ORGANIZATIONAL PROJECT MANAGEMENT MATURITY MODEL (OPM3) TO IMPROVE MINISTRY OF CONSTRUCTION AND HOUSING (MOCAH) WITHIN KURDISTAN REGIONAL GOVERNMENT

A Thesis

by

AZAD JABBAR MUSTAFA

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Chair of Committee,	John Walewski
Co-Chair of Committee,	Stuart Anderson
Committee Member,	Julian (Ho -Yeong) Kang
Head of Department,	Robin Autenrieth

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ABSTRACT

The Organizational Project Management Maturity Model (OPM3®), a standard developed by the Project Management Institute (PMI), has become an effective model to help an organization successfully implement strategies and achieve its objectives consistently, reliably, and predictably. This research studies the application of the OPM3 to assess the organizational project management capabilities of the Ministry of Construction and Housing (MOCAH) within Kurdistan Regional Government (KRG).

The research provides a review of a project management office (PMO), organizational project management (OPM), project management maturity (PMM), types of maturity models, previous applications/examples of OPM3 and their findings, and selecting the OMP3 model for the research case study (MOCAH). Furthermore, the research provides OPM3 concepts; elements, domains, processes, components, construct, and an application of the OPM3 assessment tool. A brief background of the Kurdistan Region and Kurdistan Regional Government and MOCAH is provided. A Strengths, Weaknesses, Opportunities, and Threats analysis was used to identify MOCAH's current structure and OPM performance that are not optimal to deliver projects successfully. Therefore, the objective of the research is to apply the OPM3 model to assess the current PMM of MOCAH and develop a roadmap for improvements.

The OPM3 assessment was conducted by an industry expert in collaboration with MOCAH stakeholders. Different questions and several questionnaires were posed to the stakeholders, and the results were used to assess the maturity level of MOCAH. The scope

of this research is limited to the Project Management Domain and to the Standardization level per the OPM3 methodology.

The result of the assessment showed that as scores (as percentages), Project Management was assessed at 25 percent (of the first of four stages of project management maturity, starting with standardization), and that the Organizational Enablers (OEs) pertaining to the culture and environment were scored at 38 percent; and the total score was 32 percent.

According to the results, the maturity level of MOCAH was determined to be low, yet MOCAH is capable of seizing the opportunity to transform its project delivery capabilities. Significant recommendations are provided regarding process improvements (focusing on Standardization as the prerequisite for Measurement, Control, and Continuous Improvement), as well as strategies to achieve higher maturity levels (first in Standardization of Project Management, but also in the Program and Portfolio Management Domains, particularly the latter).

DEDICATION

To my parents, wife, and children,

To the brave men and women Peshmerga,

To the Kurds and Kurdistan

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NOMENCLATURE

ASTTMM:	Automated Software Testing Maturity Model
BP:	Best Practice
CMMI:	Capability Maturity Model Integration
EVM3:	Earned Value Management Maturity Model
IPD-CMM:	Integrated Product Development Capability Maturity Model
IPMA:	International Project Management Association
IPMM:	Information Process Maturity Model
ITI-MM:	Information Technology Infrastructure Maturity Model
KPIs:	Key Performance Indicators
KRG:	Kurdistan Regional Government
MOCAH:	Ministry of Construction and Housing
OEs:	Organizational Enablers
OPM:	Organizational Project Management
OPM3:	Organizational Project Management Maturity Model
OPMM:	Organizational Project Management Maturity
P2MM:	PRINCE2 Maturity Model
P3M3:	Portfolio, Program and Project Management Maturity Model
PBO:	Project Based Organization
P-CMM:	People Capability Maturity Model
PEM:	Project Excellence Model

PMI:	Project Management Institute
PMIS	Project Management Information Systems
PMM:	Project Management Maturity
PMMMs:	Program Management Maturity Models
PMO:	Project Management Office
PPP:	Project, Program, and Portfolio
RMM:	Risk Management Maturity Model
SAM:	Self-Assessment Module
SE-CMM:	Software Engineering Capability Maturity Model
SEI:	Software Engineering Institute
SIMM:	Service Integration Maturity Model
SMCI:	Standardize, Measure, Control, continuously Improve
SW-CMM:	Capability Maturity Model for Software
SWOT:	Strengths, Weaknesses, Opportunities, and Threats
TMM:	Testing Maturity Model for Quality Assurance
TQM:	Total Quality Management

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1. INTRODUCTION

1.1 Research Overview

The dynamic condition of the industry environment increases the competition among organizations and thereby increases more challenges for any organization to sustain and obtain its strategic objectives. Therefore, it is essential for organizations to adopt project management concepts as a strategic tool to achieve its objectives. The roots of modern project management were recognized in the Second World War (Morris Peter WG 1994), and developed in a limited number of engineering based industries during the 1950s, 1960s and 1970s (Cooke –Davies and Arzymanowe, 2003). Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements (The Project Management Institute [PMI] (2008)). It can also be defined as a general purpose management process that can bring projects to successful completion and to the satisfaction of the project stakeholders (Hutson, 1997).

Establishing the Ministry of Construction and Housing (MOCHA) in the Kurdistan Regional Government (KRG) of Iraq was a significant step to fulfill the local demands of projects in the region. Development projects in the developing countries are generally focused towards infrastructure development, transportation, irrigation and agriculture (Muspratt, 1987). MOCAH emphasizes reconstruction and development of infrastructure in two main types of projects; housing and transportation (Ahmed, K., MOCAH Minister, 2013). Due to the destructive and harmful policies of Iraqi governments through several decades, the Kurdistan Region suffered from serious problems regarding the infrastructure

projects. Therefore, since its establishment in 2004, MOCAH was tasked to face many challenges due to the enormous urgent infrastructure development and construction requirements. Accordingly, as a new organization in a developing country, MOCAH faces a growing need to reorganize its organizational departments “to provide better performance incentives to their public officials (Kulshreshtha, 2008)”. Within MOCAH, as a public organization, it is common to realize “the lack of knowledge and awareness of the new tools & techniques in the growing field of project management, which results potential failure of the project with respect to scope, time and cost management (Sonuga, et al, 2002)”.

To enhance the project management performance within MOCAH, “project management maturity level must be high (Jammuldin. R et al 2010)”. According to previous research, an organization should determine the project management maturity assessment process as an effective approach for delivering projects successfully. To optimize the organization’s current structure and project management performance, a maturity model is required to assess MOCAH’s current status regarding its organizational project management maturity. Previous research and case-studies document different types of project management maturity models including:

- Capability Maturity Model/Integration (CMM)/(CMMI)
- Organizational Project Management Maturity Model (OPM3)
- PRINCE2 Maturity Model (P2MM)
- Program Management Maturity Model (PMMM)
- Portfolio, Program and Project Management Maturity Model (P3M3)

- Project Excellent Model.

Based on the functionality of the above maturity models, this research selected the Organizational Project Management Maturity Model (OPM3) as an effective and suitable model to assess MOCAH's project management maturity. The reason for selecting the OPM3 model was because this model is more adaptable for MOCAH, as a project–based organization (PBO), than other models. Furthermore, the OPM3 is flexible and scalable for the assessment process for most of organizations regardless of types, sizes, complexity, and geographic location and it helps most organizations, no matter into which level of age or maturity the organization is (PMI OPM3 Knowledge Foundation 2013).

Given the proprietary nature of the OPM3 assessment process, John Schlichter, a founder of OPM Experts LLC, assisted in conducting the assessment in collaboration with MOCAH stakeholders.

Due to limitations and constraints of the research and MOCAH's challenging conditions, the research scope is limited to assess the maturity of MOCAH in Project Management Domain and to the Standardization level on the process improvement stage.

1.2 Research Problem Statement

The physical destruction and harmful policies of Iraqi governments have undermined the infrastructure in Kurdistan Region. MOCAH is tasked to answer the enormous urgent infrastructure development and construction requirements, but is challenged by organizational and project management issues including:

- Lack of organizational and project strategies,
- Insufficient budget, and
- Poor quality controls.

Due to the lack of effective assessment and organizational project management performance, the current structure and operational procedures of MOCAH is not optimal to successfully deliver current and future infrastructure needs of the Kurdistan Region.

1.3 Research Questions

This research aims to answer the following questions:

- What is the current status and structure of MOCAH's project management office (PMO)?
- Where is the current location of MOCAH on the continuum of organizational project management maturity model (OPM3)?
- How does MOCAH stand in comparison with OPM3 concepts?
- How to utilize OPM3 knowledge, techniques, tools, and practices to improve MOCAH in different levels of process improvements stage and project management domains?

1.4 Research Objectives

The research aims to incorporate OPM3 standards and practices as a roadmap to enhance MOCAH's organizational project management capabilities by:

- The assessment of MOCAH's organizational project management processes and its current organizational project management maturity status.
- Use the results of the assessment to develop an effective roadmap for improvements, which in turn, allows MOCAH to deliver successful, predictable, and reliable projects.

1.5 Research Scope

The research is limited in scope to assess the project management maturity of MOCAH in the Project Management Domain and the Standardization level of process improvement stages of OPM3.

1.6 Research Methodology

The objective of this research was to assess the level of MOCAH's maturity in terms of project management performances utilizing the OPM3 model. For this purpose, the research has started with a literature review of PM, PMO, PBO, Project, Program and Portfolio management, OPM, maturity concept, types of maturity models, and selecting OPM3 as the model for the research case study "MOCAH". Furthermore, the research provided a comprehensive overview on OPM3 concepts, elements, domains, components, construct, and assessment tools (Self-Assessment Method (SAM) and ProductSuite). In addition, the research provided a brief background of the Kurdistan Region, the KRG, and MOCAH including a SWOT analysis to recognize the strengths, weaknesses, threats, and opportunities as a general review of MOCAH's environment.

To conduct the OPM3 assessment process, MOCAH worked with John Schlichter, the originator of OPM3 on PMI's behalf, to carry out the assessment process.

The first step was to apply the **SAM** tool, which included several questions about MOCAH's strategic objectives, the factors that can push MOCAH to achieve its goals, and the potential risks that may hinder MOCAH to bridge between its strategies and objectives.

In the second step, the **OPM3 ProductSuite** tool was applied by delivering questionnaire/surveys to the stakeholders. The questionnaire included a number of questions regarding; Best Practices of Standardization of Processes, and Organizational Enablers (OEs) as documented in Appendix A.

After analyzing the results of the assessments steps (**SAM and ProdcuctSuite**), the OPM3 assessor provided significant recommendations for further studies/research to facilitate the execution of project management maturity agendas and to create project management capability fitting MOCAH's unique requirements and contingency factors.

