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Evaluation and Development of Selection Criteria to Guide Organizational Selection of a Project Management Maturity Model

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Abstract

Organizations wishing to measurably and continuously improve processes often look towards maturity models, such as OPM3 and CMMI, as their panacea. However, selecting the wrong model for the organizations goals and resources can result in project failure. This study, focusing on OPM3 and CMMI, proposes a guidance tool that can help organizations select the right maturity model. The study is framed in the state government context due to the complexity and relative insularity of that environment. In addition to being a limited based, state governments have several limiters that factor into project selection, namely budget and taxpayer transparency.

Using several core methods of technology selection, best practices from business process improvement, and the OPM3 and CMMI-Services models, this paper reviews these components to identify what elements of a Project Management Maturity Model project could assist prospective government agencies in selecting a model that is appropriate to their situation and goals. The study identifies several factors, outside of the maturity models themselves that have effect on the outcome of the maturity model project itself. These factors should be taken into consideration by project sponsors early on in the project's conception. Failure to do so risks selection of an inappropriate model, or one that exceeds the budget of the governmental organization.

Finally, the selection questionnaire presented is intended to provide guidance regarding the purposes and functionalities of the OPM3 and CMMI-Services maturity models. Additionally, specific project success factors are framed in such a way as to generate additional discussion within the organization. These additional questions are intended to provide talking points related to the maturity model project in general, rather than for a specific model. In this

way, the government organization can accurately reflect on and plan their Project Management Maturity Model project.

Acknowledgements

I'd like to acknowledge my husband and our children. Without their patience, love and support, I could never have gotten here. To Mom and Pop-Pop - because I know you see this - for your inspiration, for instilling not only a love of learning in me, but the will to never, ever, give up. To my coworkers, many thanks for your patience and encouragement as I applied what I learned in this program, your fortitude and perseverance in the face of adversity, and for being the source of many research ideas.

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Chapter 1 – Introduction

"All models are wrong, but some are useful."
- George Box (Box, 2009)

This study began as an attempt to answer the question "Which Project Management Maturity Model, OPM3 or CMMi-Services, is the most useful (and effective) model for a State Government Agency?" Given the limited resources of State budgets and the accountability expected by taxpayers, State Government Agencies do not have the ability to choose technologies or infrastructure improvements without assurances that the selected solution will meet the needs of the Agency, and achieve the goals identified at the outset of the initiative. In addition to resource limitations and fiduciary responsibility, the federal government has, since 1996, required federal agencies to truly analyze organizational processes before acquiring information technology solutions. In the words of the General Accounting Office, organizations must "rethink what it should be doing," before deciding "how best to do it." (GAO, 1997) This purchasing maxim has trickled its way into state government, in part because of the federal-state relationship in several key infrastructure areas, such as transportation and health services. In researching these models for implementation at a State of Colorado agency, it was observed that no guidance was available to assist in determining the right model, for any sector (public or private). It appeared that organizations were conducting their own research on models in order to select a model, thus "recreating the wheel" for every Maturity Model implementation project.

As such, the research turned to the development of a selection tool or criteria that government agencies could utilize in their selection process, to minimize the impact on staff resource availability, as well as reduce the risks and costs of an implementation failure. The study is placed within the framework of state government not only because of the familiarity of

the author with that industry, but because the nature of state government is such that careful evaluation, selection and planning must go into any infrastructure improvement project. While the federal government has guidelines in place for almost every mundane government procurement need, including technology selection, those guidelines are often not scalable to state governments either in scope or resources required. Within the Project Management industry, state governments are fairly unique - the organizations have limited human and financial resources, and those resources are controlled strictly by the legislative process. Due to complex regulations, mandates and funding streams, it is not as easy to re-allocate resources to projects such as this. Funding and staffing requests must be carefully vetted and presented to the legislature for approval of the additional resources generally required, as compared to private industry which has some latitude in the acquisition or functional location of staff and funding. This thoughtful selection and planning of the project is often made in advance of any project funding, as legislatures tend to fund projects for the execution phase of a project, rather than the initiation and planning phases, in order to conserve taxpayer dollars for only the most feasible and necessary projects. This environment requires that an agency under careful contemplation and analysis before requesting funds or human resources.

As an example organization, the Colorado Department of Health Care Policy and Financing (Colorado Medicaid) represents one of the more challenging areas in State Government, with multiple project sources (federal, state, internal) and is beginning attempts to become more mature in its Project Management methodology and execution through a series of process improvement activities. The end result of legislative and regulatory processes is dozens of changes to an Agencies programs and systems on an annual basis, ranging in size from very small (table changes) to four plus (4+) years, and dollar amounts ranging from zero (\$0) through

twenty million dollars (\$20,000,000). The federal regulatory process alone results in nearly 8,000 rules every year (e-gov, 2009). Table 1 shows some of the major federal and Colorado projects identified in 2008 and 2009 that impacts the Colorado Medicaid agency. This list represents external sources of projects for the Medicaid agency, and as such excludes internal projects initiated by the Colorado Medicaid agency without the need for law or regulation. Other agencies within Colorado State Government have similar project workloads, although to varying degrees of visibility and expense.

Table 1: Major Medicaid Projects, identified 2008-2009

Project Name	Federal / State & Citation	Year Passed	IT Budget*	Implementation Date
HIPAA Transactions and Code Sets (USDHHS, 2008)	Federal	2008	\$8 million (CODHCPF, 2010)	Phase 1: 2012 Phase 2: 2013
ARRA/ HITECH ("American Recovery and Reinvestment Act of 2009," 2009)	Federal	2009	Not Identified	Phase 1: 2011 Phase 2: 2012 Phase 3: 2013 Phase 4: 2014 Phase 5: 2015
CHIPRA ("CHIPRA," 2009)	Federal	2009	Not Identified	
Colorado Healthcare Affordability Act (CHAA) ("HB09-1293," 2009)	State	2009	\$10 million (MMIS only) ("HB09-1293," 2009)	Phase 1: 2010 Phase 2: 2011 Phase 3: 2012 Phase 4: 2013
Unified Provider Enrollment Process (USDHHS, 2009)	Federal	2009	Not identified	Pilot: 2010 Nationwide: 2011
Medicaid Information Technology Architecture (USDHHS, 2010)	Federal	2008	\$1.8 million (CODHCPF, 2010)	Phase 1: 2010

**" Not identified" in this column means that the information is not available for one of the following reasons: 1) project is being funded with existing resources 2) funding amounts were not found during research or 3) projects were not completed scoped out, meaning cost is not estimable.*

With so much taxpayer money at stake, as well as political careers, there is an increased demand for project success. In Colorado, there have been several technology projects that have failed, partially or completely, in very public ways. The most recent have been the Colorado Benefits Management System (CBMS), and a new Voter Registration system (STARS). As a result of these failures, the legislature has mandated new methods for project management, including authorizing the consolidation of Information Technology statewide, ("OIT Consolidation," 2008) and a new "Contract Management System" which allows transparency into the contracts used by agencies to conduct governmental business. The goal of these legislative items is to assist agencies with the selection and oversight of contractors and technology projects. Indeed, a 2007 Gartner presentation advocates government consideration of enterprise architecture as budget reduction and procurement (Gartner, 2007) strategies.

Chapter 2 – Review of Literature and Research

Literature abounds for several areas on the periphery of Maturity Models. Topics on the periphery or related to this study include State Government Environments, Project Management, Program Management, Portfolio Management, Business Process Improvement, and Technology Selection. Also discussed in this chapter are the two Maturity Models under consideration for one particular agency within the State of Colorado - OPM3 and CMMI -Services.

Project, Program, and Portfolio Management

Project, Program and Portfolio Management processes are the core components of any Project Management Maturity Model. This section provides a brief overview of the history of these disciplines, their basic concepts, and the value that successfully implementing these processes provides an organization. Originally begun as a method for managing a schedule, Project Management has evolved into a scientific art that manages not only schedules, (Schwalbe, 2006) but resources and budgets. Project Management now evaluates and measures the progress of a project, against itself and other projects, and has spawned two new domains for organizations to use in support of their project management efforts – Program Management and Portfolio Management.

There are multiple Project Management frameworks internationally, all of which cover the same core knowledge areas, albeit with different methodologies. The most well known framework in the United States is from the Philadelphia based Project Management Institute (PMI). The PMI frameworks for Project, Program and Portfolio Management cover a wide range of industries, including software and construction. This section uses descriptions and processes from the Project Management Body of Knowledge (PMBOK), as it is the most well-

known in United States governments, and is specifically mentioned as the protocol for the State of Colorado's IT Consolidation ("OIT Consolidation," 2008).

Concepts of Project, Program and Portfolio Management

Project Management in general is a collection of processes and procedures that are utilized to assure that a project is successful within the bounds of its unique triple constraints: scope, cost, and time. (Schwalbe, 2006) These constraints provide the expectations of a project, and are often determined by forces outside the actual project team, in some cases by multiple external entities that do not necessarily communicate. In the case of state government, triple constraints are often significantly determined or impacted by the state legislature. For instance, in the case of the Colorado Benefits Management System (CBMS), the legislature determined the costs and the scope, while the implementation agencies determined the time. In projects related to implementing the National Provider Identifier ("Health Insurance Portability and Accountability Act of 1996," 1996), the US Department of Health and Human Services determined the scope and the time, while the project team had to determine the cost, and get that cost approved by the legislature.

Project Management is "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements." Project Management consists, according to the PMBOK, of five (5) Processes (PMI, 2004):

- Initiating - the definition and authorization of a project
- Planning - determining the objectives, schedule, activities and resources associated with a project
- Executing - the phase of the project in which all of the planning elements are integrated and actuated

- Monitoring and Controlling - the process of ensuring that the Execution of the project is proceeding according to the project's plan, and enacting corrective actions to correct variances from that plan.
- Closing - the closing down of a project, including acceptance of deliverables, contract termination, releasing resources, identification of lessons learned, and finalization of project documentation.

These Processes cover nine (9) areas of a project that should be evaluated and managed via the PMBOK processes. Included within these processes are formulas and tools to assist Project Managers and Project Sponsors with determining the progress and effectiveness of a particular project. These processes include the triple constraints of Scope, Time and Cost, and add the core areas that contribute to a project: Quality, Human Resources, Communications, Procurement, Integration, and Risk. Together, these processes and knowledge areas include formulas and tools to assist Project Managers and Project Sponsors with determining the progress and effectiveness of a particular project. (PMI, 2004), (Schwalbe, 2006)

Program Management is defined as "the centralized coordinated management of a program to achieve the program's strategic objectives and benefits." While apparent duplicates to the Project Management Processes, the five (5) Program Management Processes and Knowledge Areas, are "up" a level from the individual project focus of the Project Management Processes:

- Initiating - the definition and authorization of a program, including the scope and outcomes expected of the program
- Planning - the strategic planning and alternatives analysis required to achieve the expected outcomes of the program

- Executing - the integration of all the resources and projects in a program for the delivery of the program's goals
- Monitoring and Controlling - management of the program and its projects to ensure that they are delivering the expected outcomes and benefits, and the issuance of corrective actions to correct variance from Program Management Plan
- Closing - the closing down of a program, or one of its projects including acceptance of deliverables, outcomes and benefits analysis, lessons learned, and finalization of documentation.(PMI, 2008b)

Portfolio Management is the "centralized management of one or more portfolios, which includes identifying, prioritizing, authorizing, managing, and controlling projects, programs, and other related work, to achieve specific strategic business objectives. PMI provides two (2) Processes for Portfolio Management.

- Aligning - the alignment of programs and projects in a portfolio according to strategic plans, including the categorization, evaluation, selection and, prioritization within the organization's portfolio.
- Monitoring and Controlling - management Key Performance Indicators for alignment with strategic plans, and review of outcomes to ensure compliance and benefit of programs and projects to the organizational strategic goals. (PMI, 2008b)

These three domains are built upon each other, starting with Project Management (see Figure 1). The fact of multiple projects within an organization will invariably lead an organization to provide management and oversight of projects within a particular organizational

structure (Program Management). If an organization has multiple Programs, the organization will attempt to manage, align and control those Programs within a Portfolio. As shown in Figure 2, there are two views of this vision. The first is where the state's consolidated IT organization (OIT) is the Portfolio Manager, and individual agencies are treated as Programs. In the second version, the Agency is the Portfolio Manager, and individual divisions or offices are the Programs. These views are not necessarily mutually exclusive, as the OIT is able to take the more global approach, encompassing multiple agencies, while allowing individual agencies to manage and prioritize its own portfolio.

Figure 1: Relationships between Project, Program and Portfolio Management

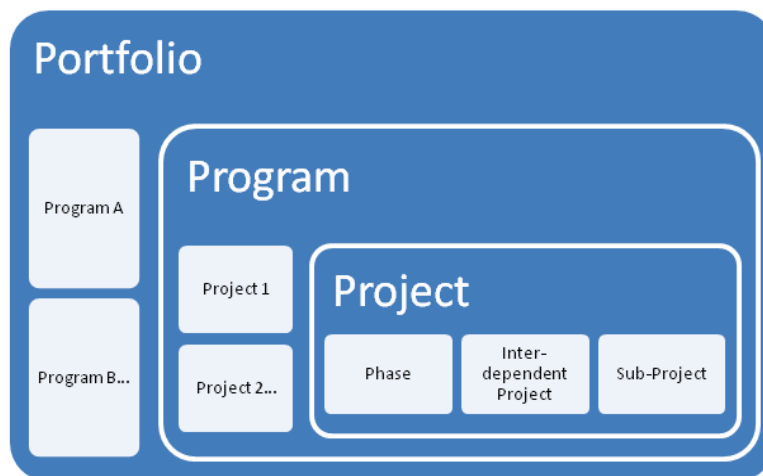
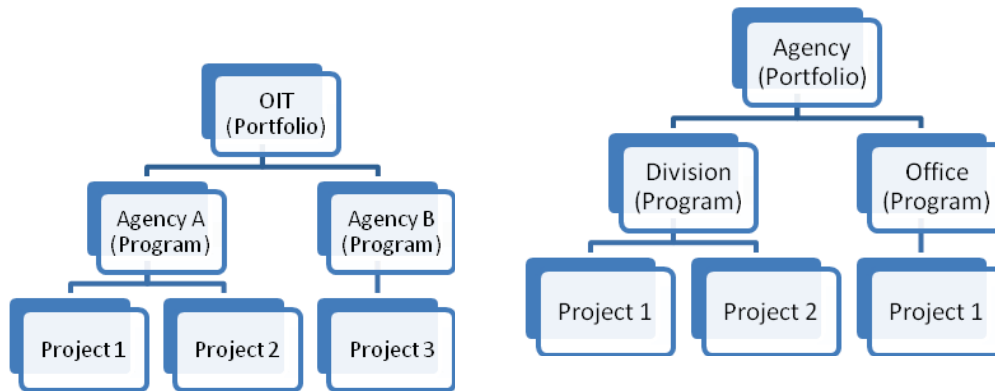


Figure 2: Possible Views of Project, Program and Portfolio Management within Colorado State Government



Implementation Case Studies

There have been several case studies on the implementation of Project Management, Program Management and Portfolio Management. For the purposes of this research, focus was made on the value proposition for these activities. The value proposition demonstrates the benefits to be gained from implementing Project/Program/Portfolio Management in an organization.

There is an expectation, especially in the public sector, that Project Management will contribute significantly to the success of the organization (Crawford, 2006). Project Management is often initiated because the organization is experiencing an increasing number of projects or an increase in the complexity of projects; or to meet specific objectives, such as improving time to market, increasing credibility, a desire to follow standards or best practices, or

to improve project performance. Across studies in Denmark, Australia, and Canada implementation outcomes have included:

- Increased customer satisfaction
- Improved management of project budget
- Improved planning and scope management
- Better risk management
- Improved control and compliance
- Increased stakeholder involvement
- Improved and standardized documentation (Crawford, 2006; Kendra, 2004)

All of these case studies credited the success of implementations to the organizational culture's adoption of Project Management processes, as well as the leadership's commitment (Lee & Anderson, 2006) to the process. It is worth noting that many of these implementations are not successful, often because these organizations do not follow these success factors. The lack of leadership commitment to the implementation was especially noted as a reason for failure. (Gefen, 2006; Lee & Anderson, 2006)

Capability Maturity Model Integration for Services (CMMI-SVCS)

In the 1980's the Department of Defense (DoD) began looking for ways to improve their ability to deliver quality software products. Carnegie Mellon University (CMU) partnered with the DoD to create the Software Engineering Institute (SEI). Out of this collaboration came a multitude of process improvement models, starting with the Capability Maturity Model Integration (CMMI) for Software in 1993. The CMMI Framework (CMF) is comprised of multiple models, and encompasses not only software, but the processes that support and surround

Software - Systems Engineering, Integrated Product Development, Acquisition, Development, and the focus of this study, Services. (SEI, 2009b)

CMMI is designed so that the implementing organizations can utilize any methodology, rather than be tied to a specific standard. This allows the organization to select methodology that fits their unique instances, and also allows them to change their methodology as the business changes. For example, an organization may elect to utilize a standard waterfall software development lifecycle when they first begin, and later choose to switch to a more Agile methodology such as eXtreme Programming or Scrum.

