process will be repeatable in the future. Therefore this PO10 would fall between levels 2 and 3.

Document 17 - Technology Services Strategic Plan 2009 _ 2014 Draft v 0.2

David J. Wood 5397 Applied Research Project Technology Services Strategic Plan 2009 – 2014 Draft v 0.2	Ref: DOC 17
	DW 03/09/10

Source:

The source of this document is the Technology Services Strategic Plan 2009 – 2014 Draft v 0.2.

Purpose:

The purpose of this document is to summarize the content of the Technology Services Strategic Plan 2009 – 2014 Draft v 0.2 document and determine how it fits into the conceptual framework.

Procedure:

The results section of this document will summarize the content of the Technology Services Strategic Plan 2009 – 2014 Draft v 0.2 and the conclusion will state where it fits in the conceptual framework.

Results:

Description of Document 9 - Technology Services Strategic Plan 2009 – 2014 Draft v 0.2

Document 9 is a 130 page document that outlines the long term plan for IT as it relates to the goals and objectives set by the city.

Relevance from the Interviews

The strategic plan is mention consistently in the interviews

Conclusion:

A strategic IT plan created by the city is paramount. This satisfies PO1. Since this is the first one the city has had this places PO1 between levels 2 and 3.

Appendix C: IRB Approval Email

12/27/2010

Gmail - FW: Confirmation of Approval: ...



David Wood <davidj.wood04@gmail.com>

**FW: Confirmation of Approval: IRB Application 2010R233.
DO NOT REPLY to this message.**

Wood, David J <djw1199@txstate.edu>

Tue, Jan 26, 2010 at 10:15 AM

To: "davidj.wood04@gmail.com" <davidj.wood04@gmail.com>

From: AVPR IRB [ospirb@txstate.edu]

Sent: Tuesday, January 26, 2010 9:07 AM

To: Wood, David J

Subject: Confirmation of Approval: IRB Application 2010R233. DO NOT REPLY to this message.

This email message is generated by the IRB online application program. Do not reply.

The reviewers have determined that your IRB Application Number 2010R233 is exempt from IRB review. The project is approved.

If you have questions, please submit an IRB inquiry form at:

http://www.txstate.edu/research/irb/irb_inquiry.html

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Institutional Review Board

Office of Research Compliance

Texas State University-San Marcos

(ph) 512/245-2314 / (fax) 512/245-3847 / ospirb@txstate.edu / JCK 489

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