Figure 1 shows the research framework which illustrates the processes of how to incorporate OPM3 concepts into the process of assessment and improvement of the Kurdistan Regional Ministry of Construction and Housing (MOCAH-KRG). The framework starts with identifying the research problem, defining research objectives, and providing research literature review. In addition, the research framework shows the data collection process by providing an overview of OPM3 concepts, a brief background of KRG and MOCAH (including SWOT analysis), and other information provided by MOCAH stakeholders. Furthermore, the framework shows the data analysis process which includes the interaction between the OPM3 expert and MOCAH stakeholders to conduct the OPM3 assessment. Finally, the results of the data analysis (OPM3 assessment) were determined and the conclusions and recommendations were developed based on the results.

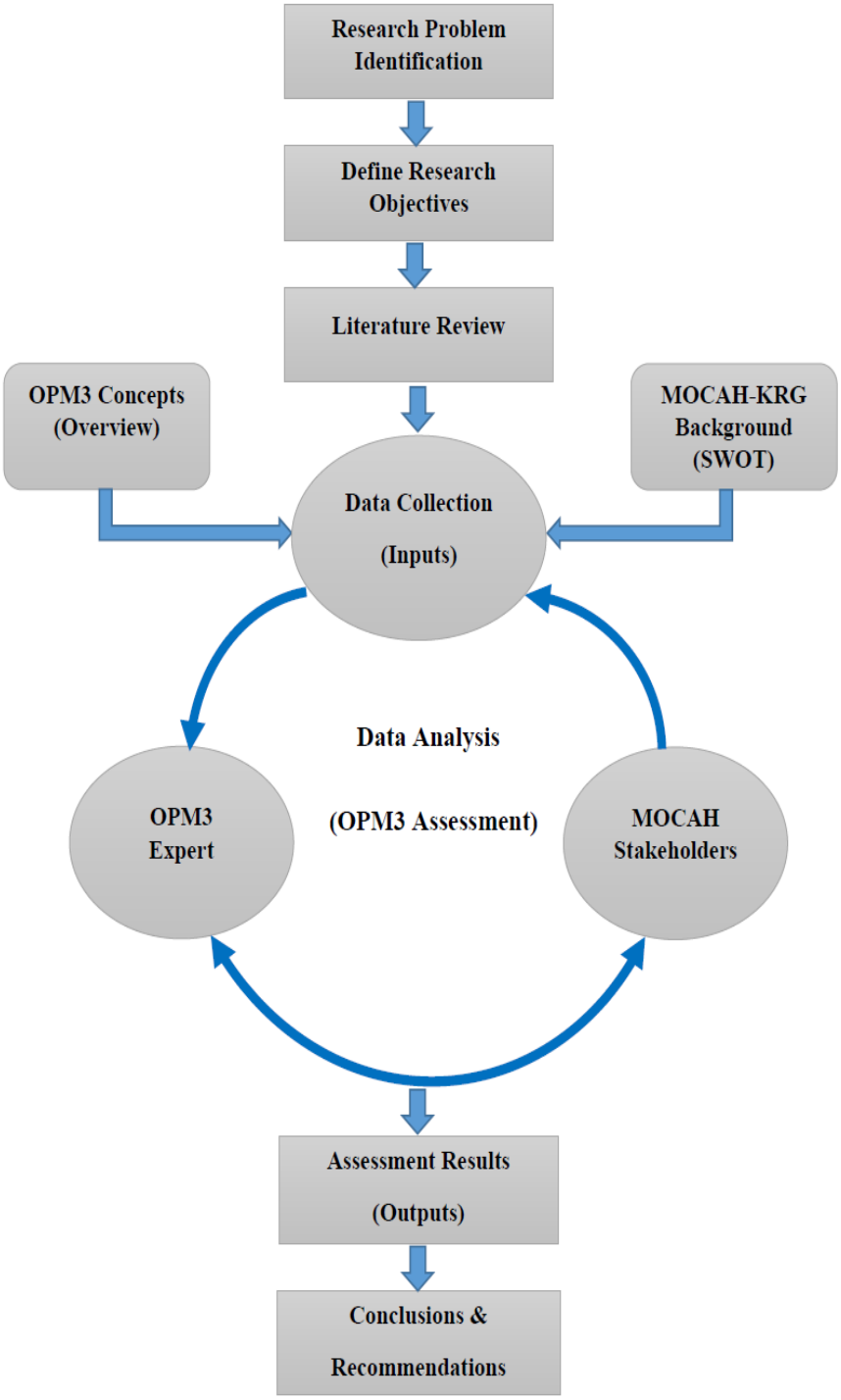

Figure 1. Research Framework

1.7 Research Limitations/Constraints

A variety of factors limited the extension of this research and/r constrained the scope as in follows:

1. Time limitations constrained the scope of the research to cover only the Project Management domain and Standardize level within the process improvement rubric of OPM3 (SMCI), which was appropriate to MOCAH (as proved by the assessment scores) and precedes and invites more research analyses and studies to cover (Program and Portfolio Management Domains) and other levels of the process improvements stages (SMCI) in the future.
2. Lack of awareness and practice of project management and maturity knowledge in MOCAH when this study was conducted.
3. Lack of prior research studies on organizational project management maturity practices.
4. Unstable political status in the Kurdistan Region which impacted on the process of gathering data about MOCAH and other relative KRG's organizations.
5. Lack of available and reliable data concerning the concepts of project management maturity within MOCAH.
6. Poor information technologies to facilitate an effective communication between MOCAH stakeholders and the OPM expert caused delays and impacted the assessment process.

1.8 Research Organization

Section 1

Section 1 of the research includes the research problem statement describing the current issues within MOCAH regarding PM performance and practices. Also this section provides the main questions and the research objectives that the research aimed to answer. The scope of the research, research significance/contributions, research methodology, and research constraints and limitations were included in this section.

Section 2

Section 2 provides the literature review on PM, PMO, PBO, Project, program and Portfolio Management, maturity concepts. This section discuses different types of maturity models and select OPM3 among those models for the research case study (MOCAH) assessment. The section also discusses previous examples/case studies on OPM3 and their findings.

Section 3

Section 3 provides a comprehensive understanding of OPM3 concepts including OPM3 elements, domains, processes, components, construct, and OPM3 assessment tools.

Section 4

Section 4 provides a brief background of the Kurdistan Region and KRG. Furthermore, this section presents a SWOT analysis of MOCAH.

Section 5

Section 5 discusses the OPM3 assessment process of MOCAH by conducting both SAM and ProductSuite assessments. In addition, this section provides the analysis of the collected data conducted by the OPM3 expert that surveyed MOCAH stakeholders. Finally, this section discusses the findings of the assessment process.

Section 6

This section provides the conclusions and recommendations that are based on the results of the assessment process conducted in Section 5. Recommendations for further research are also discussed.

2. LITERATURE REVIEW

2.1 What is a Project?

A project is a series of multi-functional activities and tasks that have a specific objective to be completed within certain specifications, defined start and end dates, funding limits, and consume human and non-human resources (Kerzner, 2009). It is also defined as ‘a temporary endeavor undertaken to create a unique product, service, or result (PMBOK Guide, 2013)’.

A project can be defined as “an endeavor in which human, material and financial resources are organized in a novel way, to undertake a unique scope of work, of given specification, within constraints of cost and time, so as to achieve beneficial change defined by quantitative and qualitative objectives (Turner and Muller, 2003).

According to Meredith and Mantel a project is “a specific, finite task to be accomplished” (Meredith and Mantel 2009). While The Office of Government Commerce (OGC) defines a project within the PRINCE2 framework as “a temporary organization that is created for the purpose of delivering one or more business products according to an agreed Business Case” (OGC, 2009). Projects are defined as “a locus of attention for strategy implementation and organizational and project learning (Pemsel et al 2014).

From the literature above, it can be understood that each project has its parameters as time, cost, scope, schedule and quality. In addition, each project has its specific resources and limitations/constraints such as: definite start and deadline, specific allocated budget, human resources with variety of skills and knowledge, tools and mechanism,

technologies, materials, regulations and laws concerning the environmental and safety aspects, and finally , but importantly, the shareholders/customers satisfaction. These factors almost always differ from one project to another and significantly impact on project type, size, and complexity. Therefore, different projects need different scenarios of project management processes to achieve project objectives.

2.2 What is Project Management?

Due to the dynamic nature of projects in terms of type, size, and complexity, project managers face continuous challenges in terms of uncertainties in the industry environment, financial conditions, political aspects, technological improvements, and availability of work force and materials for the projects. These uncertainties create different scenarios for project managers to select and perform an optimal approach in managing their projects through the project life cycle in which the projects' outcomes align with the organization's objectives. Therefore, understanding project management knowledge has become the key and essential requirement.

From the literature review of the history of project management, it can be found that "for centuries, project management basically has been used to create change or deal with change in societies", however, in 1950s, project management was recognized formally as a "distinct contribution arising from the management discipline" (Cleland and Gareis, 2006).

The project management evolution has started as a management philosophy limited to a few functional areas and considered as a nice thing to have, however, to

survive, many organizations within the firm consider project management as being mandatory and project management has become an important field of study in many colleges and universities (Kerzner 2009).

For many organizations, in order to satisfy the different needs of application areas within a variety of industries and organizations, many organizations adopt project management as an important means to characterize, define, and understand this field to emphasize strengths, bases, and development (Bredillet, 2006).

According to Roland Garies (1994), there are two main approaches of project management based on the way in which projects are perceived; first, traditional method-oriented project management approach which is based on the perception of projects as tasks with special characteristics, and second; systematic and process-oriented project management approach which is based on the perception of projects as temporary organizations and as social systems. Project management can be defined as "the discipline of planning, organizing and managing resources to bring about the successful completion of specific project goals and objectives" (Chatfield, 2007).

The PMI, under its publication (PMBOK Guide 5th edition 2013), defines project management as "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements". Also, the PMI PMBOK Guide defines the project management process groups as:

- Initiating,
- Planning,
- Executing,

- Monitoring and Controlling, and
- Closing.

In addition, the PMBOK Guide identifies the project management areas of knowledge as follows:

- Project Integration Management,
- Project Scope Management,
- Project Time Management,
- Project Cost Management,
- Project Quality Management,
- Project Human Resource Management,
- Project Communication Management,
- Project Risk Management,
- Project Procurement Management, and
- Project Stakeholders Management

Furthermore, it is significant for organizations to identify, plan, manage, and control each of the areas of project management knowledge (PMBOK Guide, 2013).

2.3 Organizational Project Management (OPM)

Organizational Project Management (OPM) is the systematic management of projects, programs, and portfolios in alignment with the achievement of strategic goals (PMI OMP3 Knowledge Foundation, 2003).

OPM is a strategy execution framework utilizing project, program, and portfolio management as well as organizational enabling practices to consistently and predictably deliver organizational strategy producing better performance, better results, and a sustainable competitive advantage (PMI, PMBOK Guide, 2013).