History and Concepts of CMMI-Services

CMMI for Services version 1.2 (CMMI-Services v1.2) was released in 2009. The CMMI-Services v1.2 incorporates those processes that any "service" organization might utilize. The intent was to design a maturity model that irrespective of the other, more software related models created by SEI that could be used by any industry. Indeed, many of SEI's piloting organizations provided such diverse services as lawn care, research, human resources, and training. The goal was to improve the delivery of services and the quality of services, under the premise that "the quality of a system or product is highly influenced by the quality of the process used to develop and maintain it." (SEI, 2009b)

SEI claims that integration of CMMI into an organization's lifestyle will help the organization:

- Improve quality
- Improve consistency of services
- Reduce costs (SEI, 2009b)

Before delving into the construct of CMMI-Services v1.2, it is important to establish the concept of "services" utilized in the development of this model. SEI defines a service as a "product that is intangible and non-storable... [through] deliver[y of] combinations of services and goods...[and] may be delivered through combinations of manual and automated processes." By this definition, CMM-Services v1.2 is generalized for any organization that has defined its base product as services - for example, Project Management, Training, Lawn Care, or Hospitality. This generality allows for broader adoption of the concepts of maturity and incremental, continuous process improvement.

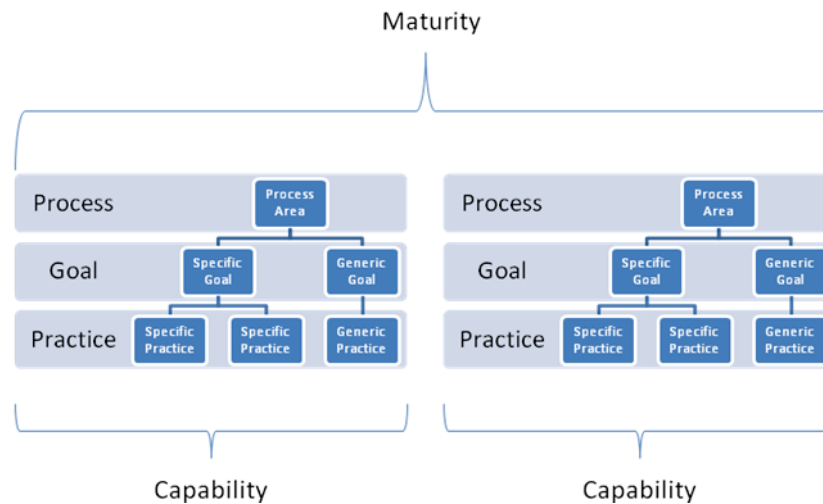
Model

CMMI-Services v1.2 has two components - Capability and Maturity, represented by unique paths for an organizations process improvement. While these are two distinct concepts, with distinct improvement paths, they are intertwined to the point that improving capability will eventually improve maturity. SEI defines these paths as:

- Capability - "achievement of process improvement within an individual process area"
- Maturity - "degree of process improvement across a predefined set of process areas in which all goals in the set are attained."

To add further definition, CMMI perceives that Capability is a Process Maturity, while Maturity is at the organizational level - that is, the maturity of the organization. It should be noted that it is impossible to improve organizational maturity without achieving process maturity. However, it is possible to achieve process maturity without improving organizational maturity. Figure 3 illustrates this relationship. (SEI, 2009b)

Figure 3: CMMI-Services Structure



CMMI-Services has two progressions of maturity, based on this concept. SEI refers to these progressions as "representations." The Continuous Representation applies to the Capability Maturity, while the Staged Representation applies to the organizational Maturity. The Continuous Representation allows an organization to select specific Process Areas to mature within, at independent adoption rates. In the Staged Maturity progression, an organization may select groups of Process Areas within which they will pursue a specific maturity path. If Maturity in one Process Area is not achieved, the organization does not increase their Maturity Level until that Process has "caught up." (SEI, 2009b)

Within this dual Maturity Level concept, CMMI-Services v1.2 bundles specific, related activities into Process Areas. Process Areas are further delineated into Specific Goals, which have Specific Practices. Achievement in a Capability requires that all practices within a Process are in place, and utilized in the organization. Both Capability and Maturity Levels are built upon the foundations of the prior level. In this manner, the organization is continuously improving

upon processes in which they have achieved capability or maturity. If one Capability level within a Process Area is not complete, the organization will not have achieved that level.

Because there are two Maturity paths, SEI created two Maturity scales for CMMI-Services, as shown in Table 2. (SEI, 2009b)

Table 2: CMMI-Services Maturity Levels

Level	Capability	Maturity
0	Incomplete	<i>Not a valid level in this representation.</i>
1	Performed	Initiated
2	Managed	Managed
3	Defined	Defined
4	Quantitatively Managed	Quantitatively Managed
5	Optimizing	Optimizing

While there are similar maturity levels within each Capability Maturity representation, there are slightly differences in the first three levels. Each level is described in Table 3.

Table 3: CMMI-Services Maturity Level Definitions

	Capability	Maturity
Incomplete	The process is either implemented and utilized either partially in not at all	Not a valid level in this representation.
Performed	The process is utilized completely, although perhaps not institutionalized, and that the utilized process meets the goals of the process.	See Initiated.
Initiated		The process is reactive, ad hoc, or chaotic. The process is successful because of human decision, not because of its institutionalism. Project often exceed one of the Triple Constraints
Managed	The process is monitored and controlled, is supported by policy, has sufficient skilled resources, and includes stakeholders as appropriate.	Specific processes are in place and utilized throughout the organization. Projects are planned and managed per policy, and has adequate, appropriate resources.
Defined	The organization has a customized a Managed process to consistently apply standard processes within an organizational unit.	The organization has policies to support tailoring (customization) of processes, and process documents have more detail than prior levels.
Quantitatively Managed	Defined processes are measured and controlled using quantitative methods, such as statistics or balanced scorecards.	Defined processes are measured and controlled using quantitative methods, such as statistics or balanced scorecards. Inter-relationships are evaluated and considered. Performance in a process becomes predictable.
Optimizing	Quantitatively Managed processes are being constantly reviewed for process or performance improvement.	Quantitatively Managed processes are being constantly reviewed for process or performance improvement.

Implementation Activities

Once selected as the organization's maturity model, organizations should follow three core steps in implementing CMMI: Assess, Implement, and Re-Assess. As maturity models are progressive and iterative in nature, the organization should conduct this cycle until the desired maturity level is achieved. Once that level is achieved, organizations should continue to Re-Assess their processes occasionally, to ensure that they are indeed performing at that maturity level, and if the processes are still effective in meeting organizational goals. (SEI, 2009b)

Assessment

Organizational assessment for the CMMI-Services model is conducted utilizing the SEI's ARC (Appraisal Requirements for CMMI) and SCAMPI (Standard CMMI Appraisal Method for Process Improvement) tools. The ARC provides guidance for the application of SCAMPI assessment to ensure that the assessments are consistent across organizations. SCAMPI provides three classes of Maturity assessment that may be conducted, ranging from highly comprehensive to a more general review. When comparing Maturity levels, if Organization ABC wanted to compare itself against Organization DEF, they would each have had to use the same SCAMPI assessment class in order to be assured that apples were being compared to apples. (SEI, 2009a)

Organizations have the choice of hiring a certified CMMI Assessor or of using their own staff to conduct the assessment. Regardless, the same tools will be utilized, which provides a level of consistency across all CMMI implementations. The assessment will review each of the process areas, and document existing business processes, and the level to which they are performed. Findings from the assessment are then used to direct the organization's implementation plan, identifying areas for targeted improvement. Once areas are identified, the

organization has two options for pursuing improvement of maturity, called representations in CMMI - continuous or staged, as described above.

Implementation

With the appraisal completed, and representation selected, the organization may begin their implementation. CMMI-Services does not recommend any particular steps toward implementation, such as planning the implementation, then executing and monitoring and controlling. Where the organization begins will depend upon the Capability or Maturity level that they have been assessed at, and what processes they want to improve or implement. For instance if the organization is following the Capability, or Continuous, representation and they are assessed at level 3 (Defined) in the Project Management process area, they may wish to develop or improve measurement and metric tools to allow them to Quantitatively Manage this process. For those not wishing to engage a consultant, there are several books published to guide organizations into and through implementing CMMI. (SEI, 2009a)

Re-Assessment

With Continuous Process Improvement as their watchword, this phase of a CMMI implementation seem obvious. SEI highly recommends re-assessing the processes on a regular basis. In addition to determining whether or not a process is effective, and providing an opportunity to reinforce application of the process and procedures, the re-assessment function will highlight those processes that may have matured to the next level, those which are lagging, and ideally the path to the next maturity level. (SEI, 2009a)

Implementation Case Studies

Literature reviews on CMMI-Services Implementations are limited. Indeed, searches of academic sources reveal no articles that go beyond descriptive or comparison reviews of CMMI. However, the SEI has compiled case studies of their own, based on implementations of SEI's CMMI for Software. CMMI for Software (SW-CMMI) is a sister maturity model to CMMI-Services. (SEI, 2007) Indeed, CMMI-Services is an expansion and generalization of SW-CMMI. Regardless, although review of these studies must be taken with a grain of salt, as these case studies are not as objective as third-party reviews.

2007 Performance Reviews, while all reports on implementations of SEI's CMMI for Software, could be used as examples of the effectiveness of the CMMI assessment process, and maturity model architecture. Summaries of these reports are included for reference only and are not intended to replace the need for CMMI-Service Performance Reports. Lockheed Martin reports that improvements in defects found per line of code decreased as the organization progressed from Level 3 to Level 5, resulting in a 20% decrease in costs associated with defect identification and repair. Warner Robins reported that project performance and cost variances decreased with effectuation of Level 5 processes. Motorola reported a 34.85% decrease in their "cost of quality," while reducing the number of defects by 13% per thousand lines of code. Motorola also reported improvements in the accuracy of their initial schedule and effort estimations. (*Performance Results from Process Improvement*, 2007)

A review of academic sources revealed one paper regarding a CMMI failure at a single organization. That paper's title, *What Can Be Learned from CMMI Failures* (Gefen, 2006) is somewhat misleading. Gefen conducted interviews to determine why some of his organization's projects were performing at such disparate CMMI-SW maturity levels. His findings indicate that

software methodology has an impact on an organization's maturity, and ability to mature. Based on his analysis, it appears that organizations with more Agile-based development environments may not be able to mature either at a similar pace, or at all in comparison to more traditional development methodologies (i.e., waterfall). His research also revealed that leadership commitment to the CMMI implementation was critical to the success of the effort, regardless of development methodology. While quality was anecdotally noticed to improve, lack of adoption of processes was in part due to the perception that documentation and process was just another "external quality requirement forced on the development teams" by the customer. Interestingly, interviewees emphasized the need for process to be able to adapt to different project types. One must wonder if the precepts of Level 4 (Defined) might have provided this adaptability.

Organizational Project Management Maturity Model (OPM3)

History and Concepts

Begun in 1993, the Organizational Project Management Maturity Model (OPM3) was developed by the Project Management Institute (PMI) to be a standard that would help an organization achieve business strategy by improving their project management capabilities. While having a base in the Capability Maturity Model (CMM) the goal of OPM3 was to focus on project management, regardless of industry, as compared to CMM's original focus of the software industry. OPM3 developers believed that CMM, and other models lacked a focus on project management activities, and did not adequately address the organizational change required for such intensive process improvement initiatives. (PMI, 2008b)

At its core, OPM3 framework uses the Project Management Body of Knowledge (PMBOK), also developed by PMI, to improve an organizations usage of PMBOK processes

across multiple domains - Project management (PM), Program management (ProgMgmt), and Portfolio management (PortMgmt). Stated goals of the OPM3 include:

- Strategic focus vs. a project-by-project viewpoint;
- A flexible framework that can be applied to single or multiple domains;
- Assists organizations in developing an organizational structure that will support the process improvements necessary to improve organizational maturity, including organization chart changes and the provisioning of tools, technologies and training to support framework knowledge and behaviors;
- Provides an enterprise view of Project Management, Program Management and Portfolio Management. (PMI, 2008b)

PMI states that the benefits to implementing OPM3 and following through on the process improvements are significant. Benefits include:

- Improved coordination between business strategy and execution of processes;
- OPM3 Best Practices support the enterprise strategy;
- Non-prescriptive, adaptable implementation is adaptable to organizational needs;
- Organizational use of PMBOK is supported by OPM3 Best Practices
- Best Practices and Capabilities cross functional boundaries, allowing comprehensive, enterprise view of processes. (PMI, 2008b)

Model

OPM3 covers Best Practices in three (3) domains: Project Management, Program Management, and Portfolio Management. All OPM3 Best Practices are based upon the precepts enjoined in PMI's Knowledge Bases for each Domain. PMI has provided definitions for each of these domains, and their Processes.

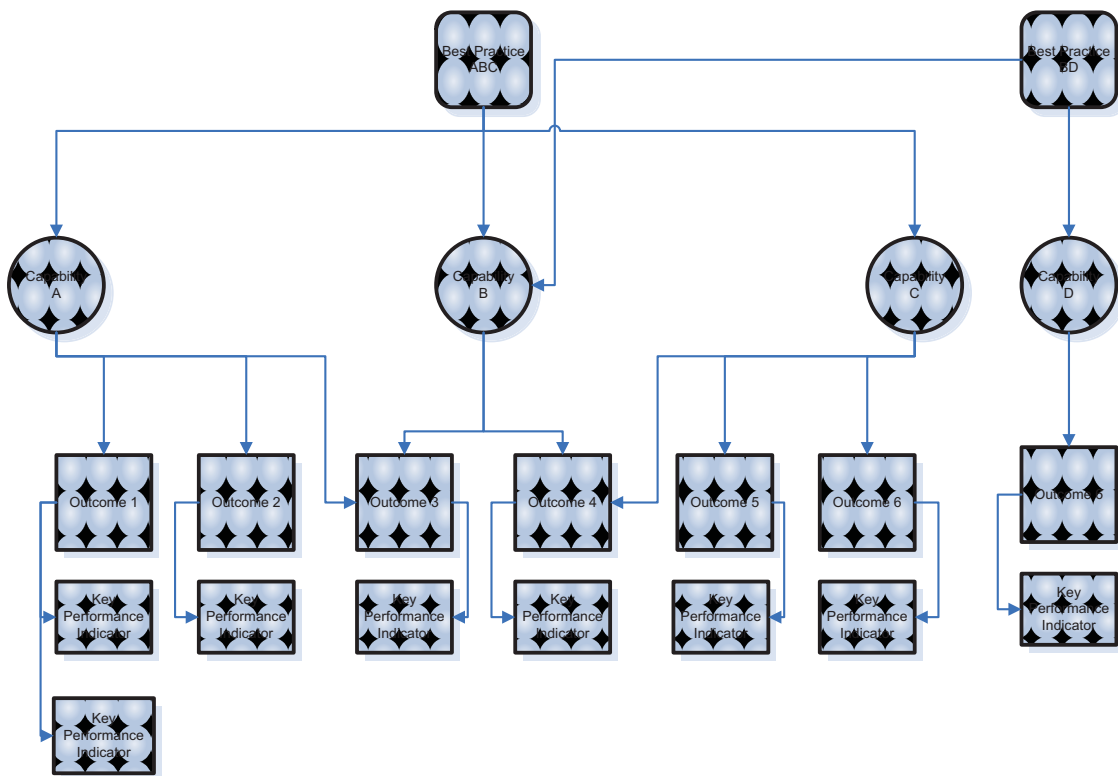
In addition to these domains, OPM3 adds a concept called “Organizational Enabler.” This concept includes those Best Practices that are critical to support the maturity of each domain. Organizational Enablers include such items as general management processes (structural, cultural, technological, human resource management), systems factors and cultural factors that facilitate the implementation of OPM3 Best Practices, and allow the organization to reach their strategic goals in each of the Domains. (PMI, 2008b)