OPM integrates the knowledge of (project, program, and portfolio) management, organizational strategy (mission, vision, objectives, and goals), people (having competent resources), and processes (the application of the stages of process improvement) (PMI OPM3 2013).

2.4 Project Management Office (PMO)

The continuous change in the industry environment creates more challenges for organizations to survive and gain profit within dynamic competitive environment. For that, organizations should implement different polices to gain competitive advantageous. Different policies develop organizational changes within the organizational structure and organizational context. The significant way to solve issues associated with these changes is to establish/embed an effective entity within dynamic organization structure which is known as Project Management Office (PMO) entity (Aubry et al 2010).

Since 1990s, PMO has become a significant and common phenomenon in project management that many organizations are interested in to improve and sustain as specialized organizational entity (Hobbs and Aubry 2007).

Dai and Wells (2004) noted that despite adapting project management process within organizations, many projects fail due to lack of strong project performance,

therefore, the key solution is establishing project management office. The PMO, also known as a center of excellence/experts, is defined as an organizational entity necessity to support project managers, teams and different management levels within the organization in successfully implementing project management concepts, tools, and techniques (Dai and Wells, 2004).

According to the PMI PMBOK Guide (2013), “PMO is a management structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques.”

PMO can refer to (Portfolio, Program, or Project) management office and can be defined as “an organizational body assigned with various responsibilities related to the centralized and coordinated management of those projects under its domain.” (PMI OPM3 Knowledge Foundation 2013). The range of PMO responsibilities can be “from providing project management support functions to actually being responsible for the direct management of one or more projects.” (PMBOK 2013).

To keep the consistency and alignment between the projects and programs with the organization’s objectives, a PMO can take a delegated role as an essential stakeholder to decide on significant actions regarding the organization’s projects (PMI OMP3, 2013).

Based on PMBOK Guide 2013, a PMO’s primary function is to support project managers in many different ways, such as; developing and managing shared documentation (project policies, procedures, and templates); coaching, mentoring, training, and oversight; Managing shared resources across all projects administered by the PMO; and coordinating communication across projects (PMBOK Guide, 2013).

From previous researches and descriptive surveys, posed to number of organizations regarding the existence of PMOs, the value of PMOs for organizations is often debatable (Gorshkova E., 2011), as in the following examples;

- 42% of the respondents confirmed that the relevance or even the existence of the PMO been seriously questioned in their organizations in recent years (Hobbs et al, 2007).
- 60% of respondents claimed that the value of PMO being argued by the senior management, project/program managers, or customers (ESI International, 2011).
- 41% of respondents from non-PMO staff found role fulfilment by PMOs in their organizations moderately good or poor (ESI International, 2011).

Based on the degree of control and influence that PMO has on projects within the organizations, there are several types of PMO structures; supportive, controlling, and directive in which each type has its own role, deliverables, the service provided to projects, and the degree of controlling the projects (PMBOK Guide 2013) which can be illustrated as in Table 1.

Table 1. Types of PMO Structures

PMO Type	PMO Role	PMO Deliverables	PMO Service	PMO Degree of Control
Supportive	Consultative	- Templates, - Best practices, - Training, - Access to information, and - Lessons learned from other projects.	Project repository	Low
Controlling	Controlling PMOs	- provide support and require compliance (PM frameworks or methodologies) through various means, - using specific templates, forms and tools, or conformance to governance.	Project Controls	Moderate
Directive	Directing PMOs	Directions of projects	Directing project controls	High

2.5 Types of Organizations

Organization's ability to deliver projects successfully is influenced by the organizational structure which determine the communication requirements, responsibilities, and management reporting structure (PMI PMBOK Guide, 2013). To manage a project, a company or authority has to set up a project organization, which can supply the resources for the project and service it during its life cycle (Lester A, 2006). Kerzner defines three types of organizations as; project-driven, non-project-driven, and

hybrid organizations (Kerzner, 2001). While Lester classifies these types as; functional, matrix, and project or task force (Lester A, 2006).

The PMI PMBOK Guide (2013) explains the three types of the organizations as follows:

a) **Functional organization**: is an organizational structure with different departments that are independent from each other in implementing the project assigned to each department. Each employee has one clear superior in the organization hierarchy and the team members are assigned by their specialty at the top level for different divisions such as engineering, production, marketing, and accounting.

b) **Matrix organization**: has characteristics between the functional and projectized organizations, and relatively it can be classified as weak, balanced, or strong depending on the level of power and influence between managers of functional and projectized organizations. The more projectized characteristics the matrix organization has, the stronger the matrix organization is and vice versa. While the balance matrix is in between depending on the project management needs of the power and authority of project managers to balance between the coordination and administration of the projects.

c) **Projectized organization**: is an organizational structure with different departments in which team members are co-located and can report either to the project manager or support services to the various projects. The project manager has a great deal of authority and independence. The co-located teams are well

collaborative and communicated to obtain the project teams objectives successfully.

2.6 Project-Based Organizations (PBOs)

This research emphasizes on PBO type to deal with its case study MOCAH as project-based organization for the assessment and analysis processes. PBO, as explained in the previous section, is one of the organizational structures that organizations have depending on the organizational management characteristics regarding to the power, authority, and independence of project managers across the organization's departments/divisions.

Based on some studies, the PBO is preferable among many organizations rather than the functional and matrix organizations assuming that PBO is more suitable for organization management in terms of "increasing product complexity, fast changing markets, cross-functional business expertise, customer-focused innovation and market, and technological uncertainty." (Hobday 2000).

According to PMI PMBOK Guide 2013, PBOs is defined as "a variety of organizational forms that involve the creation of temporary systems for the performance of projects. PBOs conduct the majority of their activities as projects and/or provide project over functional approaches." PBOs emphasizes on projects rather than functional approaches to conduct the majority of their activities to provide more advantages that other types of organizations. PBOs manage portfolios and resources in a way that ensure high level of integration, effective communication, more project emphasis (PMI OPM3, 2013).

PBO is considered as the ideal type of project organization by which the project manager has complete control over every aspect of the project (Lester 2006).

2.7 Portfolios, Programs, and Projects

A portfolio refers to a collection of projects, programs, subportfolios, and operations managed as a group to achieve strategic objectives (PMI PMBOK Guide, 2013). Programs consist of subprograms and individual projects that are managed with better performance and outcomes than if these projects are managed individually. The projects within a portfolio may not be included to any programs but are linked to the strategic plan of the organization's portfolio. Therefore, the relationship between the programs and projects may not necessarily be interdependent or directly related, however, they are linked to the strategic plan of the organization's portfolio (PMI PMBOK Guide. 2013). Figure 2 illustrates the relationships between portfolios, programs, and projects.

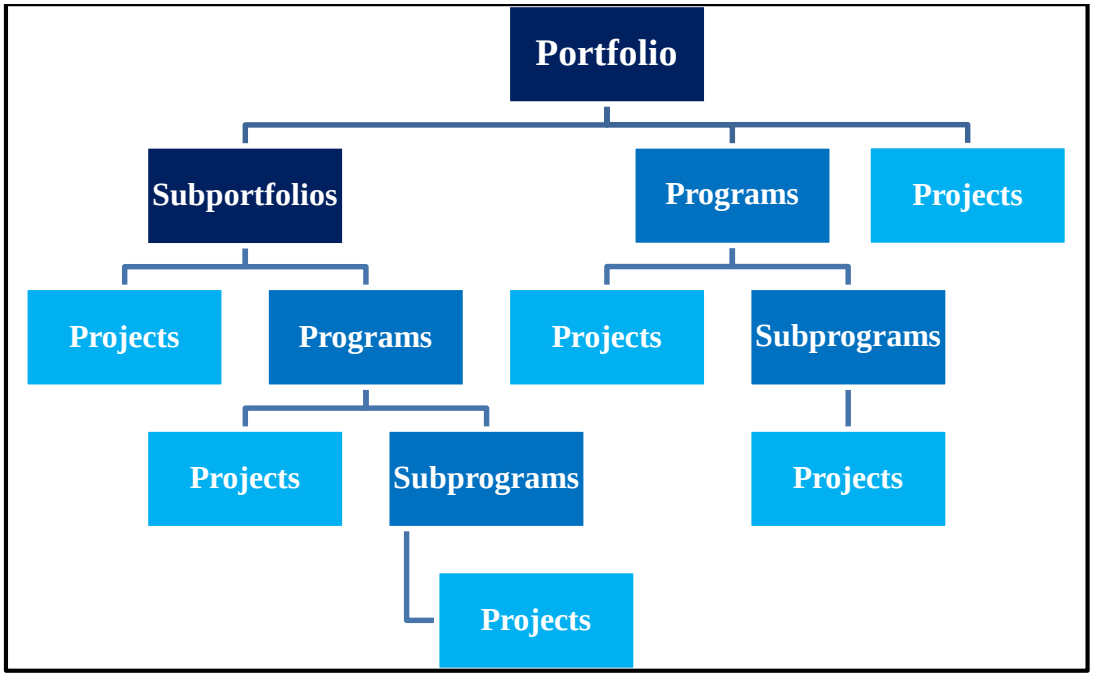

Figure 2. The Relationships between Portfolios, Programs, and Projects
(Modified from PMI OPM3, 2013)

2.8 Maturity Concept and Definition

As the industry environment has seen dramatic change recently and become more complex, the application of management skills, tools, approaches, techniques, and technologies become imperative for organizations to increase their efficiency and productivity. Many organizations nowadays expanded its range of activities to deal with more than one project to increase its return of investment. In order to sustain and compete within the dynamic competitive business industry, they improved their organizational project management continuously to fulfill its strategic objectives.

Therefore, to obtain this significant objective, it has become critical for organizations to continuously assess its organizational management performance by repeatedly evaluate, measure, standardize, and conduct improvements processes for better future. By proceeding these imperative steps, the organization can assess its maturity in terms of project management performance. Accordingly, organizations need to have a clear understanding of maturity concept.

Many resources (dictionaries and researches) have defined the "maturity" word in different ways and perspectives. For instance, the word maturity is defined as "the state or conditions of being mature, ripe, fully developed, and approaching perfection" (Webster's dictionary) and having reached the most advanced stage in a process" (the Oxford Dictionary of English Dictionary (ODE 2010), in other words maturity is the quality or state of being mature.

A maturity is defined as "an amalgam of education, ability, confidence and willingness to take responsibility." (Lester 2006). In general, the concept of maturity, has been the subject of a tremendous number of studies, and this concept evolved into what is now known as maturity (Dinson, 2003). To define the maturity to an organization, it can be refer to a perfect state of the organization to achieve its objectives (Walker et al., 1995).

Maturity is also defined as one of the organizational life cycle phases. In Kerzner project management maturity model (PMMM), the maturity is the fifth (last) phase of the life-cycle phases for project management maturity, which are: "Embryonic Phase, Executive Management Acceptance Phase, Line Management Acceptance Phase, and **Maturity** Phase" (Kerzner 2009). In addition, Kerzner defines project management

maturity as maturity as the development of systems and processes that are repetitive in nature and provide a high probability that each project will be a success.

While in the PMI OPM3 model, the organizational maturity phase is located as the third phase between four phases as: “Birth or Startup, Growth, **Mature Operation**, and Decline or evolution.” (PMI OPM3, 2013), and the PMI defines the maturity concept as “the degree to which an organization practices organizational project management”.

On the other hand, the PMI OPM3 defines the maturity “through the existence of best practices” in which a best practice is “an optimal way currently recognized by industry to achieve a stated goal or objective” (PMI, 2003).

The project management maturity is the sophisticated level of an organization which indicates the current organization’s project management performance, processes, and practices (Ibbs and Kwak 2000).

Furthermore, project management maturity is the progressive development of an enterprise-wide project management approach, methodology, strategy, and decision-making process (International Journal of Business Administration 2006).

For any organization to deliver successful projects it is critical to understand the organizational project management maturity (OPMM) as “the level of an organization’s ability to deliver the desired strategic outcomes in a predictable, controllable, and reliable manner.”(PMBOK Guide, 2013).

The maturity level has become an indicator to organization’s performance and efficiency. Based on (Pennypacker, 2002) studies, 30% of mature organizations showed more than 25% improvement when compared to less mature organizations. Accordingly,

it can be concluded that the higher the maturity levels of an organization, the better its performance in all observed areas (Pennypacker and Grant ., 2006).

According to a study conducted by PricewaterhouseCoopers (PWC), 200 respondents reported an average maturity score of 2.5, furthermore, the findings concluded that the percent of the companies that wished to increase their maturity level was 60% and 71% for those who wanted to increase their level by more than one step (Oforil and Deffor, 2013).Grant and Pennypacker (2006) conducted a survey of 126 organizations from different industries, the results showed that the median project management model level is to 2 out of 5 with respect to 36 of the 42 components analyzed. Accordingly, maturity concept has become a significant process for many organizations seek higher performance and efficiency to manage their projects successfully with the desired outcomes.

On the other hand, (Andersen and Jessen, 2003), mentioned that there is no fully matured organization in the real world that has achieved the highest level of developments and no one will.

Organizations attempt and desire to have higher level of maturity, however, the process to achieve any desired level of maturity needs the implementation of effective and suitable standard methodology and processes “such that there exists a high likelihood of repeated successes.” (Kerzner, 2009), in other words, the process requires the implementation of structured approach, known as **“Maturity Model”**. (Andersen and Jessen, 2003).

2.9 Maturity Models

A “maturity model” is a conceptual framework that describes the characteristics of effective processes in areas as diverse as strategic business planning, business development, systems engineering, project management, risk management, information technology (IT) or personnel management (PMI OPM3, 2008).

Project Management Maturity models (PMMMs) provide a systematic means to perform benchmarking and hence are adding considerable value to contemporary organizations (Korbel and Benedict, 2008). Previous researches referred the roots of maturity concepts to the Total Quality Management (TQM) movement in which the results of applications of the statistical process control techniques showed that in any maturity improvement process :1) the variability in the process is reduced, and 2) the process performance is increased (Cooke-Davies and Arzymanowe, 2003).

As the modern maturity models, the Software Engineering Institute (SEI) of Carnage-Mellon University between 1986 and 1993 (Schlichter J. 2003) developed the Capability Maturity Model (CMM) (which has improved later to CMMI) to obtain the objectives through continuum improvements by improving the quality of the software development processes (Paul et al., 1993).

Previous studies showed that there are many types of maturity models that are developed according to different functions and applications of project management maturity processes. According to Kohlegger et al (2009), there are over 70 different maturity models that have different characteristics, therefore, it is significant to have clear

understanding of each model before developing or revising it (Kohlegger et al., 2009, cited by Karim, S.B.A. et al., 2014).

(Karim, S.B.A. et al., 2014) explained that there are 25 examples of maturity models that are used for the assessment and improvement project management performance within different organizations and companies, as follows:

1. Automated Software Testing Maturity Model (ASTMM),
2. Capability Maturity Model for Software (SW-CMM),
3. Capability Maturity Model Integration (CMMI),
4. Configuration Management Maturity Model,
5. Earned Value Management Maturity Model (EVM3),
6. Information Process Maturity Model (IPMM),
7. Integrated Product Development Capability Maturity Model (IPD-CMM),
8. IT Architecture Maturity Model,
9. Information Technology Infrastructure Maturity Model (ITI-MM),
10. IT Service Capability Maturity Model (IT Service-CMM),
11. Operations Maturity Model (OMM),
12. Organizational Project Management Maturity Model (OPM3),
13. Outsourcing Management Maturity Model,
14. People Capability Maturity Model (P-CMM),
15. Performance Engineering Maturity Model (PEMM),
16. Portfolio, Program and Project Management Maturity Model (P3M3),
17. Program Management Maturity Model,

18. Project Management Maturity Model (PMMM),
19. Service Integration Maturity Model (SIMM),
20. Risk Management Maturity Model (RMM),
21. Software Engineering Capability Maturity Model (SE-CMM),
22. Software Reliability Engineering Maturity Model,
23. Testing Maturity Model for Quality Assurance (TMM),
24. Web Services Maturity Model, and
25. Website Maturity Model.

Different project management maturity models (PMMMs) are due to different sectors, scope, levels, self-assessed, facilitator-led, and accreditation for each model applied by different organizations with different business activities (Montero G., 2013). This means that not all PMMMs are the same and not applicable for all companies, organizations, and firms. Some PMMMs are applicable for software institutes, others for human capital.

Organizational Project Management Maturity Model (OPM3) which is developed by Project Management Institute (PMI), is one of the effective and instrumental PMMMs. This research has selected OPM3 as the best PMMM that can be more applicable to conduct the assessment processes and desired improvements for the research case-study the Kurdistan Region Ministry of Construction and Housing (MOCAH-KRG). In the next chapter, the OPM3 model is explained in detail to provide clear understanding of the OPM3 concepts before incorporating the model into the assessment process and future improvements for MOCAH.

3. OPM3 CONCEPTS

3.1 Introduction

For any organization to survive, sustain, and keep on track, it is essential to manage the potential changes within the organizational structure (internal changes) and the industry environment (external changes). The internal change has become an imperative to fulfil the organizational strategic objectives in alignment with the value interests of variety of disciplines and stakeholders within the organization. Conversely, the external changes are inevitable due to dynamic competitive environment of the industries, in which other competitors continuously attempt to gain a competitive advantage to face possible challenges that may increase the potential threats to the organization.

For successful outcomes from the change management processes, organizations should implement its strategy successfully, consistently, and predictably, and one of the best ways to achieve this goal is to adopt an appropriate standard/model, such as Organizational Project Management Maturity Model (OPM3).

In this chapter, the research provides an overview of OPM3 including the OPM3 concepts and definition, the history of OPM3, benefits of OPM3, examples of OPM3 application, OPM3 elements, OPM3 domains, OPM3 processes, OPM3 construct, and OPM3 assessment tools and processes.

3.1.1 What is OPM3?

The Project Management Institute (PMI) defines OPM3 as “an acronym for Organizational Project Management Maturity Model, and it is a standard developed under the supervision of the PMI.” (PMI OPM3, 2003). This standard is an instrumental means to help organizations to recognize its organizational management and to assess its organizational project management maturity depending on identified best practices. OPM3 is an effective way to “bridge the gap between the organizational strategy and successful projects (PMI OPM3 Knowledge Foundation, 2003).

The OPM3 program aims to support organizations to improve the capabilities that strengthen the enterprise-wide processes used in the domains of Portfolio, Program, and Project management within the organization in alignment with the strategic objectives (Kevin P. Grant and James S. Pennypacker, 2006). OPM3 is a significant means to increase the performance within organizations through a positive relationship between organizational project management and the performance of the participants in the project.

Incorporating OPM3 into organizational project management processes transforms the portfolio, program, and project domain processes into high-quality that are well understood, repeatable and predictable (PMI OPM3, 2003). Comparing OPM3 with other PMMMs, the PMI indicated that OPM3 is more flexible and scalable than other models in which any organization can adopt it, regardless of types, sizes, complexity, geographic location, age, maturity, and other factors (PMI OPM3, 2013).

This means that OPM3 model can be applied for any domain of Project, Program, or Portfolio (PPP) management and to any level of the process improvements stages;

Standardization, Measurement, Control, and Continuous Improvements (SMCI) (PMI, 2013).

3.1.2 The History of OPM3

The history of OPM3 started in 1998 as a story of a team established by the PMI, in which hundreds of unpaid volunteers from variety of professionals across the world joined the process to put the first cornerstone to develop an international standard. The Capability Maturity Model (CMM), developed by the SEI, was the common maturity model at that time, and the PMI standards teams determined developing such standard and even better. This standard was considered by the PMI's team as the first of its kind based on several characteristics that may distinguished this standard/model from other PMMMs. According to (Schlichter, J. et al. 2003), some of these characteristics are:

- The OPM3 standard can help organizations to assess and improve their project management as well as the capabilities necessary to achieve organizational strategies through projects,
- The OPM3 standard as a PMMM to set standard for excellence in project PPP management best practices and explain the capabilities necessary to achieve these best practices.
- Widespread participation from more professionals across industries and geographies than any other initiative to develop a maturity model to date.

In 1999, John Schlichter became the Program Director of the OPM3 Program after he joined the PMI Standards Member Advisory Group (Standards MAG). He assembled

a core team called as the “Guidance Team” which was grouped from 800 of volunteers across 35 countries to participate in the program and they spent between four to five years to create the OPM3 standard (Schlichter, J. 2009).

The program’s mission was to develop a maturity model that provides methods for assessing and developing capabilities that enhance an organization’s ability to deliver projects successfully, consistently, and predictably in order to accomplish the strategies of the organization and improve organizational effectiveness. The leadership’s vision was to create a broadly and willingly validated maturity model that is recognized internationally as the standard to develop and assess PM Capabilities within any organization (Schlichter, J. et al., 2003).

The PMI research teams identified 27 PMMMs, accordingly, seventeen sub-teams were formed to review a representative selection of those models. Based on the results of sub-teams research, the OPM3 leaderships at the PMI found that there are questions left unanswered by the existing models regarding project management maturity. Therefore, the OPM3 would significantly benefit PMI’s stakeholders. The main objective of the research was to develop best practices in project, program, and portfolio management. These best practices were defined as Capability Statements and Outcomes Statements.