Each of these domains, and the Organizational Enabler structure, are eligible for its own Maturity Level. There are four (4) maturity levels within OPM3, covering all of the PMBOK Process Areas, Domains, and Organizational Enablers, in order from lowest maturity to highest maturity:

- Standardize - Standardized Capabilities demonstrate an organization or process with documented and communicated processes, standardized processes, and an active governance process.
- Measure - Measured Capabilities demonstrate identified and measured critical characteristics and inputs, results that are related to inputs, and an inclusion of customer requirements in the measurements.
- Control - Controlled Capabilities demonstrate that the Measured Capabilities have a Control Plan which is implemented, and some process stability has been achieved.
- Continuously Improve - Continuously Improved Capabilities are those in which problems are identified, improvements have been implemented and those improvements are sustainable. (PMI, 2008b)

These maturity levels are used to “grade” the ability of the organization to be functional in the OPM3 Best Practices. Best Practices are those activities that most effectively improve an organizations ability to manage projects, programs and/or portfolios. These Best Practices are further defined into Capabilities, which are the specific activities that comprise the Best Practices. Capabilities are further deconstructed into the expected Outcomes for that Capability. The organization is then able to “grade” its Capability in a Best Practice by measuring its Key Performance Indicators of the particular Outcome. Figure 4 illustrates the levels, structure and interrelationships of OPM3. (PMI, 2008b)

Figure 4: OPM3 Structure

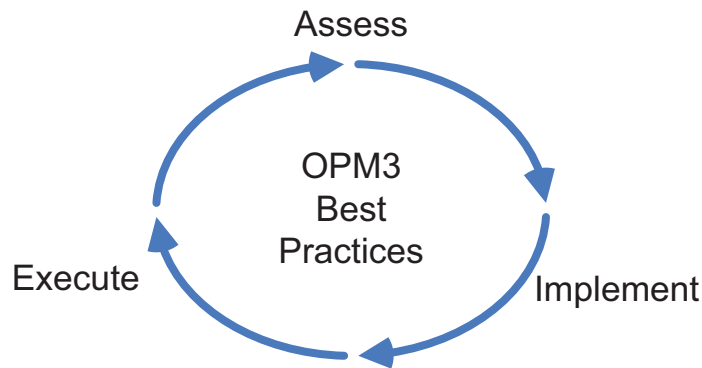


As can be seen in Figure 4, there is an interdependency that exists among Best Practices and Capabilities. That is, a Best Practice can have a Capability that exists in another Best

Practice, and a Capability can have an outcome that exists for another Capability. In Figure 4, Best Practice ABC shares Capability B with Best Practice BD. Also, Capabilities A and C share Outcomes with Capability B. While only briefly demonstrated here, there is no limit on Key Performance Indicators, and Outcomes may also share Key Performance Indicators.

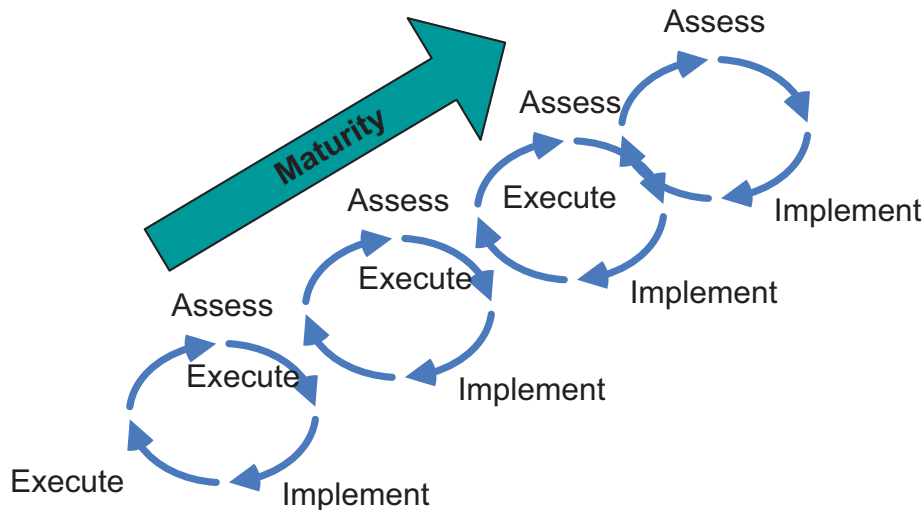
The basic premise of OPM3 (is that the organization performs a perpetual cycle of self-review. At first, an organization will perform an Assessment of their capabilities. This Assessment will help the organization discover its current capabilities, identify areas for improvement and determine its maturity level for the domain being evaluated. Once the Assessment is complete, the organization can begin implementing the process improvements. Once implemented, the organization is executing the new processes. This cycle is diagrammed in Figure 5:

Figure 5: Cycle of OPM3 Implementation



PMI recommends that even as an organization completes an implementation and is entering the execution of a Best Practice or Capability, that the organization be planning its next assessment. This recommendation is made so that Organizations not stagnate at their maturity level, and begin progressing through the successive maturity levels, as conceptualized in Figure

Figure 6: Iterative Nature of OPM3 Implementations



Implementation Activities

Phase I: Assessment

Assessment is conducted to determine an organizations maturity level. Assessment is made by determining the Capability levels within the Best Practices for the particular domain targeted by the organization for improvement. This process forms that basis for the organizations maturity plan. The Assessment identifies those Best Practices in which the organization:

- Has some current capability in; AND
- Has no current capability in

There are two stages to OPM3 Assessment, the High-Level Assessment and a Comprehensive Assessment. The High Level Assessment can be conducted either by the organization or a hired PMI Certified OPM3 Assessor, and uses 125 question questionnaire provided by PMI in their *OPM3 Knowledge Foundation* text, or in their *OPM3 Product Suite*, accessible only by the certified Assessors. PMI allows for a homegrown assessment tool, but

there is a risk that the homegrown tool does not cleanly align with the OPM3 product, and therefore may not be as valid. Once the High Level Assessment is completed and preliminary maturity and organizational process improvement focus is identified, a Comprehensive Assessment should be conducted.

The Comprehensive Assessment will drill down into the Model, and evaluate the organization's Capabilities according to the Best Practices and Domains that they have selected for maturity improvement. The Capabilities are reviewed utilizing either organizational internal resources accompanied by PMI products, or with the assistance of a hired PMI Certified OPM3 Assessor. Results from the Comprehensive Assessment lead to more detailed organizational improvement plans, or a decision to cease the maturity project. (PMI, 2008b)

Phase II: Improvement

If an organization has decided to move ahead with their maturity project, they move into the Improvement phase of the project. This phase includes two stages, Improvement Planning and Improvement Implementation, or Execution. These phases help the organization with the selection, prioritization and implementation of Capabilities that will move the organization along the maturity path that they have defined.

During Improvement Planning, the organization should select and prioritize the Capabilities that they want to mature. The organization will document the Outcomes and Key Performance Indicators that will measure their Best Practices improvement efforts. The organization should also develop their timeline for implementation, and begin identifying key human resources and training opportunities. (PMI, 2008b)

Utilizing the Improvement Plan, the organization will implement the identified Improvements over the timeline established in the Plan. These Improvements may include

organizational structure changes, in addition to the implementation of the capabilities being focused on during that Maturity cycle. PMI recommends spending almost 90% of every Maturity cycle on this Phase, as it is the primary method for gaining increased Maturity. (PMI, 2008b)

Phase III: Assess and Repeat

Once improvements have been initiated, and been in effect for awhile, the organization should re-assess their maturity. This can be accomplished by evaluating the KPI measurements, and conducting Phase I Assessments again. With the information provided, the organization can either begin another round of Implementation Planning and Execution for either the same Best Practices, or decide to focus on another set of Best Practices. PMI does not express a preference for either action, only that the organization attempt to continue the Assess, Plan, Execute cycle until the desired Maturity level is achieved for the organization, in whatever domain(s) and Best Practices selected. (PMI, 2008b)

Implementation Case Studies

Literature reviews on OPM3 Implementations are limited. Indeed, searches of academic sources reveal very few articles that address any component of OPM3, much less Implementation data. The PMI website has only three case studies available: the Washington Savannah River Company (WSRC), Pinellas County and AmeriHealth. The WSRC Case Study (PMI, 2009b) is a report on what assessments were completed, and how the organization performed. It also served as a pilot project for PMI's OPM3 Product Suite. Going into the OPM3 assessment, WSRC was deemed to be highly mature, but was implementing OPM3 to ensure it was achieving all best practices in Project and Program Management. Their assessment did not include Portfolio Management. Overall, the assessment confirmed the high maturity

level of the organization and the assessors had made only a few recommendations for improvement.

The Pinellas County (PMI, 2009a) covers a series of assessments conducted between 2004 and 2006. The county reports some findings that were surprising to them, and a moment when they realized that significant change would be required to get them beyond their third assessment. Outcomes of their process improvement efforts have been a change in customer perception of the IT Department and integration of previously out-sourced staff back into the core team. Lessons learned from the project include

- Senior Management support is critical for customers and organizational stakeholders to believe in the project.
- Communicate with the entire organization; provide transparency into the process
- Do not force the process
- Start slowly and take baby steps
- Select realistic goals, and meet them.
- Be aware that not everyone is in Project Management

AmeriHealth (PMI, 2008a) conducted its OPM3 assessment as a gap analysis for their Project Management Office. As a result of the assessment, they identified some key areas for improvement, and at the publishing of the report were working towards improving their prioritization, processes, and documentation.

What is notable about these case studies is the lack of information regarding post-implementation assessments, and progress towards expected outcomes. This information would be valuable in determining the effectiveness of this model, especially if quantitative data were available.

Business Process Improvement

Business Process Improvement (BPI) is a derivation of Business Process Engineering (BPE), also referred to as Business Process Change (BPC) or Business Process Re-engineering (BPR). BPE is the engineering or development of processes that are used by a business to support the generation of the business' products or services. By extension, BPI activities are intended to improve the business' processes in order to increase such measures as time to market, quality, efficiency, and profit. The mention of BPI can instill a gleam of profit into a manager's eye, and the fear of job losses by staff. Maturity Models provide a frame in which BPI can occur. Maturity Models guide the discussion of BPI, the selection of processes to be improved, and the path to increased maturity of those processes.

Concepts

BPI has evolved over time from concepts of integrating lessons learned or quality assurance events to an entire industry complete with its own graphical notation, and consulting services organizations. ("Business Process Management Notation," 2009) These consulting services organizations are focused on assisting businesses in not only documenting existing processes, but improving the processes, and therefore the business' bottom line. For many business', the term BPI means the automation of everything they do. In describing CMMI to her readers, Caputo (Caputo, 1998) likens the implementation process as a choreography effort; however this statement is perhaps more effective when applied to BPI, rather than to CMMI

“Choreography involves movement of the body, guiding one or more dancers through certain dance steps and through changing rhythms while maintaining balance to create a peak performance for their audience. Software process improvement involves the movement of an organization, guiding one or more individuals through certain activities and through changing conditions while maintaining balance to create a peak performance for their customers.”

BPI got a boost adoption by the Clinger-Cohen Act of 1996 ("Clinger-Cohen Act," 1996), which put into federal law the rather revolutionary concept that process redesign should drive technology acquisition in government agencies, rather than technology acquisitions driving process redesign. In corollary, since the mid-1990s, a large number of how-to manuals, studies, and critiques have been published.

The basic precepts of BPI are simple:

- Document the current processes
- Redesign, or automate these processes

What BPI is not, however, is "manumation," whereby an organization takes a process that is conducted manually, and builds an automated process that is an exact replica of the manual process, without evaluating the process itself for efficiency and effectiveness. (Scholl, 2004)The argument against manumation is similar to the "bad data in, bad data out" discussion - if the process is bad, automating it will not make the outcome of the process better.

Implementation Activities

The General Accounting Office of the United States (GAO) released their *Business Process Reengineering Assessment Guide, version 3* in March, 1997. This 74 page guidance was published to assist government agencies in implementing BPI initiatives. The guidance addresses three phases of BPR:

- Assessing the Agencies Decision to Pursue Reengineering
- Assessing the New Process' Development
- Assessing Project Implementation and Results (GAO, 1997)

These phases are reinforced as key activities throughout the literature. Indeed, while commercial literature is focused more on the "how" of BPI/BPR/BPC, most of the academic literature is focused on the assessment and post-implementation activities, as these phases are deemed to be indicators of BPI project success.

The academic literature emphasizes that BPI is not a single activity; that is, BPI should not be done once and assumed to never be needed again. BPI, in literature, is viewed as a continuous improvement activity, and once begun, should not end. (Harrison, 1999) Researchers point out that there are no guarantees that a BPI initiative will enable the success of the organization, and that BPI is not a panacea to business ills. (Bannerman, 2008; GAO, 1997) The research appears to overlap in its identification of critical components of successful BPI projects, which can be broken down into two core components - processes and organization factors.

Table 4: Elements of Business Process Improvement Success (Bannerman, 2008; GAO, 1997; Scholl, 2004)

Processes	Organizational Factors
<ul style="list-style-type: none"> ● Identification and use of Subject Matter Experts ● Documentation of current processes ● Workflow Analysis ● Diagnosis of Root Causes of Process problems ● Collaboration and Communication ● Active Project Management ● Governance 	<ul style="list-style-type: none"> ● Clearly stated mission ● Clearly identified customers and stakeholders ● Strong leadership support ● Stakeholder Buy-in ● An organizational culture that encourages improvement and is accepting of change. ● Adequate resources assigned to the project ● Lack of territorialism and/or internal politics ● Ownership ● Alignment of BPI initiative to strategic goals

Harrison emphasizes that without the analysis and diagnosis of processes, the BPI project is incomplete, and may lead to the inappropriate and ultimately costly measures, of functional reorganization and personnel reductions (Harrison, 1999). Bannerman's research works to refute some of the myths of BPI propaganda, all of which are dependent on the success criteria listed above in Table 4:

- Process Improvement leads to Business Improvement. Business improvement can only be achieved if the organization seeks to link BPI to specific business goals.
- Process Change equals Process Improvement. The act of changing a process does not translate into improvement. Indeed, manumation is a change of process that means only that the process has been automated - there may be no improvement of the process. In fact, the process may have worsened because of the automation.
- Software Processes are non-lethal. A BPI effort that improves software function, may inadvertently affect something else. There have been documented examples of deaths or adverse health outcomes related to software process improvements. Bannerman's article references a motor vehicle registration process, designed to catch commercial vehicle safety issues during registration that ultimately resulted in vehicular fatalities.
- Enterprise as an automated process. The enterprise cannot automate processes improvement; there must be alignment between strategy and organizational change processes. The strength of this alignment is key to success or failure of the change management. (Bannerman, 2008)

Implementation Case Studies

There are many anecdotal and analytical case studies regarding BPI initiatives. All of these examples, whether an expose of successful or failed BPI efforts, echo the same needs - without strategic alignment, and organizational support, BPI efforts will not succeed. Harrison documents (Harrison, 1999) the case of an Internal Revenue Service BPI initiative, in which the IRS implemented desktop PC's for their staff. While the effort improved the perception of IRS employees as paper pushers stuck in the last century, the implementation did not actually affect the quality, speed or efficiency of the services conducted in those offices. In this case, the IRS did not analyze or diagnose what was wrong with their process, or how the solution might fit into the organizational strategy before deciding on a solution, and assumed that the PC installation would fix it (panacea). In Bannerman's example of the failed motor vehicle registration process improvement, the failure was caused by a decision to circumvent the process, and when discovered, make assumptions on the criticality of the process improvement, and risk of process improvement failure without including key, knowledgeable staff.