In the earlier stages of emerging OPM3 standard, the **Self-Assessment Module (SAM),** (as known as **OPM3 Online** assessment tool), was used by many organizations and companies for assessment OPMM. However, the SAM (OPM3 Online) was no more used because of some problems, as Schlichter mentioned:

- The users of OPM3 Online tool had to answer about 150 questions including project, program, and portfolio management at the same time which could not be emphasized on a specific area required to be assessed and improved.
- OPM3 Online questions only allowed simple “Yes” or “No” answers which could not give partial credit for partially implemented best practices.

Therefore, the second OPM3 assessment tool was developed as (**OPM3 ProductSuite**). This tool is more flexible and applicable than the OPM3 Online tool and it helps the organization to determine actual maturity per the Capability-Outcomes of the OPM3 Standard. Thus, select specific area for assessment and improvement without conducting the process through the entire areas of project management improvements across the organization.

The PMI has published the first edition of OPM3 standard as “Project Management Maturity Model (OPM3) Knowledge Foundation in 2003, the second edition in 2008, and the third edition in 2013. In these publications, the PMI incorporated the knowledge from its most famous publication of Project Management Book of Knowledge Guide (PMBOK Guide), which has five versions/editions (the 1st edition was published in 1987, and the 5th in 2013).

The OPM3 standard helps organizations to improve organizational project management for project, program, and portfolio by translate strategy into successful outcomes in a consistent and predictable manner through its three key elements;

1) Knowledge element,

2) Assessment element, and

3) Improvement element

3.1.3 What Does OPM3 Do?

(PMI OPM3, 2003) indicated that OPM3 application effectively supports organizations to increase its efficiency and PM performance by:

- Integrating the cooperative knowledge of the OPM community from a varied assortment of businesses and different locations,
- Recognizing and forming generally accepted and proven OPM practices,
- Support organizations to evaluate its current maturity and how to step for higher level of maturity in the future,
- Developing a framework to assess organization's practices compared to OPM3 Best Practices,
- Developing a guideline based on the assessment results to guide organizations to achieve further improvements, and
- Supporting organizational decision making to be ready for any potential changes.

3.1.4 OPM3 Benefits

OPM3 application significantly benefits organizations, senior management, and participants in the PM processes through wide range of benefits (PMI OPM3, 2013) as in the followings:

- Enhance the relationship between organization strategy and project execution,

- Deliver projects predictably and reliably,
- Increase organization efficiency,
- Improve PM performance,
- Increase productivity,
- Increase profitability,
- Decrease cost and rework,
- Increase market share,
- Improve customer satisfaction and,
- Provide competitive advantage.

3.1.5 OPM3 Purpose

The main purpose of OPM3 is to ensure that:

- The organization carries out the right projects and allocates resources properly,
- There is a clear understanding of the linkages between strategic vision, the initiatives that support the vision, and the objectives and deliverables to be achieved by portfolios of programs and projects, and
- The stakeholders' interests are aligned with market demands.

3.2 OPM3 Previous Case Studies (Examples)

Before implementing any new approach, tool, or standard, it is crucial for the organization to conduct comprehensive studies/researches to validate the existent

standards, approaches, and tools based on the findings of previous similar case studies. Therefore, the organization's managers should determine whether their organization can carry out the process or not by undertaking some important steps as follows:

- Recognize the background of other organizations (case studies) to be compared with the organization,
- They should identify the main reasons that stood behind the application of the desired approach by those organizations, and
- Evaluate the available alternatives to select the best one based on the results of the previous examples.

Therefore, it is significant for MOCAH managers to recognize and identify the previous results that other organizations achieved after implementing OPM3 approach in there organizational project management processes to assess and improve the OPMM.

Through the literature review of OPM3 conducted by this research, there were several of organizations and industries from different countries around the world applied OPM3 standard. They found OPM3 as an effective approach to assess their organizations' current project management maturity and utilized OPM3 as a significant framework for continuous improvements in the future.

Some examples, as in Table 2, are given in this research to explain the application of OPM3 and its results in terms of the assessment and improvements processes for organizational project management maturity. Furthermore, the research illustrates the OPM3 improvement cycle to help organizations how to prepare for assessment processes,

perform assessment, plan for improvements, implement improvements, and repeat the process for continuous improvements.

Table 2. Examples of OPM3 Application by other Companies

#	Name of the Company/ Case Study	Reference
1	The Washington Savannah River Co. (WSRC), Headquartered in Boise, Idaho, USA.	OPM3® CASE STUDY OPM3® ProductSuite in Action: Savannah River Site. http://opm3online.pmi.org
2	Shanghai Airport Authority	Application of Organizational Project Management Maturity Model (OPM3) to Construction in China: An Empirical Study, "2008 International Conference on Information Management, Innovation Management and Industrial Engineering" http://www.researchgate.net/publication/232629214
3	Honk Kong MNCs	OPM3 In Honk Kong MNCs. http://www.knowledgecentury.com/download/opm3_050607_hkcs.pdf
4	IProcure Systems Inc. (ISI),	Organizational Project Management Maturity Model (OPM3): A Case Study "Sanjay Desai, GE Corporate, USA; Jakov Crnkovic, University at Albany (SUNY), Albany, New York, USA; E- Peter Ross, University at Albany (SUNY), Albany, New York, USA; http://www.irma-international.org/viewtitle/33338/
5	Siemens Corporate Technology	Accelerating Organizational Project Management Maturity At Siemens. http://www.mundopm.com.br/eventos/ipemac/ppt/kevin05.pdf

Table 2. Cont'd

#	Name of the Company/ Case Study	Reference
6	Ministry of Interior, Kingdom of Saudi Arabia	Transforming the Project Management Culture within the Ministry of Interior Kingdom of Saudi Arabia http://www.opmexperts.com/opm3_national_security.pdf
7	Ambithus, Lisboa, Portugal	Project Management Institute (PMI), Organizational Project Management Maturity Model (OPM3) © 2013 – Third Edition
8	Mapna Special Projects Construction, Iran	Project Management Institute (PMI), Organizational Project Management Maturity Model (OPM3) © 2013 – Third Edition

In the following sections, the research provides detail about two of these examples explaining the company background, problems and challenges, solutions, and the assessment results.

3.2.1 Example 1: The Washington Savannah River Co. (WSRC).

3.2.1.1 Background

With more than $3 billion in annual revenue and around 24,000 people, Washington Group headquartered in Boise, Idaho, USA. It has multiple projects around the world in variety of projects; power, defense, oil and gas processing, environmental management, industrial facilities, transportation and water resources. Its subsidiary the Washington Savannah River Co. (WSRC), has been selected as the first pilot project volunteer.

The leaders of the company has step toward achieving a strategic goal to align business results with the organization strategy through internal initiatives driven by project managers. To achieve this goal, OPM3 standard and OPM3 ProductSuite was conducted.

In March 2006, the process was started by forming a team of four trained persons, trained under PMI Certified OPM3 Assessor certification program. The main objective of the process was to assess the OPMM by incorporating OPM3 ProductSuite methodology and tools, and thereby evaluate the findings of the assessment process (PMI OPM3, 2006).

3.2.1.2 Challenges

Technical, scope management, cost and schedule, difficulty in achieving best practices in traditional project areas, and inappropriate to apply PM to general operational tasks were addressed as the main challenges for WSRC to apply PM principle to improve efficiency and meet strategic goals.

3.2.1.3 Solutions

To solve these problems/challenges, the assessment team employed OPM3 methodology to support WSRC analysis of its OPMM and how to apply PPP management principles (knowledge, skills, tools, and techniques) and best practices to obtain its objectives. However, there were some barriers that restricted the robustness of the assessment and impacted the scope of the assessment, such as; limited time for the assessment, limited number of assessors to conduct the assessment, and the available version of OPM3 ProductSuite was under development at the assessment. Accordingly,

the process scope included the stages; (standardize, measure, control, and improvement) and two domains of OPM3; (project management and program management) but excluded the portfolio management domain (PMI OPM3, 2006).

3.2.1.4 Results

The maturity degree for WSRC, in general, was very high and the results of the assessment can be illustrated as in Table 3.

Table 3.Assessment Results for WSRC

#	Assessment Area / Domain	Maturity Degree %
1	Site's Organizational Enablers (benchmarking, benchmarking, executive sponsorship, knowledge management, resource allocation, strategic alignment, project management training and metrics)	97
2	Project Management	97
3	Program Management	94
4	Portfolio Management	Not Included

3.2.2 Example 2: Shanghai Airport Authority

3.2.2.1 Background

As an organization, Shanghai Airport Authority (SAA) was established by the Municipal Government of Shanghai in charge of the construction and utilization of Pudong International Airport. It has undertaken the entire design and operation of both Terminal 1 and Terminal 2 of Pudong International Airport. The main goal of SAA was"to make Shanghai airport the most attractive core air hub in Asia-Pacific region, become world-class airport operator and ascend to the most valuable airport company."[1]

OPM3 standard was used as a desirable model to assess Shanghai Pudong International Airport Construction Project and its management organizations, including Terminal, Flight, Aviation Control, supporting facilities, and Oil Supply (Gungshe J. et al., 2008).

3.2.2.2 Challenges

Despite the significant efforts have been made in PM regarding the theoretical research and incorporating the theory into practice in China, there are many challenges on the local market as China was starting to integrate project management techniques into construction. (Guangshe J. et al., 2008). Accordingly, the large-scale construction projects in China needs: 1) standardization, 2) governance, and 3) acceptable PM experience.

[1] The information was adapted from the official website of Shanghai Airport Authority; (http://en.shairport.com/2012-05/26/content_15888467.htm).

3.2.2.3 Solutions

The application of OPM3 to SAA used to assess the feasibility and challenges to implement the OPM3 standard and to suggest a model to match the large-scale construction projects with Chinese characteristics. To achieve this goal, the SAA project managers should determine:

- Understanding of OPM3 basic concepts in order to prepare for the assessment of SSA's OPMM against the OPM3 best practices,
- Understanding OPM3 concepts as a whole package, and
- Providing support to be familiarized with the OPM3 assessment process.

On the other hand, the OPM3 assessor should have clear understanding about the SSA organization background, structure, and processes to be compared with OPM3 concepts, PPP domains, and assessment processes.

Based on that, the questionnaire and the surveys were developed in a suitable way to be more practical and acceptable by the stakeholders and participants in the OPM3 assessment process.

3.2.2.4 Results

After the assessment process has been conducted, many reports were provided as the results of the maturity assessment of SSA organization, and the summary of the findings can be explained as in Table 4.