Technology Selection

For thousands of years, mankind has been asking which technology to use - papyrus or parchment, sails or oars, copper or bronze, folio or bound book? In the 1450's, was Gutenberg's printing press really worth the investment in time and money? Will the printing press make me money, make my business more efficient, and get people reading more? One could argue that this was one of the most critical technology selections in history. What would have happened if no one had purchased these presses and found them to be efficient and effective at bulk production of reading material? Predicting the success of an innovation (product or service) is

not easy, and should be not be based on the "cool-ness" factor of the solution, or because it was recommended by a friend or cohort in another industry or sector. What works for one organization may not work for another and one should always research available options for the best fit. (GAO, 1997)

These questions still plague us, and as long as we have choices to make (including the choice to not implement a technology), humans must find ways of quantifying these decisions. This section covers a selection of decision-making tools that humans have created to assist with decision making. These tools could be used not only for providing decision points regarding Maturity Model implementations, but also other IT projects such as an online application to determine preliminary eligibility for medical assistance programs, or an application in which medical providers can check medical assistance eligibility of their patients and submit claims for reimbursement, all at no charge (current projects within Colorado Medicaid). Sources recommend that an organization not rely solely upon one analysis method but upon multiple methods, with the aim of providing as much information as possible to the decision-makers. The included methods are not a complete set of analytical tools available; however, these are the most mentioned in literature regarding "technology selection."

Additionally, literature does not discount the effect of organizational knowledge, both individual and institutional on technology selection (Kearns, 2007). Indeed, several authors advocate for the necessity of including both senior level management of the business and IT sides, as well as more line-level subject matter experts in the evaluation of any technology. These resources are invaluable in determining not only the ROI, benefits, or alignment of a solution, but also for pointing out the pitfalls and risks that may occur with that solution.

Return on Investment (ROI)

This basic concept in financial analysis is simply the difference between the financial benefit and the financial cost divided by the financial cost. It is intended for use as a benchmark, in a comparison to other organizations (Lingane & Olsen, 2004) or projects. In mathematical format (Keil, 2006), it is represented as:

$$\text{ROI} = \frac{\text{benefit} - \text{cost}}{\text{cost}}$$

Keil and Kuhrmann have offered an ROI model that is specific to assessing process improvement initiatives. Their argument is that there are additional factors to consider when determining the ROI of a process improvement project:

- artifact/ product quality
- process quality and/or adequacy
- architecture quality and/or adequacy
- satisfaction of the customer. (Keil, 2006)

Keil and Kuhrmann posit that these core factors are intertwined, and cannot be separated from an ROI discussion. As such, they have incorporated these factors into a new ROI equation, one that will account for the impact of these factors on the investment return. The new equation is:

$$\text{ROI} = \frac{(-K) + e_p + e_{Ar} + e_A + e_U}{K}$$

In this formula, K equals cost, e_p represents savings achieved through process improvement, e_{Ar} represents savings from architectural improvement, e_A is the artifact or product quality improvement and e_U is the satisfaction of the customer. In this way, if the estimated savings, quality, or customer satisfaction goes up or down, the ROI will have taken these into account.

When mapped in a spider or constellation graph, these factors will visualize the impact of each factor, allowing easier decision making. (Keil, 2006)

Social Return on Investment (SROI)

One of the challenges for government is that, as a business that provides services at zero cost, there is often no quantitative way to measure the Return on Investment. In addition to financial measurements, such as Return on Investment, there are other, more intangible measures that particularly affect government entities, including impacts or perceptions of impacts in social, political and economic realms (Creswell, 2006). In recent years, a concept called "Social Return on Investment (SROI)" seeks to fill that gap and provide a way to measure intangible products, such as those provided charity or public service entities. The goal of SROI is to provide measurement to demonstrate that investment in a project (time, money and resources) will have benefit in some intangible way (Creswell, 2006). In some ways, Keil and Kuhrmann's expanded ROI model accommodates some elements of SROI. Academic literature on the science of SROI or its effectiveness is not readily available; however it is included in this discussion because of its recent appearance in discussions surrounding government projects, social and technological.

First implemented in large scale assessments in 1999, it was developed as part of a business plan competition - the Global Social Venture Competition. This model can be combined with financial analysis to provide organizations informed data for value assessment (Lingane & Olsen, 2004). While no specific formula is laid out in the literature, Lingane and Olson (Lingane & Olsen, 2004) offer guidance on what should be included in an SROI analysis:

- Positive and negative impacts should be included. If providing cellular text of medical appointment reminders will cost a medical assistance client a per text fee from their cellular phone service provider, that impact should be included in the

analysis. Likewise, if texting this same reminder reduces the number of missed appointments, it will positively impact health outcomes, which will in turn reduce costs for the agency.

- Include impacts made by and on stakeholders. In the example above, the client's per text fee is not a direct impact to the medical assistance agency. However, it is an impact to that agency's stakeholder (the client).
- Be careful to include impacts that are directly attributable to the organization, not downstream impacts that aren't directly related to your organization. For example, the medical assistance agency cannot claim that while they are providing the appointment reminder service, the decrease in clients on food assistance is an impact that they achieved.
- Be careful to only count an impact once. If counting an impact as social, do not also count it as financial.
- Do not claim benefit when the mere presence of any organization in an industry or geographic region would provide a similar benefit. The example provided by Lingane and Olson is that a company locating in rural Nigeria provides local economic stimulus. It should not be counted as a social impact because the company's product or service is not the cause of the impact, the fact that they are there, hiring people and spending money locally is the cause of the local economic stimulus.
- Only use monetary value if it is appropriate and logical to do so. For instance, when estimating the impact of adding new clients to the medical assistance

program, it may be appropriate to utilize the average annualized cost per client in determining value.

- Provide context for measurements used. That is, are the measurements for this quarter or same quarter last year?
- Document risks, assumptions, and discount values used in determining the valuations of social impacts. Doing this provides context and information for downstream analysts.
- Include sensitivity analysis, so that downstream analysis understands the dependencies on assumptions as well as the level of certainty in the value.
- Continue tracking social impact, even after the initial analysis on a project is completed. This provides ongoing review of the verity of the analysis, as well as providing indications of change that may trigger a course adjustment.

Strategic Alignment

Strategic Alignment is one of those analyses that can be difficult to establish or quantify, yet is essential to effective business operations and governance. Strategic Alignment Assessments are intended to answer one simple question: does this project align with or support the mission of this organization? In some organizations, it is implemented as a simple yes/no answer to that question: If the answer is yes, the project will either be actionable, or the project will move onto the next level of analysis. A no answer often kills a project right up front. In other organizations, more complicated scoring exists, perhaps with weights attached to specific alignment criteria, and certain ranges are advanced to the next gates or not.

Avila, et al. (Avila, 2009) provide reviews of nine strategic alignment models, including the focus of each model, the path each model takes through the alignment review, and where

each model is best applied. Kearns and Sabherwal (Kearns, 2007) posit that an organization's knowledge of its business are critical to supporting high-levels of Business-IT alignment. Higher levels of Business-IT alignment are associated with improved planning quality as well as reductions in implementation issues. Higher levels are also associated with improved identification of gaps between present and future states. Regardless of the alignment analysis tool, the purpose and effect is clear - to ensure that projects are supportive of the organization's mission, and move the organization further along the path to fulfillment of that mission. Additionally, Most discussions of strategic alignment focus on either the strategic goals of the organization, or the alignment between the business and technology sides of organization. (Avila, 2009; Jemison, 1981; Kearns, 2007)

State Government Environment

State Governments operate, in many ways, similarly to the federal government in that there are three branches to its operations: Legislative, Executive and Judicial. This mimicry was by design, as states entering the Union needed to have a political structure that was similar to the federal level. Primary differences are in the size of the legislature, authority of legislative and executive branches, elected or appointed judges, and the cycles on which the legislatures meet.

The Legislature is responsible for developing, vetting, and passing a budget for the state. The Legislature may also propose laws, and provide auditing oversight of the Executive Branch. Once signed by the Governor, the proposed legislation becomes law, and the agency responsible for enforcement of that law will begin operations related to that law. The Judicial Branch exists to provide enforcement of penalties to existing laws, as well as provide interpretation for laws that are deemed “ambiguous.” Within the Legislative Branch, Representatives are elected to serve, by the people of the state, in one of two houses – House and Senate. In Colorado, these

houses are referred to in the plural as the General Assembly. Depending on the constitution of the state, the legislature may meet annually, or semi-annually; the Colorado General Assembly meets annually, from January through May. The Executive Branch consists of the Governor, and the agencies that operate the government. These agencies administer the laws and policies of the government. As such, the agencies must implement any laws that are signed. Additionally, agencies are granted the ability to make any regulations needed to provide clarification or administrative/operational instructions in support of those laws.

The Legislative Process

Laws are created during the legislative process. This process is complex, and is based on parliamentary rules. A bill (proposed legislation) is developed by a legislator, vetted in a committee for feasibility and political alignment, and then voted on in one house of the legislature. If that house approves that bill, the bill is then passed to the second chamber, where it is again reviewed in committee, and voted on. If it passes that chamber, the bill is sent to the Governor for signature or veto. If the Governor does not veto the bill, it becomes law.

That is necessarily a high-level view, and what most people understand to be the process. However, there is a deeper level to the legislative process that involves the Executive Branch agencies. During the development and assessment of a bill, the legislature asks Executive Branch agencies to evaluate the bill for potential impacts to their agencies. Specifically, the agencies are asked to provide information related to implementing the bill (should it be signed by the Governor) – cost, staffing, contracts, time to implement, conflicts with other laws or regulations (including federal). This is called the Fiscal Note Process. It is important to note that agencies are prohibited from analyzing proposed bills as a combined portfolio – they must evaluate each bill as if it were the only bill that exists, and cannot indicate whether a particular

set of bills will have implementation conflicts (time, cost, resources) with each other. This isolated review has cumulative negative effect on the effectiveness and efficiency of an agency, who must then organize these new projects into not only their existing portfolio, but into their strategic vision.

The Regulatory Process

If a law has sufficient detail to it, an Executive Branch agency may implement the law without any further action needed. However, if the law is nebulous, agencies must provide the additional administrative requirements for it. This additional clarification is usually provided through the Rule-making, or Regulatory, process. According to federal rule-making requirements, regulations are required when:

- “Substantive rules of general applicability
 - Interpretive rules
 - Statements of general policy
 - Rules of procedure
 - Information about forms
 - Information concerning agency organization and methods of operation”
- ("Administrative Procedure Act,")

The Regulatory process requires that the executive agency allow, receive, respond to and incorporate comments from the general public. As a result, the regulatory process can be very protracted.

The Budget Process

In Colorado, budgets are prepared annually for two years out. That is, the State Fiscal Year (SFY) Budget process for 2010-2011 was begun in SFY 2008-2009. The SFY 2010-2011

Budget was presented by the Governor in November 2009, and will be debated and finalized by the General Assembly by the middle of May 2010. The SFY 2010-2011 begins July 1, 2010.

When developing budget requests, and in particular requests for acquisition of services or technology, there are several criteria that must be addressed during the budget process.

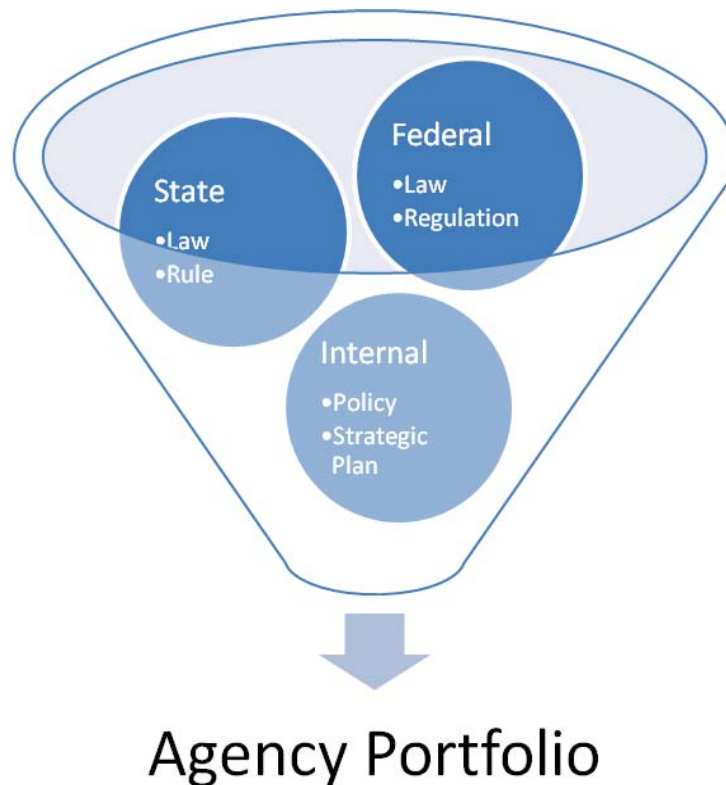
Appendix C is a recent budget request for a series of technology projects within the agency that houses Colorado Medicaid. Criteria include statutory authority or requirement, the level of financial commitment by the state (i.e., the state pays 50% of the cost, the federal government or grant pays the other 50%), the goals of the project, the critical need for the project (i.e., the system is 40 years old, and not able to be accommodate new functionality requirements), and the consequences for not implementing the project. If not fully addressed in the narrative, the request may be cut. Likewise, the more funding required by the state and the higher the perception that this is not a mandatory project, the more likely the project will not be provided the funding it requested. Conversely, if the project has a higher federal or grant match (i.e., 65%, 75% or 90% federal match) the project has a higher chance of receiving funding, although this is not a guarantee. Detailed attention is also paid to how the project supports the agency goals or mission statement.

Sources of Projects

As stated in the introduction, there are several sources of projects for government agencies. Acting much like a funnel, projects and sources compete with each other for the right to land on the agency's portfolio plate. Regardless of the source, agencies need to assign resources, develop policies, acquire vendors, implement software (new or changes to existing), measure performance, locate and manage funds, and report to external stakeholders. With varying degrees of success, agencies are able to do these activities. Some agencies are excellent

at locating funds, but perhaps not the best at managing them or securing vendors. Others are excellent at software development, while another agency struggles to identify requirements and adequately test. The State of Colorado's OIT Consolidation Plan seeks to level this playing field to some extent. However, the variances will most likely still exist until all agencies are participating at a high maturity level.

Figure 7: Inputs to an agency's project portfolio



IT Consolidation

In efforts to reduce costs, eliminate duplicate purchases or efforts, and increase fiduciary oversight of projects, many states have completed or begun so-called "consolidation" efforts. These efforts range in scope from only centralizing desktop support activities to not only that, but also managing agency level projects, and providing enterprise application support. In all,

nine states have consolidated their information technology operations and oversight. ("State of Colorado Office of Information Technology Website," 2010)

In Colorado, consolidation began in 2007 with an Executive Order by Governor Bill Ritter, granting the Governor's Office of Information Technology (OIT) additional authority.

Key elements of the Order include -

- OIT Authority
 - oversee statewide IT budgets
 - develop statewide policies on IT contracts
 - develop a statewide strategic plan
 - prioritize projects and initiatives across agencies,
 - provide Project Management assistance for "at-risk" projects
 - participate in decision-making related to agency "initiatives, projects and programs"
- OIT Goals
 - allow agencies to focus on core missions
 - strategically manage IT projects
 - leverage IT investments via shared services
 - "reduce costs"
 - "increase efficiencies"
 - develop "centers of excellence"
- Directs all state departments to "coordinate with OIT on those activities [information technology] as they relate to major contracting, operational, risk assessment, hiring, and project management decisions."(Ritter Jr, 2007)

This Executive Order became predecessor to Senate Bill 08-155, which formalized the OIT, provided it with budgetary authority and staff, and laid out basic timelines in which the consolidation of activities must happen ("OIT Consolidation," 2008). Pursuant to that legislation, OIT has developed a consolidation plan, labeled "C2P" (*C2P: The Colorado Consolidation Plan; State of Colorado Enterprise Architecture, Governance and Consolidation v1.95* 2008) and is actively working towards accomplishing the goals set forth in both Executive Order and legislation.

As part of the C2P effort, OIT established an Enterprise Project and Portfolio Management Office (EPPMO), which has released its own enterprise wide standard project methodology ("State of Colorado Office of Information Technology Website," 2010), and is in the process of identifying an enterprise standard tool for Portfolio and Project Management. ("State of Colorado Office of Information Technology Website," 2010) The EPPMO, in conjunction with its Project Manager User Group (PMUG), will be releasing a survey to agency CIOs related to the state of agency Project Management Maturity sometime in February or March 2010. This author will be compiling the data and providing data analysis services for the survey. The survey is home-grown, and utilizes the OIT standard project methodology as its basis for reference. Once findings are reported, the EPPMO will develop a plan to assist each agency in maturing its project, program, and portfolio management with an eye towards applying a standard maturity model across all agencies. At this writing, that maturity model was not yet decided upon.

Chapter 3 – Methodology

This study is a work of Qualitative Analysis, utilizing the principles of Grounded Theory and Content Analysis. The author was unable to get permission to conduct surveys or interviews of State of Colorado CIOs and Executive Directors related to what criteria they would want to know when selecting a Maturity Model. As a result of this unexpected development, this paper is based solely upon research collected from academic literature, textbooks, government publications, as well as primary source materials from the Project Management Institute and the Software Engineering Institute at Carnegie Mellon University. The SEI's Capability Maturity Model and the PMI's Organizational Project Management Maturity Model were selected due to the familiarity of these models within government circles, and within the United States in general.

Research Focus

Specific questions that were to be addressed for each model during the study include the following:

- What are the characteristics of the model?
- What are the costs, resource and organizational culture requirements for implementation and ongoing support?
- What outcomes could be expected?
- What questions should government organizations answer when selecting a maturity model for their portfolio management?
- What limitations might impact the effectiveness of a particular maturity model?
- What business drivers/ concerns does each model support and/or improve?

These questions are intended to provide the framework for the development of the selection tool.

Searches were conducted utilizing the Regis Libraries in two subject area, Business and Computer Science, which have provided a wealth of information related to Project, Program and Portfolio Management, as well as core components of Business Process Improvement, and Technology Selection topics. Search queries included, individually and in combinations:

- Maturity Model, Maturity
- Capability Maturity Model, CMM, CMMI
- Organizational Project Management Maturity Model OPM3
- Business Process Improvement, BPI
- Technology Selection
- Strategic Alignment
- Return on Investment, ROI
- Social Return on Investment, SROI
- Project Management

State and Federal Government process sources were augmented by Federal guidance on acquisitions, as many State agencies are required to follow at least some of the Federal Acquisition Regulations (FAR) in order to meet federal funding match requirements. Primary sources used in this study include the OPM3 and CMMI models, and the State of Colorado's IT Consolidation Plan (C2P). Every attempt is made to relate the model goals and structure with how they could fit into government operations and limitations.

Grounded Theory

In utilizing Grounded Theory, this study focuses on the process of selecting a Project Management Maturity Model, and proposes that a selection tool could be developed to assist

organizations, specifically state governments, in selecting the Model that will most likely result in success for them. Grounded Theory data analysis techniques were utilized to identify common themes, and inter-relationships among apparently varied topics. (Leedy, 2005) Using this approach, the processes outlined in each maturity model were analyzed for common patterns and structures. Additionally, the literature reviewed on associated topics was analyzed for success and failure themes that could be extrapolated to a maturity model implementation in a state government environment.

Content Analysis

The basic premise of Content Analysis is to systematically examine bodies of knowledge for the "purpose of identifying patterns, themes, or biases." (Leedy, 2005) In this study, the bodies of knowledge utilized those that surround the subject matter of Project Management, Program Management, Portfolio Management, Technology Selection, Business Process Improvement, and of course, the Maturity Models focused on - OPM3 and CMMI-Services. By examining these areas, it was hoped to identify key characteristics of each model, and the methods by which a selection tool could be developed. The theory was that review, individually and in combination, of this data would reveal patterns or characteristics that would lend itself to providing a clear path towards a particular Maturity Model, given that guiding questions could be developed to assist an organization in the selection.

Chapter 4 – Project Analysis and Results

What are the characteristics of the model?

OPM3 is characterized by its absolute dedication to the PMBOK and associated texts. The model's Best Practices mimic the structure and knowledge areas of the PMBOK, and it appears that the end user of the OPM3 should be intimately familiar with the PMBOK methodology. Additionally, the organization seeking to use OPM3 could struggle with its assessment and implementation if it is not a so-called "PMBOK shop." In contrast, CMMI-Services is significant for its dedication to being methodology agnostic. The processes and capabilities are arranged more by function, than by workflow. Interestingly, a PMBOK shop might be challenged to manage the assessment, as it is really not organized in the same format. Both models are industry neutral, in that each model can be applied to any industry or business sector from software to construction or event planning.

Structurally, the models are similar, although the CMMI-Services goes into greater specificity, at first blush than the OPM3 although it hard to tell for certain without the purchase of OPM3's Product Suite. Where the two models diverge consistently is in the maturity levels themselves. CMMI-Services has two categories of maturity, which measure either individual processes or process groups, while OPM3 has only one category. Additionally, CMMI-Services has five or six levels, depending on the representation, versus OPM3's four levels (Table 5).

Table 5: Comparison of CMMI-Services and OPM3 maturity levels

Maturity Level	CMMI-SVCS	OPM3
0	Incomplete or "not applicable"	
1	Performed or Initial	Standardized
2	Managed	Measured
3	Defined	Controlled
4	Quantitatively Managed	Improved
5	Optimizing	

Regarding the process areas themselves, the models are organized differently. OPM3 is organized by Domain, while CMMI-Services is organized by Categories, which are then further detailed into Processes, supported by Specific Practices. CMMI-Services' Specific Practices are equivalent to OPM3's Best Practices. It should be noted that OPM3 markets some 400+ Best Practices; however, analysis reveals that many of them are the same Practice, labeled with a different level of maturity. In many minds, this would appear to be "quadruple counting," as each Best Practice has four levels of maturity. For normalization and accuracy in measurement, the OPM3 Best Practices have been stripped of their duplications, and counted individually for accurate comparison. CMMI-Services does not duplicate their Specific Practices are ordered by functional process area. For reference, Appendices A and B contain the complete lists of OPM3 Best Practices and CMMI-Service Process Areas and Goals

Table 6: Comparison of CMMI-Services and OPM3 Categories and Process counts

CMMI-Service Categories	# of Specific Practices	OPM3 Domains	# of Best Practices
Project Management	77	Project	42
Service Establishment & Delivery	40	Program	49
Support	37	Portfolio	23
Process Management	28	Organizational Enablers	15
General Practices	16		
Totals	198		129

Interestingly, the models contain many of the same Processes and Practices, although labeled or categorized differently (see Appendices A and B). In this, there is no practical difference between the two models for Project Management Maturity. However, where the differences are apparent is in other Process Areas. OPM3 specifically focuses on the PMBOK Knowledge Areas, and PMI specialist domains of Program and Portfolio Management. CMMI-

Services includes other areas of a service organization beyond the Project functions, into to how services are delivered to customers, the support of services for customers, and the management of these processes. For an organization that is not just interested in improving or maturing their project management, this is a key differentiator. Added to CMMI-Services differentiating factors include the ability to adapt other CMMI models into the organization, such as CMMI for Acquisitions, CMMI for Software, and CMMI for People. PMI does not have such extensible models, as they are completely focused on their core business of Project Management.

What are the costs, resource and organizational culture requirements for implementation and ongoing support?

For government organizations, costs and resources are often the elements that provide the most debate on a project. These elements, especially in times of revenue declines will often kill a project before it has left the idea phase. While detailed cost and resource estimates were not readily available for this project, some basics were available for review. Table 7 provides more detailed information regarding costs for these models.

CMMI-Services materials are available for free, as are any CMMI products, including such items as training materials and assessment guides. This no-cost option is because the SEI, CMMI's developer is under contract for these materials by the Department of Defense, and these are considered to be "works for hire." Federal law requires certain deliverables paid for with federal funds to be made available to the public free of charge. This is also true of certain systems' source code. While the source code may be public domain (in this case the models are the source code), the actual implementation methods (in the case of software, this would be the compiler) are often not public domain. Adopters of CMMI would have to either have their own resources trained in CMMI Assessments, or would have to hire a certified assessor as a consultant. Training materials are free, but there is a cost for obtaining certification. Once

certified, consultants can charge market prices for their knowledge and services. CMMI does not require any minimum education or PM certifications for their model certifications. CMMI expects that organizations continue their assessments and maturity growth ad infinitum. Therefore, it should be assumed that if consultants were hired for the first assessment, consultants will be utilized for subsequent assessments.

OPM3 products are not free. As a private organization, PMI is free to charge what they feel is fair market value for their works. PMI charges for the OPM3 Knowledge Base, which is an introductory view of the model, itemizes the Best Practices, and provides a high-level assessment questionnaire. Anything beyond that, including the Capabilities that support the Best Practices requires additional purchase. Like the CMMI-Services model, the OPM3 has certified assessors that will provide consulting services to an implementing organization. Training is by paid course only, with a fee for the test. Once certified, consultants can charge market prices for their knowledge and services. It is unclear from documentation whether non-PMPs can obtain certification, but given PMI's track record of rigid certification progressions and OPM3 complete reliance on PMI knowledge domains, it is unlikely that non-PMI certified individuals could obtain training or certification on OPM3. Like CMMI, OPM3 expects that organizations continue their assessments and maturity growth ad infinitum. Therefore, it should be assumed that if consultants were hired for the first assessment, consultants will be utilized for subsequent assessments.

Regarding resources, neither model makes mention of levels of effort or suggested FTE requirements, either in role, skill or percent of time allocated to the project. Based on personal involvement in process improvement initiatives, the resources available for an initiative must be in scale with the level of effort, complexity and breadth of the initiative. Since each maturity

model is a "custom job," the resources required will be completely dependent on the scope of the initiative. Only one case study indicated how many FTE were on an implementation, Motorola, and that information was not especially helpful in determining resource requirements:

"As noted earlier, the MSG China CMMI® transition project began in December of 2003. It continued for 22 months through September of 2005. The total effort spent was approximately 17.6 staff years, which is about 1.1 percent of the Center's total engineering effort. Most of the effort, 60 percent, was spent on training for deployment. About 20 percent was used on process redesign, and 14 percent was devoted to appraisal activities. More than 92 percent of the employees received classroom training on the new MSG China software production process." (*Performance Results from Process Improvement, 2007*)

Researchers in the literature continually emphasize the importance of organization buy-in, and strong senior management support. This emphasis leads to the assumption that not only should senior management be actively involved in the project, but representatives from affected business areas should also be active participants in the maturity assessment and implementation.

Table 7: Costs, as available for CMMI-Services and OPM3

Item	OPM3(PMI, 2010)	CMMI-SVCS
Manual	\$95.65 from PMI.org	Free
Self-Assessment	Single User: \$95.65	Free
	Multi-User: \$4495.00	
	Product Suite: per consultant	
	Improvement Planning Directory:	n/a
Organizational Training	per consultant	Potentially free (cost if trainer hired, or attend course).
Consultant	not available	not available
Implementation	not available	not available
Maintenance	not available	not available
OPM3 Consultant Certification	\$4,925 (training, application & exam costs) enables certified person to be able to administer ProductSuite	not applicable

What outcomes could be expected?

Outcomes are not clearly proven via literature. However, the stated goals of each model seem reasonable when put under review against the practices that each model proscribes. If effectively and appropriately implemented, the practices should garner the expected outcomes of increased efficiency, decreased cost, increased time to market and improved product/project/service quality. As stated in the Literature Review of this study, there is little academic review. This lack of academic review is an opportunity for future study. Many of these entities enter into maturity projects without measurement tools in place. However, for those entities that do have some project management outcome measurements, the current measurements should be able to be incorporated into either model without impacting the measurements themselves. This will allow continuity of measurement for longitudinal success/failure studies.

What questions should government organizations answer when selecting a maturity model for their portfolio management?

Based on Colorado State Budget requests, government organizations should be focused on whether or not a particular meets their stated needs and desired outcomes for implementing a maturity model. Factors such as costs, and FTE resource requirements should also be considered. Strategic alignment of any project, particularly one as life-changing as a maturity model has the capability of being, should be a primary consideration. If the model does not "fit" with the organizations goals, mission, or operational functions, it should not be implemented. An example of a bad fit might be implementing OPM3 in a martial arts school or in a retail environment where Project Management is not really a function of the business. However,

CMMI-Services might be a better fit, as it provides process improvement abilities for other service industry functions, such as customer and product support, and service delivery.

What limitations might impact the effectiveness of a particular maturity model?

Of course, funding availability limits any project. However, given the process improvement nature of Maturity Models, it appears that the most significant limitations on effectiveness or success of a model implementation will be those same limiters of any process improvement initiative - lack of senior management involvement, lack of organizational buy-in and support of change, poor or non-existent process analysis and lack of knowledgeable resources. (Bannerman, 2008; GAO, 1997; Scholl, 2004) Additionally, if an organization only pursues one iteration of assessment, implementation and re-assessment the organization will not realize the fullest benefit of the selected model. Even if initially assessed at the highest maturity level, constant re-assessment allows the organization to adjust to changing priorities, business objectives, and customer needs.

What business drivers/ concerns does each model support and/or improve?

While containing some similarities, especially in the areas of Project Management and Organizational Abilities, CMMI-Services and OPM3 serve different clearly different clientele. OPM3 is best used in a primarily project oriented organization that is comfortable with the PMBOK methodology. OPM3 can be utilized in a non-software development environment. CMMI-Services appears to be better suited to organizations with several "core functions" that may or may not utilize PMBOK, and may wish to expand their maturity initiatives to other operational areas of their business, such as procurement or software development. While CMMI-Services can be utilized in non-software development organizations, its genesis in

software engineering is obvious by its structure and naming conventions (i.e. Configuration Management).

Table 8: OPM3 and CMMI-Services Product Comparison

Component	OPM3	CMMI-Services
Base Methodology	PMBOK	None
Approach	Strategic	Strategic
Domains	Project Management, Program Management, Portfolio Management	Project Management, Process Management, Service Delivery and Maintenance, Support
Representations	Single	Dual: Capability and/or Process Group
Maturity Levels	4 levels <ul style="list-style-type: none"> • Standardize • Measure • Control • Continuously Improve 	5 levels <ul style="list-style-type: none"> • Initial • Managed • Defined • Quantitatively Managed • Optimizing
Capability Levels	No separate levels	6 levels: <ul style="list-style-type: none"> • Incomplete • Initial • Managed • Defined • Quantitatively Managed • Optimizing
Marketed Outcomes	<ul style="list-style-type: none"> • Improved coordination between business strategy and execution of processes; • OPM3 Best Practices support the enterprise strategy; • Non-prescriptive, adaptable implementation is adaptable to organizational needs; • Organizational use of PMBOK is supported by OPM3 Best Practices • Best Practices and Capabilities cross functional boundaries, allowing comprehensive, enterprise view of processes. 	<ul style="list-style-type: none"> • Improve quality • Improve consistency of services • Reduce costs
Activity Structure	4 levels Best Practices>Capabilities >Outcomes >Key Performance Indicators	3 Levels Process Area>Specific Goal>Specific Practices
Organizational Focus	User Defined	User Defined
Industry Focus	None	Services

Extensibility	Not extensible to other domains	Extensible to Development, Acquisitions, and People
Duration	Assessment: 6-8 weeks Implementation: 12-24 months	Certification: Preparation - 6 months Certification Review - 5-7 days (external evaluators) Implementation: unknown
Costs	Internal Assessor - minimum is \$5200 for the development and training of an internal Certified OPM3 Assessor, plus materials External Assessor - substantial cost.	Marginal if performed internally, Substantial if external consultant procured.

Chapter 5 – Conclusions

When first started, the pre-conception of the Selection Tool to be presented was that a simple decision tree, or questionnaire would be able to suffice as a Selection Tool. Deeper review into the components of the two Maturity Models, and the associated knowledge areas (Project Management, Technology Selection, Business Process Improvement, Government Environment) reveal more complex factors that could not be addressed with a mere decision tree. Overall, the decision on which Maturity Model should be selected is determined largely based on how that model's goals and structure is strategically aligned with the organizations goals and structure. To this end, the selection tool has become a combination of a questionnaire with supplemental questions that will provide the organization with opportunity to truly think through their project, and the alignment, support, and resources required to have a successful implementation. This approach was chosen because of the complexity of the models and the individuality of each organization - there are too many variations to accommodate in a more sophisticated tool at this point in time. The Selection Questionnaire is presented in its entirety in Appendix D and discussed in this chapter.

Reviews of the ancillary components impacting Project Management Maturity Models - Project Management, Business Process Improvement, and Technology Selection - combined with knowledge of state government *modus operandi*, leads to several conclusions regarding the success criteria for projects of this type. Ultimately, a maturity model is a business process improvement endeavor, as the maturity model causes an organization to look deeply into its own eyes and evaluate the processes it uses to conduct business. These processes are analyzed for possible improvements which are implemented and then re-evaluated after a period of time. The process repeats as many times and as frequently as necessary.