Table 4. Assessment Results for SAA

(Adapted from Guangshe J. et al., 2008)

Domain	Maturity Degree %			
	Standardize	**Measure**	**Control**	**Improvement**
Project	69.25	60.5	54.25	46.875
Program	66.125	58	50.5	42.465
Portfolio	42.375	29.625	16.625	7.785

In summary, based on the results of the two examples discussed before (but not limited to), the OPM3 standard has become one of the remarkable models to assess the project management maturity levels for any organizations regardless of the types, sizes, complexity, geographic location. And it can be used for the assessment process for any domain of; project, program, or portfolio management, and to any process improvement stages; standardize, measure, control, and improvements (SCMI) (PMI OPM3, 2013).

3.3 OPM3 Key Elements

OPM3 consists of three key elements:

3.3.1 Knowledge

Presents the contents of OPM3 including an executive summary, a narrative explanation to understand organizational project management, definition and application toward organizational management maturity, terms of OPM3 standard, OPM3 steps, OPM3's appendices, glossary, and indices. (PMI OPM3, 2003).

3.3.2 Assessment

Supports the organization to assess its current organizational project management and organizational project management maturity to be compared with OPM3 standard.

3.3.3 Improvement

After conducting the assessment process, the organization can identify new set of Capabilities which supports the organization to form a basis of plans for future improvements.

3.4 OPM3 Domains

According to the Project Management Institute (PMI) and the PMBOK ® Guide, the organizational project management can be divided into three domains as following:

3.4.1 Project Management Domain

The basic domain of OPM3 is the Project Management Domain which deals with individual projects. Two or more projects can comprise the second domain as Program Management Domain.

3.4.2 Program Management Domain

OPM3 context defines a program “as a group of related projects managed in a coordinated way to obtain benefits and control not available from managing them individually.”

3.4.3 Portfolio Management Domain

A portfolio domain is comprised of a group of programs, projects, and other work grouped together to provide effective management to achieve the organizational objectives successfully, consistently, and predictably.

3.5 Organizational Project Management Processes

PMBOK ® Guide - Chapter 3, explains that the project management domain consists of five process groups as follows:

1) Initiating Process Group (PG1)
2) Planning Process Group (PG2)
3) Executing Process Group (PG3)
4) Monitoring and Controlling Process Group (PG4)

5) Closing Process Group (PG5)

3.6 OPM3 Best Practices

The PMI defines a Best Practice as “an optimal way currently observed by industry to achieve stated goal or objective. For organizational project management this includes the ability to deliver projects predictably, consistently, and successfully to implement organizational strategies. ”

3.6.1 Best Practice Constituent Components

3.6.1.1 Capabilities

A Capability can be defined as a specific competency that helps an organization to execute project management processes and deliver projects management services and products. The existence of successful Outcomes is important to determine Capabilities, by which two or more Capabilities are aggregated to make one Best Practice (PMI, 2008).

3.6.1.2 Outcomes

The application of a Capability leads to number of tangible or intangible Outcomes.

3.6.1.3 Key Performance Indicators (KPIs)

The Outcomes that are created by the application of a Capability can be determined either quantitatively or qualitatively by a criterion called Key Performance Indicator (KPI).

3.7 OPM3 Improvement Stages (SMCI)

The OPM3 improvement stages are recognized by the PMI as four main stages:

1. Standardization,
2. Measurement,
3. Control, and
4. Improvement

These are the stages that each organization should obtain them stage after stage to achieve desired improvement for the organizational management processes.

The Capabilities follow the process improvement path of “Standardize, Measure, Control, and Continuously Improvement (SMCI).”Organizational Enablers (OE) Best Practices: the Capabilities DO NOT follow the SMCI process improvement path (PMI OPM3, 2008).

3.8 Organizational Enablers (OEs) Best Practices

They are (Structural, Cultural, Technological, and Human-resource) practices that can be leveraged to support and sustain the implementation of Best Practices (PMI OPM3, 2013).

The PMI OPM3, 2013 categorizes the OEs as follows:

- Sponsorship,
- Governance,
- Benchmarking,
- Strategic Alignment,
- Organizational Project Management Policy and Vision,
- Organizational Project Management Techniques,
- Organizational Project Management Methodology,
- Organizational Project Management Practices,
- Organizational Project Management Communities,
- Resource Allocation,
- Project Success Criteria,
- Project Management Metrics,
- Organizational Structures,
- Management Systems,
- Project Management Training,
- Competency Management,
- Individual Performance Appraisals,
- Knowledge Management and Project Management Information System (PMIS)

3.9 Dependencies and Interrelationships among OPM3 Components

The PMI concluded that organizational project management maturity is increased by achieving the SMCIs Best Practices within the project management domains of

projects, programs, and portfolios, supported by the Organizational Enablers (OEs) Best Practices.

3.10 OPM3 Maturity Assessment Tools

The PMI developed two different tools to assess current state of maturity of an organization and then use the results of this assessment to improve the organization maturity stage in the future. These two assessments tools are explained as follows:

1) **Self-Assessment Module (SAM)** also known as **(OPM3 Online)** assessment tool.
2) **OPM3 ProductSuite** assessment tool.

3.10.1 SAM/ OPM3 Online

When the PMI research teams developed OPM3 standard in 2003, it provided the Self-Assessment Module (SAM*)*. First, the tool was offered as a CD accompanying the book of "OPM3 Knowledge Foundation- First Edition-2003*"*. Later, it was offered as an online process via the Internet and was known as "OPM3 Online"[2]. The process consists of (151) questions to be answered only by "Yes" or "No" as depicted in Figure 3.

[2] http://opm3online.pmi.org/demo/wheretofocus.shtml

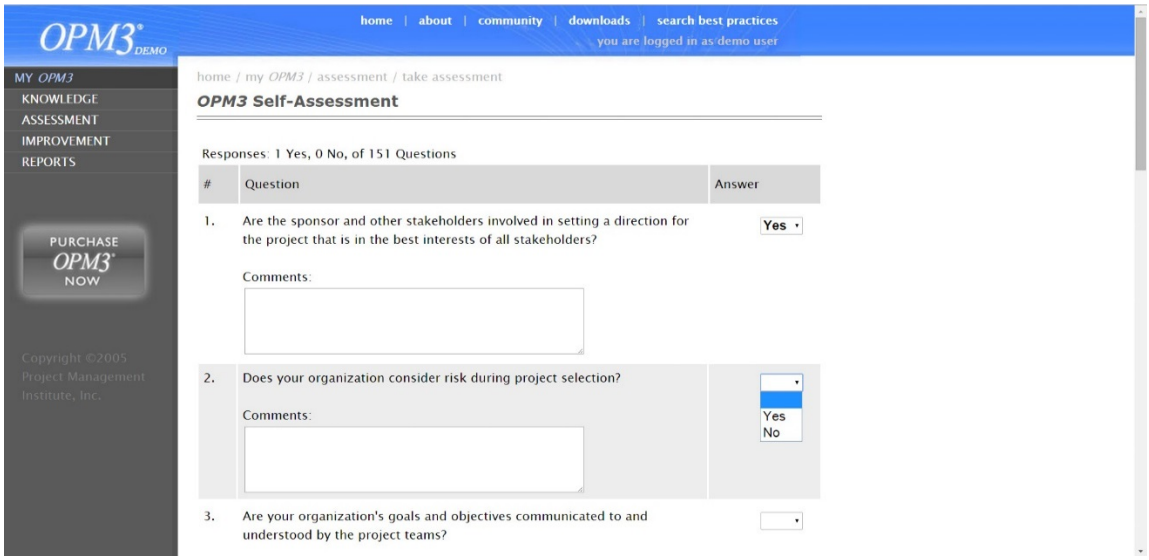

Figure 3. OPM3 Online Self-Assessment

The PMI's experts realized that the (SAM) or OPM3 Online was ineffective tool for assessing and implementing OPM3. Therefore, PMI withdrew the OPM3 Online assessment tool and reverted to the better tool created in 2005, which is called **(OPM3 ProductSuite)**.

3.10.2 OPM3 ProductSuite Assessment Tool

As an effective tool to better assess and develop an organization's maturity, PMI aided by a strategic partnership, Det Norske Veritas (DNV) a Norwegian Company, developed the **(OPM3 ProductSuite)** assessment tool to be used as an effective tool to assess and improve organizations' maturity. It has three elements; certification, tools, and services. "OPM3 ProductSuite is a combination of advanced tools that achieve the

Standard's original intention of assessing organizations in terms of the capabilities and outcomes that are in the best practice buckets." (Schlichter J., 2009).

The OPM3 ProductSuite consists of 488 Best Practices (BPs) and 412 of them are pertained to the Standardization, Measurement, Control, and Continuous Improvement of the (Project, Program, and Portfolio) Management Processes. Each domain has its specific number of processes (42, 47, 13) respectively. And each process requires (15) Capability-Outcomes, in which all together producing (1,530) Capability-Outcome statement as in Figure 4.

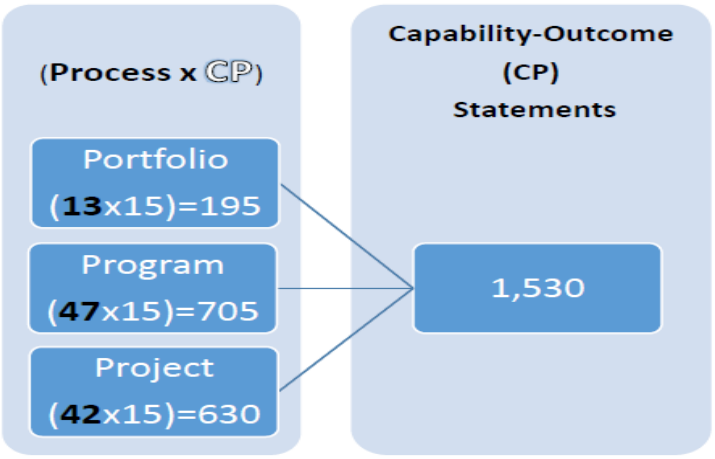

Figure 4. OPM3 ProductSuite and Capability-Outcome Statements

3.11 OPM3 Improvement Cycle

For an organization to apply the OPM3 standard, it is very important to understand the fundamental steps of OPM3 assessment and improvement stages. The PMI has indicated that the main steps for assessment and improvement are five steps;

1) Prepare for Assessment,

2) Perform Assessment,

3) Plan for Improvements,

4) Implement Improvements, and

5) Repeat the Process.