Appropriate selection of technology is also critical to the success of a government agency. Implementation of a technology that does not meet the functional business needs of the organization, does not provide support to the goals of the organization, or costs too much will ultimately cause a breakdown in organizational processes. This breakdown will be either in processes and workarounds, work product quality, or in the case of costing too much, a lack of funds to bankroll other mission-critical projects. While not technically a "technology," Project Management Maturity Model selection can benefit from the same techniques utilized to determine whether an organization should invest in the new version of SQL Server, or if the organization should implement a web-based service to verify Vehicle Identification Numbers.

Throughout the literature, two clear success criteria emerged regarding successful business process improvement and technology selection projects. First and foremost, it is clear that while the functionality of the product is extremely important, it is more important that the product's functionality be highly aligned with the strategic direction of the selecting organization. This can be a challenge in state government environments, due to the high turnover of Executive Branch appointees, and the relative stability of the Legislative Branch. As a result of this churn, state agencies often receive new leadership teams at least every four years. Each new leader brings their own vision of how and what the organization should focus (strategy). Fortunately, maturity models accommodate this churn via the "re-assessment" mechanisms that are conducted periodically.

The second success criterion is that of leadership support. Numerous studies emphasize that organizational leadership (governor, agency director) must actively support the business process improvement project. Without such support, middle management and line staff are less likely to comply with new processes, documentation requirements, or measurement values. This

lack of compliance undermines the goals of the maturity project, and creates an environment in which improvement is not valued. Unfortunately, in state government, the routine executive level personnel churn makes attaining and maintaining active leadership support not only more challenging, but more critical to the agency's success.

Theresa Jones said it clearly - "CMMI means you are more likely to develop what is needed and do it right, rather than doing things that sound like a good idea and making a complete mess" of them (Huber, 2004). Unfortunately, the same can be said of implementing OPM3, albeit focused strictly on the execution of Project Management practices. It is apparent from the analysis of the two models, that the similarities in structure, content and purpose are much larger than the differences. Additionally, the requirements for success, and the implementation paths are also overwhelmingly similar. Overall, the selection of OPM3 over CMMI or vice versa comes down to a few essential questions

- How married is the organization to PMBOK?
- How much money is available to do the assessment and implement the model?
- What process(es) is the organization trying to improve?

Without the framework, and availability of guidance and comparisons, however, agencies have the challenge of recreating research and analysis with each instance of this project.

Selection Questionnaire

The questions are designed to help the decision-makers fully understand their organization and what they are attempting to accomplish. This tool should not be used in isolation, and should not replace an agency's fiduciary responsibility to understanding its projects, and expected outcomes. A review of each model should be conducted so that the

organization is making an educated and informed decision. The questionnaire can be completed during or after this model review. What this questionnaire obviates is the need for an in-depth analysis of each model by each organization, which can be very time and resource intense. In completing these questions, they should be able to determine which model would be more in line with their organization's hopes, goals, and functionality. In all there are 12 questions, comprising two functions -

- Determining the more appropriate model
- Providing "thinking" points for the project.

The first six questions deal with guiding the agency to the appropriate model for them. Table 9 provides the questions, and the guidance for interpreting the response. The questions and guidance were derived from analysis of the models, and are intended to guide the agency in determining what they hope to accomplish, combined with their current commitments (i.e., to PMBOK), processes and resources (funding and personnel).

Table 9: Selection Questionnaire, part one

#	Consideration	Reasoning / Interpretation
1	What formal Project Management methodology do you use?	While CMMI can utilize any PM methodology, OPM3 can only support PMI's PMBOK.
2	What level of funding do you have available for this initiative?	If you have zero or low funding, you should consider CMMI, as you can implement with no or little cost so long as you are comfortable with not obtaining CMMI "level certification."
3	Besides Project Management, are there other business processes that you want to improve or mature?	If there are, the types of processes you want to improve will provide insight into the model that will align better with your intent to improve. See question 3a for follow-up. If not, proceed to question 4. If all you want to improve is Project Management, either model will suffice.

#	Consideration	Reasoning / Interpretation
3a	What other processes are under consideration? (check all that apply)	<p>OPM3 provides maturity paths for the following processes: Program Management Portfolio Management CMMI provides capability/ maturity paths for the following processes: Acquisition / Procurement Software Development Service Delivery Configuration Management Support Services Process Management</p> <p>If the agency is strictly interested in Project, Program and/or Portfolio Management, OPM3 should be selected. However, just because an organization is interested solely in OPM3 topics does not mean it is not a software development entity.</p>
4	Are you able to contract this out, or handle in-house?	<p>If you are not able to contract out, you should consider CMMI, as with appropriate training (potentially free), you can conduct assessments and determine implementation paths on your own.</p> <p>This question helps the organization determine their resources. If they are not able to contract out their assessment (minimum), then they should highly consider CMMI, as the training materials are free of charge, it is only the "certification" that has financial costs associated with it. However, if the organization has the funds to purchase the OPM3 Product Suite, they can at least perform some of the assessment activities.</p>
5	Does your organization perform any software development?	<p>If so, you may want to consider CMMI, as it provides additional process maturity paths for Software (the original focus of CMMI). As mentioned above, the OPM3 does not focus on any processes other than PMBOK processes. This question is intended to make the organization think about parallel processes, and whether they should also mature those processes.</p>

The next six questions (Table 10) are designed to guide the agency in the initial planning and feasibility analysis.

Table 10: Selection Questionnaire, part two

#	Consideration	Reasoning / Interpretation
6	Do you have senior management support and organizational buy-in?	This is a feasibility question. If you do not have senior management support and organizational buy-in, studies indicate that your maturity project is likely to fail.
7	What is your expected ROI for this project? $\text{ROI} = \frac{\text{benefit} - \text{cost}}{\text{cost}}$	This is a project planning question. This guides the organization in thinking through the costs and benefits, in the hopes that they will be able to determine if this project will be of actual use to them rather than being a "boondoggle" or "pork" project. It should be noted that many government organizations do not ever have a positive ROI (nature of government), and that a negative ROI does not mean that the project is a useless waste of taxpayer funds; there may be mitigating reasons to move forward with the project, such as SROI values.
8	What SROI criteria or expectations do you have for this project?	This is a project planning question. This helps the organization determine whether or not they have non-financial expectations of return for this project. If sufficient enough, these SROI criteria may provide enough weight to override a negative ROI (question 7).
9	What are your organizational strategic goals related to Project Management?	This is a project planning question. This question is intended to see if the organization has conducted a strategic alignment assessment. If it has not, or cannot answer this question, the organization should conduct or re-evaluate its strategic alignment assessment.
10	What is your timeframe for achieving assessment and one maturity level improvement?	This is a project planning question. This question allows agencies to begin planning budgetary allocations, across fiscal years as necessary.
11	Do you have staff available that are trained and dedicated to this project?	This is a project planning question. This question allows agencies to begin planning resource allocations and personnel requests.

Regardless of which model is selected, the level of effort to assess and implement improvements is significant, and this study should re-emphasize that undertaking one of these projects should not be done without a full understanding of the selected model, and without significant backing top-down and bottom-up (from executive director to receptionist and vice versa). As with any project, a maturity project should also conform to the organization's strategic plan. Study after study has demonstrated that these factors will make or break a project, regardless of the good intentions, expected ROI or SROI, or project plan.

Future Research

There are several areas for future research of this topic, some of which address gaps in current academic literature. Others are questions that arose out of research, and one cannot overlook the need to assess the effectiveness and impact of the Selection Tool.

Conduct academically-based Case Study research on the implementations of OPM3 and CMMI-Services.

With the dearth of academic Case Studies for these Maturity Models, and the interest in modern organizations to implement them, it is incumbent on the academic community to conduct peer-reviewed analysis of the implementations, and the outcomes of these projects, including success and failure rates, lessons learned, costs, and resources. Without this, organizations are reliant upon the marketing materials provided by the proponents and creators of these Models.

Does it matter which PMM is selected?

With the advent of more maturity models, it is necessary to question whether or not one is more effective than another, or is the journey of process maturity more important than the path (model) taken?

Can organizations mature without implementation of a Maturity Model?

Is it possible for an organization to mature with the use of a maturity tool? Case studies reported by both OPM3 and CMMI indicated that there are highly mature organizations that were highly mature prior to their assessments (WPSC, Lockheed Martin). How did they become that mature without a Maturity Model, or were they using one and decided to switch. An evaluation of these initially highly mature organizations may shed some light.

Follow-up on Implementations that utilized the selection tool

Follow-up should be done on those organizations that utilized the selection tool to determine if the selection tool was effective in guiding the organization to appropriate tool. As part of that research, it should be asked if there was information in the selection tool that was not useful, or if there was information that would have been helpful, but was not available in the selection tool. If research demonstrates the need, the tool should be updated to incorporate lessons learned from its applications.

Did the use of SROI provide a positive or negative impact on the selection of the model?

This question goes to further support or debunk the science of SROI. Did the usage of SROI in selection provide unreasonable or misleading expectations of the selected model? If a positive SROI is a criterion in selection is it an accurate predictor of outcomes. In contrast, if a negative SROI is determined in planning and the project does go forward, are the outcomes reflective of that negative SROI.

How does the use of a model (in general, or a particular model) impact the effectiveness and accuracy of SROI calculations in prospective policy and/or project selection?

While this is more of a political science or social science question, it is a valid discussion in the IT world, as SROI is being considered an increasingly valid tool in technology selection

(consider business use of instant messaging or multiple monitors). This question arose during the evaluation of the SROI and especially when applied to government projects. Would the implementation of a model, and growth through that model improve the effectiveness or accuracy of SROI calculations?

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- e-gov. (2009). Regulations.gov. 2009, from <http://www.regulations.gov/search/Regs/home.html#home>
- GAO. (1997). *Business Process Reengineering Assessment Guide*. Retrieved. from.
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- PMI. (2004). *A Guide to the Project Management Body of Knowledge (3rd Edition ed.)*. Newtown Square, Pennsylvania: Project Management Institute, Inc.
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SEI (Ed.). (2009b). *CMMI for Services, Version 1.2*. Pittsburgh: SEI.

State of Colorado Office of Information Technology Website. (2010). 2010, from <http://www.colorado.gov/cs/Satellite/OIT-New/OITX/1205189512252>

USDHHS. (2008). Health Insurance Reform; Modifications to the Health Insurance Portability and Accountability Act (HIPAA) Electronic Transaction Standards; Proposed Rule, 45 CFR Part 162. *CFR*.

USDHHS. (2009). *Comprehensive Medicaid Integrity Plan of the Medicaid Integrity Group*. Retrieved 2/10/10. from <http://www.cms.gov/DeficitReductionAct/Downloads/CMIP2009-2013.pdf>.

USDHHS. (2010). *Medicaid Information Technology Architecture*. Retrieved 2/10/10. from <https://www.cms.gov/MedicaidInfoTechArch/>

Annotated Bibliography

Administrative Procedure Act. (1946)

This federal legislation provides for administrative rules of the federal government, especially the issuance of regulations. It should be noted that states have similar provisions.

American Recovery and Reinvestment Act of 2009, (2009).

ARRA, as this legislation is also called, was the economic stimulus package signed by President Barack Obama in February 2009. The primary impact to Medicaid agencies and healthcare providers from this legislation is the incentive programs related to Electronic Health Records and Health Information Exchanges.

Avila, O., Goepf, V, Kiefer, F. (2009). Understanding and Classifying Information System Alignment Approaches. *Journal of Computer Information Science, Fall 2009.*

This research provides a framework in which to classify IS alignment methods. This framework could be utilized to help organizations determine which alignment method most suits their needs and environment.

Bannerman, P. (2008). *Capturing Business Benefits from Process Improvement: Four Fallacies and What to do About them.* Paper presented at the International Conference on Software Engineering, Leipzig, Germany.

This paper identifies four myths about process improvement, and reminds organizations that not all BPI efforts have positive effects. Provides possible mitigations for these myths, including ensuring that there is buy-in and strategic alignment.

Box, G. (2009). Today in Science. Retrieved 12/28/2009, from

http://www.todayin的角度.com/B/Box_George/BoxGeorge-Quotations.htm

This website provides information regarding science concepts and significant scientists, including quotations.

Business Process Management Notation. (2009). from www.bpmn.org

This website is dedicated to the Business Process Modeling Notation (BPMN), developed and managed by the Object Management Group. BPMN expands on and standardizes the process and workflow patterns available within Visio, while offering guidance and instruction on the use of visual process notation.

C2P: The Colorado Consolidation Plan; State of Colorado Enterprise Architecture, Governance and Consolidation v1.95 (2008). Retrieved. from

http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-Disposition&blobheadername2=MDT-Type&blobheadervalue1=inline%3B+filename%3D528%2F82%2FColorado+Consolidation+Plan+C2P+1_24_08.pdf&blobheadervalue2=abinary%3B+charset%3DUTF-8&blobkey=id&blobtable=MungoBlobs&blobwhere=1191379490052&ssbinary=true

This document outlines the strategic consolidation plan for the Colorado Governor's Office of Information Technology, as required by SB08-155.

Caputo, K. (1998). *CMM Implementation Guide: Choreographing Software Process Improvement*. Boston: Addison-Wesley.

This book was designed to assist organizations in developing CMMI programs. The author uses corollaries to dance choreography in explaining concepts.

Children's Health Insurance Program Reauthorization Act, (2009).

This federal legislation re-authorized the State Children's Health Insurance Program, which is intended to cover children whose families do not qualify for Medicaid, but are under 200% of the Federal Poverty Limit. This legislation allows states to expand the income limits, potentially up to 250% of the Federal Poverty Limit.

Clinger-Cohen Act, (1996).

This federal legislation provides the basis for the GAO's Business Process Reengineering Assessment Guide. The legislation mandates standard methodology for purchasing of technology across multiple federal entities.

CODHCPF. (2010). *SFY2010-11 Budget Request - MMIS Adjustments*. Retrieved 2/10/2010. from

<http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1251618233805&ssbinary=true>.

This Budget Request provides the funding request for system and operational enhancement projects for the Medicaid Management Information System (MMIS), which is the federally mandated claims payment system for Medicaid

Colorado Healthcare Affordability Act, (2009).

HB09-1293, as this bill is also called, expands Colorado Medicaid populations to several new categories.

Concerning the Centralization of the Management of State Agency Information Technology Resources in the Office of Information Technology, and Making an Appropriation in Connection Therewith, (2008).

State of Colorado law mandating the consolidation of IT services within state government into a central governing body. Services to be consolidated include infrastructure (networks and data centers), project oversight, and technology purchases. This legislation is the authorizing agent for the C2P.

Crawford, L. (2006). Developing Organizational Project Management Capability: Theory and Practice. *Project Management Journal*, 37(3), 74-86.

This paper follows the story of Project Management capability from concept through implementation. Identifies the origins PM capability as an organizational capability in 1990s. Crawford discusses early recognition of the need for a maturity progression for this capability and its components.

- Creswell, A. (2006). *The role of public return on investment assessment in government IT projects*. Paper presented at the Proceedings of the 2006 international conference on Digital government research.
This was a paper/ poster presentation. The author suggests that there is a framework for ROI that can be used for public sector technology projects. The framework identifies development and benefit risks, direct and indirect benefits of the project, and downstream gains that may result from the project.
- e-gov. (2009). Regulations.gov. 2009, from <http://www.regulations.gov/search/Regs/home.html#home>
This website provides information regarding federal regulations. In addition, the site provides the text of regulations.
- GAO. (1997). *Business Process Reengineering Assessment Guide*.
This federal guidance provides federal employees with information on the how and why to perform an assessment prior to beginning any Business Process Reengineering initiative.
- Gartner. (2007). *Crawl Walk Run: Building Public Sector IT Portfolio Management Maturity*. Paper presented at the Project & Portfolio Management Summit.
This conference presentation by Gartner reviews the need for, benefits of, and organizational requirements for Portfolio Management by public sector entities. Gartner emphasizes the need for business-IT alignment, clear project selection criteria, and executive stakeholder buy-in.
- Gefen, D., Zviran, M, Elman, N. (2006). What Can Be Learned from CMMI Failures? *Communications of AIS*, 2006(17), 2-28.
This is a case study of an organization that implemented CMMI-SW, but did not realize enterprise wide success (measured as progressive maturity). Through interviews, the author identifies the causes of success or failure in growth. Analysis revealed differences in maturity could be attributed to both "line staff" buy-in and Software Development Life Cycle methodology. Title is perhaps a misnomer as the CMMI implementation didn't necessarily fail, only didn't go as far as they thought it would because of Agile methodology limitations.
- Harrison, M., Shirom, A. (1999). *Organizational Diagnosis and Assessment: Bridging Theory and Practice*. Thousand Oaks: Sage Publications.
This book provides guidance and techniques for diagnosing organizational problems, including several assessment techniques.
- Health Insurance Portability and Accountability Act of 1996, (1996).
This federal legislation includes Administrative Simplification regulations that require standardization of certain transactions and data elements used in health care transactions, as well as regulations regarding the privacy and security of personal health information.

This legislation generates has generated several projects that all entities must successfully complete.

- Huber, N. (2004). Development models underpin IT overhaul. *Computer Weekly*, 16-16.
This snippet from Computer Weekly magazine is the source for the Teresa Jones quote. The article discusses the purposes of ITIL and CMMI and their possible benefit, as follow-ups to announcements of ITIL and CMMI implementations in some organizations.
- Jemison, D. (1981). The Contributions of Administrative Behavior to Strategic Management. *Academy of Management Review*, 6(4), 633-642.
This old article reviews some theories about management, and reinforces that how managers act directly impacts the effectiveness of the organization they are in, as organizations should be viewed as open systems. Open systems reinforce themselves via internal feedback.
- Kearns, G., Sabherwal, R. (2007). Strategic Alignment Between Business and Information Technology: A Knowledge-Based View of Behaviors, Outcome, and Consequences. *Journal of Management Information Systems*, 23(3), 129-162.
This research paper analyzes six hypotheses surrounding the idea that business strategy and IT strategy must align in order to have successful projects. Authors used questionnaire of large companies, the results of which appear to support the hypotheses.
- Keil, P., Kuhrmann, M. (2006). *An Approach to Model the Return on Investment of Organization-Wide Improvement Projects Using the Concept of External Effects*. Paper presented at the International Conference on Software Engineering, Shanghai, China.
These authors present a new calculation for determining ROI. They expand the current model to include such project variables as process and architectural improvement savings, product quality, customer satisfaction with an end product and maintenance/upgrade costs. The model provides for a visual demonstration of opportunities and risks for a particular approach or investment based on these factors. An expansion or twist on Social Return on Investment.
- Kendra, K., Taplin, L. (2004). Project Success: A Cultural Framework. *Project Management Journal*, 35(1), 30-45.
This article focuses on the interrelationships between PM, the project team, methodology and measurement systems that affect project success. Reviews project success factors and proposes that organizational values (competencies, measurements, organizational structure and business processes) need to be aligned to achieve consistent project success and organizational maturity.
- Lee, L. S., & Anderson, R. M. (2006). An Exploratory Investigation of the Antecedents of the IT Project Management Capability. *e-Service Journal*, 5(1), 27-42.
Lee et al suggest that IT Project Management maturity and other factors support an organization's IT PM capability, and that capability is the base for the organization's IT capability. In other words, without significant IT PM capability, an organization's IT functionality/ capability will not be effective.

Leedy, P., Ormrod, J. (2005). *Practical Research Planning and Design* (8th Edition ed.). Upper Saddle River: Pearson Merrill Prentice Hall.

This textbook provides guidance on planning and designing research papers.

Lingane, A., & Olsen, S. (2004). Guidelines for Social Return on Investment. *California Management Review*, 46(3), 116-135.

These authors propose standards for calculating SROI within four categories - calculation construction, calculation content, calculation certainty, and continuity. They suggest that failure to adhere to the guidelines could provide an incorrect SROI result.

Performance Results from Process Improvement. (Case Studies)(2007). Case Studies). Rome, NY.

This newsletter provides CMMI case studies. The organization supporting this publication is the Department of Defense (DoD), which also supports the Software Engineering Institute (developer of the CMMI for the DoD).

PMI. (2004). *A Guide to the Project Management Body of Knowledge* (3rd Edition ed.).

Newtown Square, Pennsylvania: Project Management Institute, Inc.

This PMI book provides the details of the PMI's project management methodology. The newest version (4th Edition) is the basis for PMI's Project Management certification examinations.

PMI. (2008a). *OPM3 Case Study, AmeriHealth Mercy Family of Companies.*

This case study was sponsored by the creators of the OPM3 (PMI) to market the OPM3. The study describes a health care organization that utilized the OPM3 *ProductSuite* assessment tool to provide more information about its current state of PMO operations, and identify any areas for improvement.

PMI. (2008b). *Organizational Project Management Maturity Model (OPM3®) Knowledge Foundation - 2nd Edition: Project Management Institute.*

This book from PMI provides basic knowledge and manual assessment tools regarding PMI's OPM3 product. Further purchases from PMI and/or PMI certified consultants are required to complete user knowledge of OPM3, and obtain the full benefits of OPM3.

PMI. (2009a). *OPM3 Case Study: OPM3 in Action: Pinellas Turns Around Performance and Customer Confidence.*

This case study was sponsored by the creators of the OPM3 (PMI) to market the OPM3. The case describes a county IT division's path from poor project performance and a negative reputation to high performing projects and improved reputation via the use of OPM3.

PMI. (2009b). *OPM3 Case Study: OPM3 ProductSuite in Action: Savannah River Site: PMI.*

This case study was sponsored by the creators of the OPM3 (PMI) to market the OPM3. This case describes the usage and post-usage evaluation of PMI's OPM3 *ProductSuite* assessment tool in a waste treatment facility.

- PMI. (2010). PMI Business Solutions Pricing and Signup. 2010, from www.pmi.org/BusinessSolutions/Pages/PricingSignup.aspx
This is a webpage within PMI's website. The page outlines PMI direct costs for tools associated with OPM3 assessments. Because OPM3 Certified Assessors are independent consultants, their costs are not provided on this site; inquirers must contact the individual consultants to discover consultant pricing.
- Executive Order D-016-07: Improving State Information Technology Management, D-016-07 C.F.R. (2007).
This Executive Order from Colorado's Governor Bill Ritter, Jr was issued as a predecessor to SB08-155, and contains essentially the same language as that bill. The order provides additional authority to the Office of Information Technology, and mandates certain activities by that, and other, state agencies and offices.
- Scholl, H. (2004). *Current practices in e-government-induced business process change (BPC)*. Paper presented at the Proceedings of the 2004 annual national conference on Digital government research.
Scholl makes several propositions regarding internal and external stakeholder engagement, current-state assessment, training, and senior management support in e-government projects. He then compares private sector BPC projects with public sector projects to see if the hypotheses were true. Not all were, due to some vagaries in public sector environmental factors.
- Schwalbe, K. (2006). *Information Technology Project Management, Fourth Edition* (Fourth Edition ed.). Boston: Thomson Course Technology.
This textbook fully describes all of the processes and concepts of Third Edition of PMI's PMBOK.
- SEI. (2007). *Introduction to the Architecture of the CMMI Framework*. Retrieved July 30, 2009, from http://www.sei.cmu.edu/pub/documents/07_reports/07tn009.pdf.
This PDF provides explanations of the various CMMI models, and how they are structured. It also explains the relationships between the models. This is a free resource.
- SEI. (2009a). *Standard CMMI Appraisal Method for Process Improvement. CMMI*. from www.sei.cmu.edu/cmmi/index.cfm.
SCAMPI provides the CMMI assessor with the information and tools required to conduct an Assessment that can be utilized to inform CMMI Implementations and benchmarking efforts. SCAMPI, like all CMM tools is free of charge.
- SEI (Ed.). (2009b). *CMMI for Services, Version 1.2*. Pittsburgh: SEI. from www.sei.cmu.edu/cmmi/index.cfm.
This text is the meat of the CMMI for Services maturity model. The text details the maturity and capability model frameworks, as well as detailed information regarding each process and specific goals. This is a free resource.

State of Colorado Office of Information Technology Website. (2010). 2010, from <http://www.colorado.gov/cs/Satellite/OIT-New/OITX/1205189512252>

This website offers information related to the C2P, as well as project statuses from the Executive Governance Committees (EGCs) and methodology from the statewide Project Manager's User Group (PMUG).

USDHHS. (2008). Health Insurance Reform; Modifications to the Health Insurance Portability and Accountability Act (HIPAA) Electronic Transaction Standards; Proposed Rule, 45 CFR Part 162. *CFR*.

This is the proposed regulation for the HIPAA Transactions & Code Sets update that is driving system changes within Medicaid, as well as the rest of the healthcare industry.

USDHHS. (2009). *Comprehensive Medicaid Integrity Plan of the Medicaid Integrity Group*. Retrieved 2/10/10. from

<http://www.cms.gov/DeficitReductionAct/Downloads/CMIP2009-2013.pdf>.

This report from CMS outlines the agency's plans for complying with the Deficit Reduction Act requirements for enhanced Medicaid Program Integrity. Specifically, the report mentions the UPEP project as one of the ways in which the Medicaid Program will achieve reduced fraud, waste and abuse.

USDHHS. (2010). *Medicaid Information Technology Architecture*. Retrieved 2/10/10. from <https://www.cms.gov/MedicaidInfoTechArch/>

The MITA framework is a newer concept in Medicaid Program Administration and systems development. MITA combines a maturity model approach to Medicaid Business Processes with a Service Oriented Architecture approach to future systems.

Appendix A - OPM3 Best Practices

Process Name	Domain	OE #	Standardize	Measure	Control	Improve	OE Core Area
Capture & Share Lessons Learned	All	3030					PMIS & Knowledge Management
Perform Benchmarking to Improve Performance	All	3050					Benchmarking
Educate Executives	All	5180					Organizational Project Management Vision & Scope
Facilitate PM Development	All	5190					Competency Development
Provide PM Training	All	5200					PM Training
Provide Continuous Training	All	5210					PM Training
Provide Competent Organizational PM Resources	All	5220					Resource Allocation
Establish Internal PM Communities	All	5240					Organizational PM Communities
Interact with External PM Communities	All	5250					Organizational PM Communities
Integrate PM Methodology with Organizational Processes	All	5270					Organizational PM Methodology
Establish Common PM Framework	All	5280					Organizational PM Methodology
Establish Organizational Project Management Policies	All	5290					Organizational PM Policy & Vision
Establish Training & Development Program	All	5300					PM Training
Establish Executive Support	All	5340					Sponsorship
Recognize Value of PM	All	5490					Organizational PM Policy & Vision
Define PM Values	All	5500					Organizational PM Policy & Vision
Establish Career Path for all Organizational PM Roles	All	5620					Competency Management
OPM Leadership Program	All	7005					Organizational PM Policy & Vision
Educate Stakeholders in OPM	All	7015					Organizational PM Policy & Vision

				Vision
Cultural Diversity Awareness	All	7025		Organizational PM Policy & Vision
Establish Organizational Project Management Structures	All	7045		Organizational Structures
Adopt Organizational PM Structure	All	7055		Organizational Structures
Institutionalize the Organizational PM Structure	All	7065		Organizational Structures
Manage the Holistic View of the Project	All	7105		Organizational PM Policy & Vision
Manage the Environment	All	7115		Competency Management
Demonstrate Communication Competency	All	7185		Competency Management
Collect OPM Success Metrics	All	7325		PM Metrics
Use OPM Success Metrics	All	7335		PM Metrics
Verify OPM Success Metric Accuracy	All	7345		PM Metrics
Analyze & Improve OPM Success Metrics	All	7355		PM Metrics
PM Information System	All	7365		PMIS & Knowledge Management
Achieve Strategic Goals & Objectives through the Use of Organizational Project Management	All	7405		Strategic Alignment
Establish Project Manager Competency Process	OE	1430		Competency Management
Establish Organizational Project Management Policies	OE	1000		Organizational Project Management Policy & Vision
Staff Organizational Project Management With Competent Resources	OE	1400		Competency Management
Manage Organizational Project Management Resource Pool	OE	1410		Competency Management
Establish Strong Sponsorship	OE	1450		Sponsorship

Apply Project Management Processes Flexibility	OE	1460	Organizational Project Management Practices
Record Project Resource Assignments	OE	1590	Resource Allocation
Review Projects against "Continue or Terminate" criteria	OE	2160	Project Success Criteria
Benchmark Organizational PM Performance against industry standards	OE	2190	Benchmarking Individual Performance Appraisals
Use Formal Performance Assessment	Portfolio	1530	Organizational Project Management Techniques
Assess Confidence in Plans	Portfolio	3520	Organizational Project Management Techniques
Use Common Project Language	Portfolio	5170	Organizational Project Management Techniques
Certify Quality Management System	Portfolio	5320	Management Systems PMIS & Knowledge Management
Manage Portfolio Value	Portfolio	5660	Organizational PM Policy & Vision
Create an Organizational Maturity Development Program	Portfolio	6980	Strategic Alignment
Organizational Business Change Management Program	Portfolio	7035	PM Metrics
Define OPM Success Metrics	Portfolio	7315	PMIS & Knowledge Management
Intellectual Capital Reuse	Portfolio	7375	Organizational Project management practices
Adhere to Inter-Project Rules of Conduct	Program	1680	Organizational Project Management Practices
Adhere to Inter-Project Protocol Agreements	Program	3550	Competency Management
Assess Competency of Key Organizational PM Resources	Program, Portfolio		
Provide Organizational PM Support Office	Program, Portfolio	7075	Organizational Structures

Encourage Taking Risk	Project	3070	Organizational Project Management Techniques
Manage Related Projects	Project	3570	Organizational Project Management Practices
Customize PM Methodology	Project	5260	Organizational PM Methodology
Collaborate on Goals	Project	5520	Organizational PM Policy & Vision
Demonstrate Competency in Initiating a Project	Project	7135	Competency Management
Demonstrate Competency in Planning a Project	Project	7145	Competency Management
Demonstrate Competency in Executing a Project	Project	7155	Competency Management
Demonstrate Competency in Monitoring & Controlling a Project	Project	7165	Competency Management
Demonstrate Competency in Closing a Project	Project	7175	Competency Management
Demonstrate Leadership Competency	Project	7195	Competency Management
Demonstrate Managing Competency	Project	7205	Competency Management
Demonstrate Cognitive Ability Competency	Project	7215	Competency Management
Demonstrate Effectiveness Competency	Project	7225	Competency Management
Demonstrate Professionalism Competency	Project	7235	Competency Management
Integrate PM Across All Operations	Project, Portfolio	5390	Organizational PM Practices
Establish Mathematical Models for Planning	Project, Program	1630	Organizational Project Management Techniques
The Organization Management Self Development	Project, Program	7125	Competency Management
Estimating Template/Tools Established for Use Across	Project, Program	7305	Organizational PM Techniques

Organization

Portfolio Identify Components	Portfolio	4785	4795	4805	4815
Portfolio Categorize Components	Portfolio	4825	4835	4845	4855
Portfolio Evaluate Components	Portfolio	4865	4875	4885	4895
Portfolio Select Components	Portfolio	4905	4915	4925	4935
Identify Portfolio Risks	Portfolio	4940	5850	6360	6750
Portfolio Prioritize Components	Portfolio	4945	4955	4965	4975
Develop Portfolio Risk Responses	Portfolio	4970	5880	6390	6780
Balance Portfolio	Portfolio	4985	4995	5005	5015
Portfolio Authorize Components	Portfolio	5025	5035	5045	5055
Communicate Portfolio Adjustment	Portfolio	5030	5940	6450	6840
Analyze Portfolio Risks	Portfolio	5065	5075	5085	5095
Review & Report Portfolio Performance	Portfolio	5070	5980	6490	6880
Portfolio Monitor Business Strategy Changes	Portfolio	5080	5990	6500	6890
Monitor & Control Portfolio Risks	Portfolio	5140	6050	6560	6950
Initiate Program Process	Program	3120	3590	4000	4390
Develop Program Management Plan Process	Program	3130	3600	4010	4405
Plan Program Scope Process	Program	3140	3610	4020	4410
Develop Program Infrastructure Process	Program	3155	3165	3175	3185
Develop Program Schedule Process	Program	3190	3660	4070	4460
Manage Program Resources Process	Program	3200	3670	4080	4470
Estimate Program Costs Process	Program	3210	3680	4090	4480
Monitor & Control Program Performance Process	Program	3215	3225	3235	3245
Budget Program Costs Process	Program	3220	3690	4100	4490
Plan Program Risk Management Process	Program	3230	3700	4110	4500
Plan Program Quality Process	Program	3240	3715	4120	4510