4. KURDISTAN REGION

MINISTRY OF CONSTRUCTION AND HOUSING

4.1 Introduction

The Ministry of Construction and Housing (MOCAH) is one of the significant and vital ministries within the Kurdistan Regional Government (KRG). It has evolved from the combination of two previous ministries established in 1992: Ministry of Reconstruction and Development and Ministry of Work and Housing, and was unified in 2004 as the (Ministry of Construction and Housing). [3]

Because of the destruction and harmful policies of the previous Iraqi regimes, the condition of Kurdistan Region's infrastructure was at the lowest level. More than 4,500 towns, districts, and villages were destroyed by Saddam Hossain regime who arrested and killed most of the people in what was so-called "Anfal Campaigns", Halabja chemical bombing, and other genocide campaigns across Kurdistan. These destruction policies left thousands of displaced people with no houses, schools, hospitals, and other necessary infrastructure and facilities, such as; water supply, sewerage, and roads and bridges. Therefore, the task of MOCHA was very difficult in its first stages of emergence in 2004 to answer the enormous urgent requirements which led to unsatisfied results due to lack of strategy, insufficient budget, and poor quality control of the projects.

[3] Kurdistan Regional Government, Ministry of Construction and Housing-KRG, http://www.krg-mocah.net/awapages.php?pageID=7

4.2 Kurdistan Region and Kurdistan Regional Government (KRG) Background

The word “Kurdistan” literally means the “Land” of the “Kurds”. Kurdistan Region or Southern Kurdistan, is the southern part of a great Kurdistan which consists of three other parts in Iran to the east, Syria to the west, and Iraq in the south. The great Kurdistan was divided into four main parts after the Sykes–Picot Agreement was assigned between the United Kingdom and France during the World War One in May 1916.

Kurdistan Regional Government (KRG) is the local government of the Kurdistan Region of Iraq. It has been established after 1991 and has been recognized by Iraqi Government after 2003 as the local government of the Kurdistan Region.

The Kurdistan Region consists of the cities of Erbil (the Capital of Kurdistan Region), Kirkuk, Sulaimani, Dohuk, and Halabja. However, Kirkuk city and may other parts (known as disputed areas), are still out of the KRG’s authority and it is administratively related to the central government of Iraq, which creates several problems between KRG and Iraqi government. Some other information about Kurdistan Region can be summarized as follows:

- Area: Approximately 50,000 Km^2 (including Kirkuk and other parts).
- Population: 8.35 million (2013).
- Official Language: Kurdish and Arabic.
- Natural Resources: Petroleum, natural gas, phosphates, sulphur, and agriculture.
- Political Structure: Parliamentary Democracy, Presidency, and Council of Ministries (KRG).

- Kurdistan Region map, Kurdistan Flag and Kurdistan Regional Government Arm are shown in Figure 5, and more information can be found at the official website of KRG "http://www.krg.org/?l=12"

Figure 5. Figure. Kurdistan Flag, KRG Arm, and Kurdistan Region Map[4]

[4] http://commons.wikimedia.org/wiki/Atlas_of_Iraqi_Kurdistan#/media/File:Autonomous_Region_Kurdistan_en.png

4.3 The Ministry of Construction and Housing (MOCAH)

4.3.1 Introduction

As one of the vital and significant ministries in the Kurdistan Regional Government, the Ministry of Construction and Housing (MOCAH) has been established after 1992.

The physical destruction and harmful policies of Iraqi regimes undermined the infrastructure in the Kurdistan Region. More than 4,500 villages were destroyed by Saddam Hussein regime including thousands of schools, clinic centers, roads, and all other facilities. Thousands of Kurdish people were killed in several genocide campaigns and thousands were displaced to live in coercive residential complexes under lower level of fundamental services.

After 1992, MOCAH's first and urgent task was to rehabilitate the displaced families and reconstruct of thousands of unit houses, schools, and health centers and renovate and construct hundreds of miles of roads with number of bridges. The economic situation in Kurdistan Region was insufficient to cover all the demands and, thereby to achieve MOCAH strategic goals in terms of high quality projects.

After the collapse of Iraqi regime in 2003, MOCAH was tasked to answer the enormous urgent infrastructure development and construction requirements. MOCAH achieved many considerable goals concerning the construction and highway projects compared with the decades before 2003. Thousands of unit houses, schools, hospitals, clinic centers, and governmental buildings and facilities were built. Hundreds miles of different types of roads and highways were constructed and number of bridges were

established. MOCAH, however, is challenged by organizational and project management issues including:

- Lack of organizational and project strategies,
- Insufficient budget, and
- Poor quality controls.

The current structure and operational procedures of MOCAH is not optimal to successfully deliver current and future infrastructure needs of the Kurdistan Region. Therefore, the main objective of this research is to incorporate OPM3 standards and practices as a roadmap to enhance MOCAH organizational and project performance by:

- The assessment of MOCAH organizational project management processes and its current organizational project management maturity status, then
- Using the results of the assessment to plan for more improvement, which in turn, delivers projects successfully, predictably, and reliably.

4.3.2 MOCAH's Vision, Mission, and Strategic Plan

Based on the interview conducted by The Report Company with Mr. Kamaran Ahmed, the former minister of MOCAH-KRG, after 2010, MOCAH has passed the primary stages of its evolution (from 2003 to 2010) and started to set its vision, mission, and strategic plan to step forward to act more effectively and improve its performance as well. The ministry has two major activities:

- Construction of roads, highways and bridges, and

- Construction of unit houses and public buildings.

4.3.2.1 MOCAH Vision

Safe Roads and High Quality Buildings.

4.3.2.2 MOCAH Mission

- Construction of two-way roads, express ways, bridges, and tunnels,
- Construction of modern high quality building and services, and
- Construction of best unit houses for Kurdistan Region civilians.

4.3.2.3 MOCAH Strategic Plan

The MOCAH started to set its strategic plan for twenty years to construct advanced highways and build high quality unit houses for the residence throughout the Kurdistan Region. According to MOCAH's master plan, the ministry emphasis will be on two main activities:

- Construction of (5,000) five thousands unit houses of estimated budget of $ 250 million each year, and
- Construction of advanced highways, tool roads, bridges, and tunnels throughout Kurdistan Region of around $ 1 billion each year.

Table 5 shows a summary of MOCAH plan for proposed roads for 2015-2030

Table 5. Planned Roads Projects (2015-2030)

Planned Project ID	No of Lanes	Length Km	Intervention	Completion Year	Budget $US Million	Governorate Name
R (01-105)	- Single, - Dual 2 Lanes, and - Dual 3 Lanes		New Roads	2015-2030		- Erbil, - Sulaimani, and - Dohuk
Total		2406.7			8927.6	

As a total length roads proposed 2,406.7 Km with an estimated total cost of approximately $US 9 billion are planned by MOCAH to be constructed starting from 2015 and ending in 2030. (Appendix B).

Regarding the construction of bridges, Table 6 shows a summary of proposed bridges planned by MOCAH for 2015-2030. (Appendix C).

Table 6. Proposed Bridges (2015-2030)

Proposed Bridge ID	Proposed Bridge Name	Dam	Crossing River Width ml	Completion Year	Governorate Name
B(01-21)	Bridge B01- B21	- Bekhma, - Gomaspan - TaqTaq, - Khewata, and - Mandawa	20-75	205-230	Erbil, Sulaimani, and Dohuk

4.3.3 MOCAH Organizational Breakdown Structure (OBS)

Based on the organizational breakdown structure (**OBS**) of MOCAH, it can be considered as a complex and hierarchical organization by which the three main OPM3 domains (Projects, Programs, and Portfolios) can be recognized within the ministry's structure. Figure 6 MOCAH OBS 1, and Figure 7 MAOCAH OBS 2 illustrate the construct of MOCAH's organizational structure.

From figures 6 and 7, the hierarchy of MOCAH can be summarized as follows:

1. His Excellency, the Minister,
2. Two deputy ministers:
    - Deputy 1 for Roads and Bridges,
    - Deputy 2 for Housing and Public Buildings.
3. Consultant Engineers,
4. Five Director Generals (DG's):
    - DG of Roads and Housing - Erbil City,
    - DG of Roads and Housing - Sulaimani City,
    - DG of Roads and Housing - Dohuk City,
    - DG of Administration and Finance, and
    - DG of Technician.