Manage Program Issues Process	Program	3255	3265	3275	3285
Program Plan Communications Process	Program	3270	3740	4150	4540
Identify Program Risks Process	Program	3280	3750	4160	4550
Define Program Goals & Objectives	Program	3280	3315	3325	3335
Plan Program Risk Responses	Program	3310	3780	4190	4580
Plan Program Procurements Process	Program	3320	3790	4200	4590
Direct & Manage Program Execution Process	Program	3340	3810	4220	4610
Develop Program Requirements	Program	3345	3355	3365	3367
Program Distribute Information Process	Program	3370	3840	4250	4640
Develop Program Architecture Process	Program	3375	3385	3395	3405
Administer Program Procurements Process	Program	3400	3870	4280	4670
Report Program Performance	Program	3410	3880	4290	4680
Develop Program WBS Process	Program	3415	3425	3435	3445
Monitor & Control Program Scope Process	Program	3440	3910	4320	4710
Monitor & Control Program Schedule Process	Program	3450	3920	4330	4720
Monitor & Control Program Risks Process	Program	3480	3950	4360	4750
Close Program Procurements Process	Program	3490	3960	4370	4760
Close Program Process	Program	3500	3970	4380	4770
Manage Program Architecture Process	Program	3505	3515	3525	3535
Manage Component Interfaces Process	Program	3545	3555	3565	3575
Analyze Program Risks Process	Program	3605	3610	3625	3635
Conduct Program Procurements	Program	3655	3665	3675	3685
Establish Program Financial Framework Process	Program	3705	3715	3725	3735

Develop Program Financial Plan Process	Program	3745	3755	3765	3775
Monitor & Control Program Financials Process	Program	3805	3815	3825	3835
Identify Program Stakeholders Process	Program	3845	3855	3865	3875
Plan Program Stakeholder Management Process	Program	3885	3895	3905	3915
Engage Program Stakeholders Process	Program	3925	3935	3945	3955
Manage Program Stakeholder Expectations Process	Program	3965	3975	3985	3995
Plan & Establish Program Governance Structure Process	Program	4005	4015	4025	4027
Plan Program Audits Process	Program	4035	4045	4065	4075
Program Approve Component Initiation Process	Program	4105	4115	4125	4135
Program Provide Governance Oversight Process	Program	4205	4215	4225	4235
Manage Program Benefits Process	Program	4255	4265	4275	4285
Control Program Changes Process	Program	4305	4315	4325	4335
Program Approve Component Transition Process	Program	4355	4365	4375	4385
Develop Project Charter Process	Project	1005	1700	2240	2630
Develop Project Management Plan Process	Project	1020	1710	2250	2640
Project Collect Requirements Process	Project	1030	1720	2260	2650
Monitor & Control Project Work Process	Project	1035	1045	1055	1065
Project Define Scope Process	Project	1040	1730	2270	2660
Project Define Activities Process	Project	1050	1740	2280	2670
Project Sequence Activities Process	Project	1060	1750	2290	2680
Project Estimate Activity Durations Process	Project	1070	1760	2300	2690

Project Create WBS Process	Project	1075	1085	1095	1105
Project Develop Schedule Process	Project	1080	1770	2310	2700
Project Develop Human Resource Plan Process	Project	1090	1780	2320	2710
Project Estimate Costs Process	Project	1100	1790	2330	2720
Project Determine Budget Process	Project	1110	1800	2340	2730
Project Estimate Activity Resources Process	Project	1115	1125	1135	1145
Project Plan Risk Management Process	Project	1120	1810	2350	2740
Project Plan Quality Process	Project	1130	1820	2360	2750
Acquire Project Team Process	Project	1150	1840	2380	2770
Manage Project Team Process	Project	1155	1165	1175	1185
Project Plan Communications Process	Project	1160	1850	2390	2780
Project Identify Risks Process	Project	1170	1860	2400	2790
Project Perform Qualitative Risk Analysis Process	Project	1180	1870	2410	2800
Project Perform Quantitative Risk Analysis Process	Project	1190	1880	2420	2810
Project Identify Stakeholders Process	Project	1195	2005	2015	2025
Project Plan Risk Responses Process	Project	1200	1890	2430	2820
Project Plan Procurements Process	Project	1210	1900	2440	2830
Direct & Manage Project Execution Process	Project	1230	1920	2460	2850
Project Quality Assurance Process	Project	1240	1930	2470	2860
Develop Project Team Process	Project	1250	1940	2480	2870
Project Distribute Information Process	Project	1260	1950	2490	2880
Project Conduct Procurement Process	Project	1270	1960	2500	2890
Project Administer Procurements Process	Project	1290	1980	2520	2910
Project Report Performance Process	Project	1300	1990	2530	2920
Project Perform Integrated Change	Project	1310	2000	2540	2930

Control Process						
Project Control Scope Process	Project	1330	2020	2560	2950	
Project Control Schedule Process	Project	1340	2030	2570	2960	
Project Control Costs Process	Project	1350	2040	2580	2970	
Project Perform Quality Control Process	Project	1360	2050	2590	2980	
Project Monitor & Control Risks Process	Project	1370	2060	2600	2990	
Project Close Procurements Process	Project	1380	2070	2610	3000	
Close Project or Phase Process	Project	1390	2080	2620	3010	
Project Manage Stakeholder Expectations Process	Project	2035	2045	2055	2065	
Project Verify Scope Process	Project	1320	2010	2550	2940	
	175	71	103	103	103	483

Appendix B- CMMI-Services Processes and Practices

CMMI-Services Process Areas

Process Areas	Abbr	Category	Maturity Level	# of Goals	# of Practices
Project Monitoring & Control	PMC	Project Management	2	2	10
Project Planning	PP	Project Management	2	3	15
Requirements Management	REQM	Project Management	2	1	5
Supplier Agreement Management	SAM	Project Management	2	2	8
Service Delivery	SD	Service Establishment & Delivery	2	3	8
Configuration Management	CM	Support	2	3	7
Measurement & Analysis	MA	Support	2	2	8
Process & Product Quality Assurance	PPQA	Support	2	2	4
Organizational Process Definition	OPD	Process Management	3	1	7
Organizational Process Focus	OPF	Process Management	3	3	9
Organizational Training	OT	Process Management	3	2	7
Capacity & Availability Management	CAM	Project Management	3	2	6
Integrated Project Management	IPM	Project Management	3	2	10
Risk Management	RSKM	Project Management	3	3	7
Service Continuity	SCON	Project Management	3	3	8
Incident Resolution & Prevention	IRP	Service Establishment & Delivery	3	3	11
Service System Development	SSD	Service Establishment & Delivery	3	3	12
Service System Transition	SST	Service Establishment & Delivery	3	2	5
Strategic Service Management	STSM	Service Establishment & Delivery	3	2	4
Decision Analysis & Resolution	DAR	Support	3	1	6
Organizational Process Performance	OPP	Process Management	4	1	5
Quantitative Project Management	QPM	Project Management	4	2	8
Causal Analysis & Resolution	CAR	Support	5	2	5
Organizational Innovation & Deployment	OID	Support	5	2	7
			TOTALS	52	182

CMMI - Services General Practices, by Process Area

GP#	Description	CAR	CM	IPM	MA	OID	OPD	OPF	OT	PMC	PP	PPQA	QPM
2.1	Establish an Organizational Process												
2.2	Plan the Process											X	
2.3	Provide Resources											X	
2.4	Assign Responsibility											X	
2.5	Train People								X				
2.6	Manage Configurations											X	
2.7	Identify & Involve Relevant Stakeholders			X						X	X		
2.8	Monitor & Control the Process				X					X			
2.9	Objectively Evaluate Adherence												X
2.10	Review Status with Higher Level Mgmt									X			
3.1	Establish a Defined Process			X				X					
3.2	Collect Improvement Information			X				X	X				
4.1	Establish Quantitative Objectives for the Process												
4.2	Stabilize Subprocess Performance												X
5.1	Ensure Continuous Process Improvement						X						
5.2	Correct Root Causes of Problems	X											

Generic Goals are applied to specific Process Areas, not all PA's.

CMMI - Services Specific Goals, by Process Area

Process Area	SG	Description	# SPs
CAM	sg1	prepare for capacity & availability management	3
	sg2	monitor & analyze capacity & availability	3
CAR	sg1	Determine causes of defects & problems	2
	sg2	address causes of defects & problems	3
CM	sg1	establish baselines	3
	sg2	track & control changes	2
	sg3	establish integrity	2
DAR	sg1	evaluate alternatives	6
IPM	sg1	use the projects defined process	7
	sg2	coordinate & collaborate with relevant stakeholders	3
IRP	sg1	prepare for incident resolution & prevention	2
	sg2	identify, control & address incidents	6
	sg3	define approaches to address selected incidents	3
MA	sg1	align measurement & analysis activities	4
	sg2	provide measurement results	4
OID	sg1	select improvements	4
	sg2	deploy improvements	3
OPD	sg1	establish organizational process assets	7
OPF	sg1	determine process improvement opportunities	3
	sg2	plan & implement process actions	2
	sg3	deploy organizational process assets & incorporate experiences	4
OPP	sg1	establish performance baselines & models	5
OT	sg1	establish an organizational training capability	4
	sg2	provide necessary training	3
PMC	sg1	monitor the project against the plan	7
	sg2	manage corrective action to closure	3
PP	sg1	establish estimates	5
	sg2	develop a project plan	7
	sg3	obtain commitment to the plan	3
PPQA	sg1	objectively evaluate processes & work products	2
	sg2	provide objective insight	2
QPM	sg1	quantitatively manage the project	4
	sg2	statistically manage sub process performance	4
REQM	sg1	manage requirements	5
RSKM	sg1	Prepare for Risk Management	3
	sg2	Identify & Analyze Risks	2
	sg3	Mitigate Against Risks	2
SAM	sg1	establish supplier agreements	3
	sg2	satisfy supplier agreements	5
SCON	sg1	identify essential service dependencies	2

	sg2	prepare for service continuity	3
	sg3	verify & validate the service continuity plan	3
SD	sg1	establish service agreements	2
	sg2	prepare for service delivery	3
	sg3	deliver services	3
SSD	sg1	develop & analyze stakeholder requirements	3
	sg2	develop service systems	5
	sg3	verify & validate service systems	4
SST	sg1	prepare for service system transition	3
	sg2	deploy the service system	2
STSM	sg1	establish strategic needs & plans for standard services	2
	sg2	establish standard services	2
TOTALS	52		182

Appendix C – Example State of Colorado Budget Request

Link to the document: State of Colorado FY2010-11 Budget Request Cycle – Department of Healthcare Policy and Financing; Refinance Colorado Benefit Management System Improvements:

<http://www.colorado.gov/cs/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobkey=id&blobtable=MungoBlobs&blobwhere=1251606884659&ssbinary=true>

In the Word version of this thesis, click on image to open the full document

Schedule 13
Change Request for FY 2010-11 Budget Request Cycle

Decision Item FY 2010-11	Base Reduction Item FY 2010-11	Supplemental FY 2010-11	Budget Amendment FY 2010-11							
Request Title:	Robust Colorado Health Management System Improvement									
Department:	Health Care Policy and Financing									
Priority Number:	0112003	OSPR Approval:	Johy Bartholomew Date: January 4, 2010							
			Date: 1-4-10							
	1	2	3	4	5	6	7	8	9	10
	Prior Year Actual FY 2009-10	Appropriation FY 2010-11	Supplemental Request FY 2010-11	Total Revised Request FY 2010-11	Base Request FY 2010-11	Language Rate Reduction FY 2010-11	Revisions Request FY 2010-11	Budget Amendment FY 2010-11	Total Requested FY 2010-11	Change from Base FY 2010-11
Total of All Line Items	Total 1,857,057	5,496,100	(745,579)	3,745,521	2,863,370	0	2,305,100	(745,579)	1,245,124	-1
	FTE			0	0	50	0		0	0
	GF	438,148	3,068,390	(813,545)	3,178,710	0	1,411,149	(611,545)	318,715	0
	GR		0	0	0	0	0	0	0	0
	CF	3,011,272		0	0	0	0	0	0	0
	CFE/RF	1,005		0	5,516	0	0	0	5,516	0
	FF	341,653	1,967,840	(242,048)	2,067,445	0	1,531,840	(242,048)	220,194	-1
(I) Executive Director's Office	Total 1,005	1,488,377	(595,100)	0	2,905,040	0	1,446,000	(242,048)	0	0
(II) Information Technology Contracts and Projects	FTE		0	0	0	0	0	0	0	0
(III) Health Benefits	GF	1,005	1,488,377	(595,100)	0	0	1,433,260	(1,433,260)	0	-1
(IV) Management Systems Medical Assistance Project	CFE/RF			0	0	0	0	0	0	0
	CF			0	0	0	0	0	0	0
	CH/RF			0	0	0	0	0	0	0
	FF	6,270	1,967,840	(701,140)	0	0	1,250,340	(701,140)	0	0
(V) Indigent Care Program	Total 6,270	1,967,840	(701,140)	0	0	0	0	0	0	0
(VI) 57-CAM Children's Basic Health Plan Trust	FTE		0	0	0	0	0	0	0	0
	GF	1,626,162	3,900,000	0	2,910,000	0	0	1,626,162	2,910,000	0
	GFE			0	0	0	0	0	0	0
	CF	3,411,070		0	0	0	0	0	0	0
	CH/RF			0	0	0	0	0	0	0
	FF			0	0	0	0	0	0	0

Appendix D - Selection Questionnaire

#	Consideration	Answer	Interpretation/ Guidance
1	What formal Project Management methodology do you use?	<ul style="list-style-type: none"> a) PMI's PMBOK b) Homegrown c) None d) PRINCE2 e) Other 	While CMMI can utilize any PM methodology, OPM3 can only support PMI's PMBOK.
2	What level of funding do you have available for this initiative?	<ul style="list-style-type: none"> a) none b) less than \$50,000 c) less than \$250,000 d) more than \$250,000 	If you have zero or low funding, you should consider CMMI, as you can implement with no or little cost so long as you are comfortable with not obtaining CMMI "level certification."
3	Besides Project Management, are there other business processes that you want to improve or mature?	<ul style="list-style-type: none"> a) no b) yes 	If there are, the types of processes you want to improve will provide insight into the model that will align better with your intent to improve. See question 3a for follow-up. If not, proceed to question 4. If all you want to improve is Project Management, either model will suffice.
3a	What other processes are under consideration? (check all that apply)	<ul style="list-style-type: none"> a) Program Management b) Portfolio Management c) Acquisition/ Procurement d) Software Development e) Service Delivery f) Support Services g) Process Management h) Configuration Management 	<p>OPM3:</p> <ul style="list-style-type: none"> Program Management Portfolio Management <p>CMMI:</p> <ul style="list-style-type: none"> Acquisition / Procurement Software Development Service Delivery Configuration Management Support Services Process Management
4	Are you able to contract this out, or handle in-house ?	<ul style="list-style-type: none"> c) no d) yes 	If you are not able to contract out, you should consider CMMI, as with appropriate training (potentially free), you can conduct assessments and determine implementation paths on your own.

#	Consideration	Answer	Interpretation/ Guidance
5	Does your organization perform any software development?	a) no b) yes	If so, you may want to consider CMMI, as it provides additional process maturity paths for Software (the original focus of CMMI)
6	Do you have senior management support and organizational buy-in?	a) no b) yes	This is a feasibility question. If you do not have senior management support and organizational buy-in, studies indicate that your maturity project is likely to fail.
7	What is your expected ROI for this project? $\text{ROI} = \frac{\text{benefit} - \text{cost}}{\text{cost}}$	<write in>	This is a project planning question.
8	What SROI criteria or expectations do you have for this project?	<write in>	This is a project planning question.
9	What are your organizational strategic goals related to Project Management?	<write in>	This is a project planning question.
10	What is your timeframe for achieving assessment and one maturity level improvement?	a) 6 months b) 12 months c) 18 months d) 2 years or more	This is a project planning question.
11	Do you have staff available that are trained and dedicated to this project?	c) no d) yes	This is a project planning question.