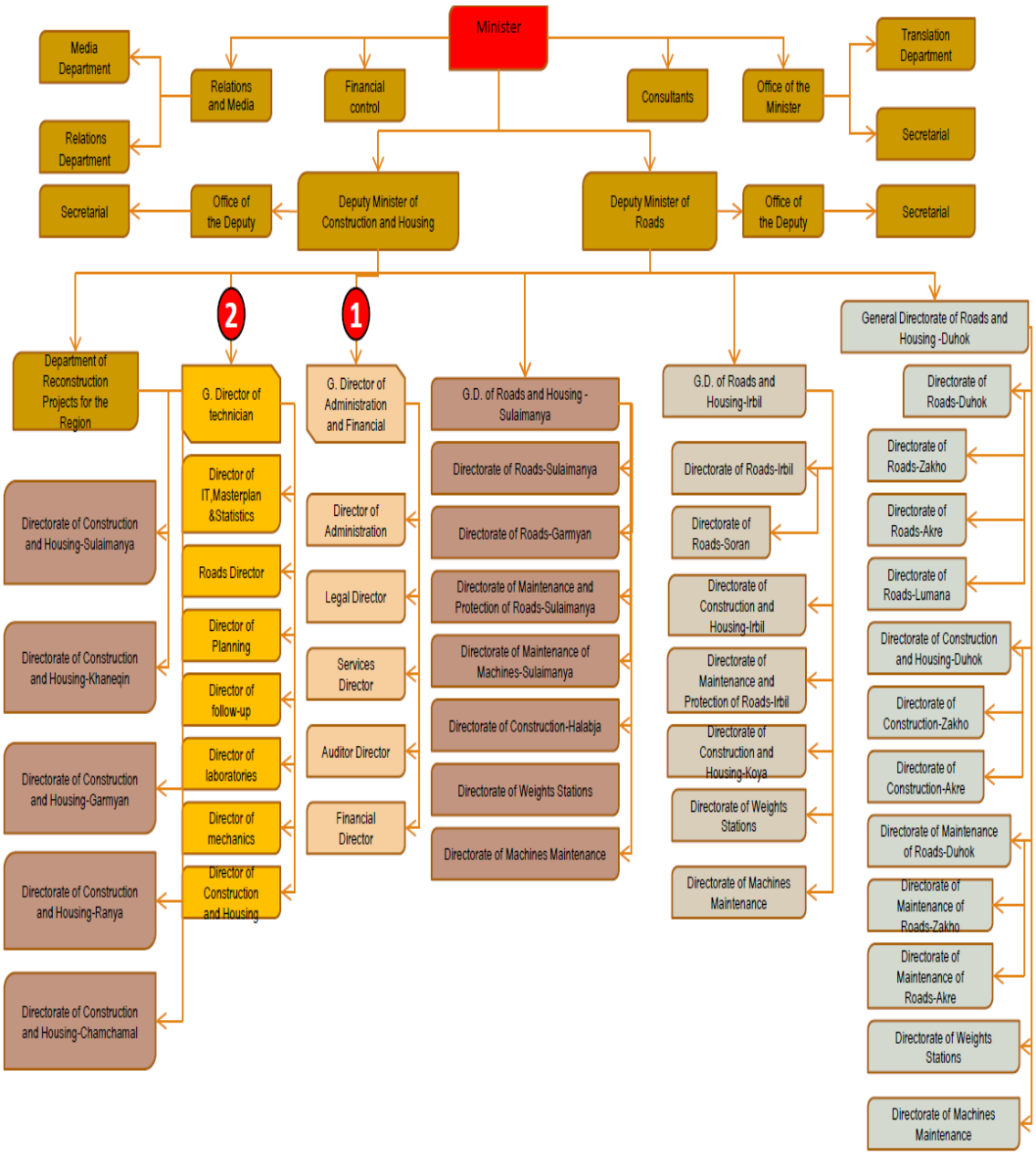

Figure 6. MOCAH OBS 1

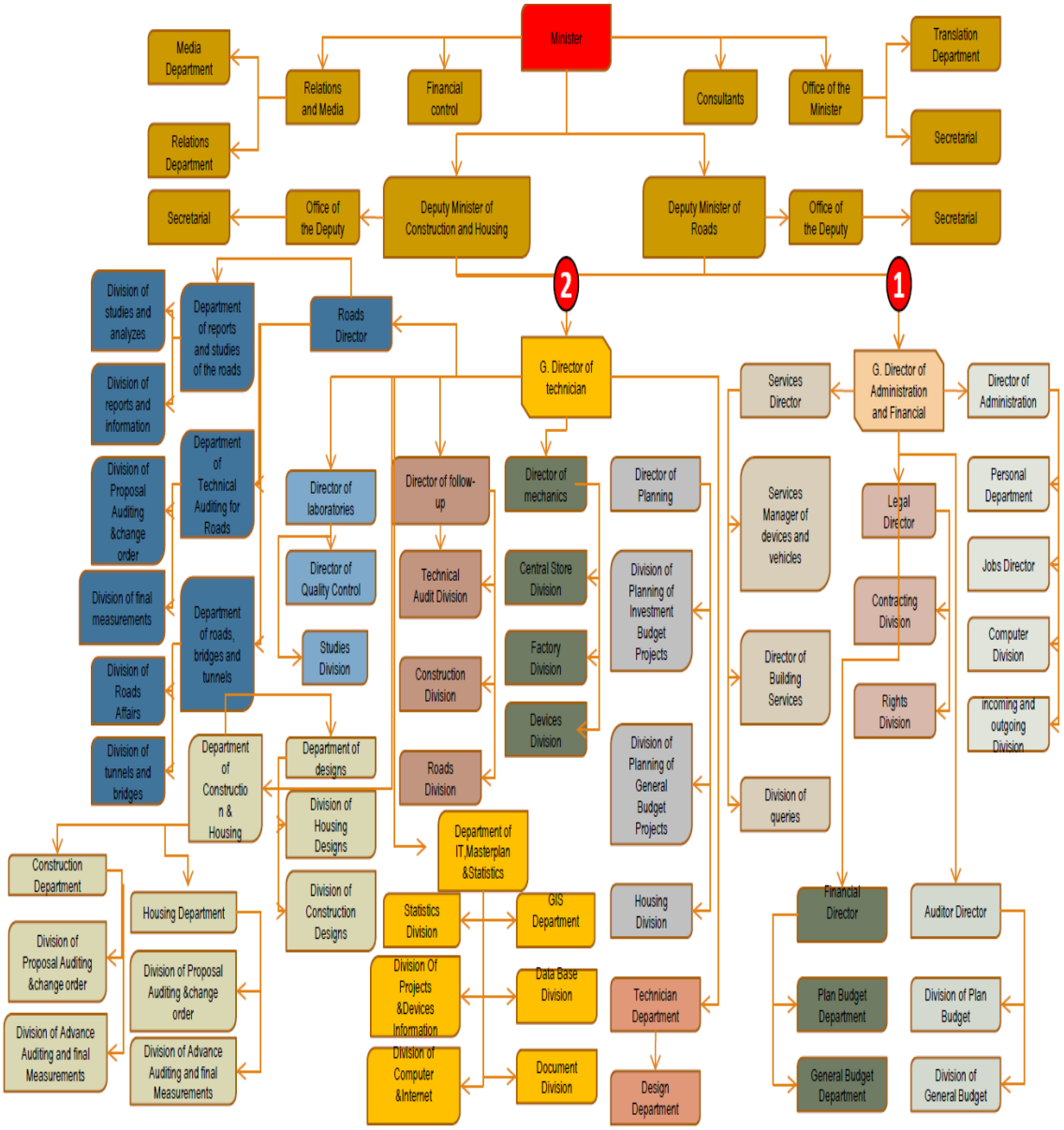

Figure 7. MOCAH OBS 2

4.3.4 MOCAH Size (Employees Number)

From the number of employees in MOCAH, it can be determined as a big-size organization. Table 7 illustrates the total number and different positions of MOCAH's employees.

Table 7. Number and Positions of MOCAH's Employees

#	Description	Total No.
1-	Total number of **employees** with master, high diploma and bachelor degrees in general	**1692**
2-	Total number of engineers in **all professions** (civil, mechanical, electricity, agriculture, architecture, roads, chemical, soil, nuclear, irrigation and so on) with master, high diploma and bachelor degree	**1162**
3-	Total number of road, civil and construction engineers with **master, high diploma and bachelor degree**	**689**
4-	Total number of road, civil and construction engineers in **Erbil** governorate with master, high diploma and bachelor degree	**263**
5-	Total number of road, civil and construction engineers in **Sulaimani** governorate with master, high diploma and bachelor degree	**293**
6-	Total number of road, civil and construction engineers in **Dohuk** governorate with master, high diploma and bachelor degree	**133**

4.4 SWOT Analysis and MOCAH

4.4.1 SWOT Analysis

SWOT Analysis is an effective approach which can be used to assess the Strengths, Weaknesses, Opportunities, and Threats of any organization to measure its current situations and provide awareness to the organization's owner to achieve the organizational objectives. Figure 8 shows the main elements of the approach by which an analyst can recognize the strength and weaknesses as internal factors (within the organization) and the opportunities and threats as external factors (environmental factors). In addition, the strengths and opportunities are considered as positive factors, while the weaknesses and threats as negative factors.

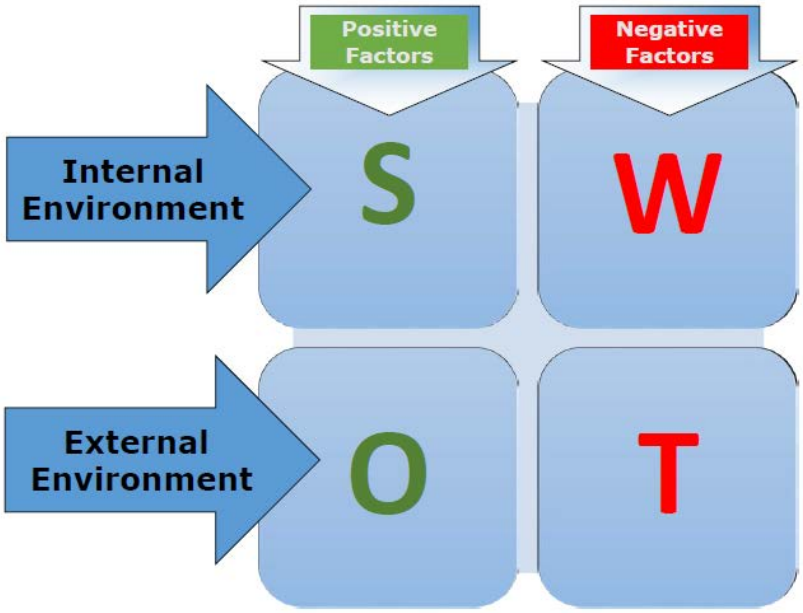

Figure 8. SWOT Analysis Elements

(Adapted from Business model. Strategy diagram. Business strategy chart. SWOT template)

4.4.2 MOCAH Strengths, Weaknesses, Opportunities, and Threats

The main objective to conduct the SWOT analysis for MOCAH is to provide a general background of the organization in terms of its strengths, weaknesses, opportunities, and threats.

In order to conduct the SWOT analysis to determine MOCAH's strengths, weaknesses, opportunities, and threats, it is essential to have the fundamental data and information regarding the internal factors within the organization, and external factors, environmental factors. The data was collected from different resources.

The main important internal data was collected from senior managers, senior engineers, administration departments, information technology (IT) department, the official website of MOCAH, and the documented interview with the former minister of MOACH. For example, the Vison, Mission, Strategic Plan, MOCAH OBS, Roads and Bridges projects planned for 2015-2030, number of employees,….etc. , were collected via emails with the Deputy Minister (Agreen A. Aziz), and the DG of Technique affairs and planning (Zana Mustafa Uzeri), the senior engineer (Sanaw Faridon Mohammed) and other senior engineers and managers from different departments within MOCAH, and the documented interview of "The Report Company with the former minister of MOCAH".

The external data was collected from the MOCAH's resources and from other resources out of MOCAH, such as the information about the monitoring and assessment of the projects. One of the most important resource for the monitoring and assessment process is the Projects Follow-up Department-KRG Council of Ministries (Nariman Kaksour Awla), which has a significant role to monitor and control the quality of overall projects in Kurdistan Regional Government's ministries and organizations, including MOCAH.

Based on the collected data about MOCAH, the research conducted a SWOT analysis as in the followings:

4.4.2.1 MOCAH Strengths

- **KRG Supports:** as an entity of the KRG government, MOCAH is supported by the government by providing human resources, financial resource, technological, and legal supports.
- **Wide Relationships:** with other organizations (KRG' ministries, UN organizations, international and local NGOs, and Universities and Scientific institutions) that can support MOCAH in terms of communications, exchanging information, training, conducting surveys, analysis, and researches.
- **Organizational Breakdown Structure:** which provides wide range of areas to be assessed as Projects, Programs, and Portfolios Management.
- **Wide range of experts and professionals:** in different levels and disciplines that might form a flexibility to manage potential changes.

4.4.2.2 MOCAH Weaknesses

- **Lack of Organizational Management Practices:** since MOCAH was established recently, in 2004, it has no enough experience in the field of organizational project management.
- **Lack of Expertise in Design Process:** MOCAH design departments needs more experts in designing its projects by expert designers using advanced new technologies and design tools and software.
- **Lack of Organizational Project Management (OPM) Standards** required for assessment and improvement organization management processes.

- **Lack of Advanced Technologies:** the information Technology system of MOCAH still needs more advancement and supports either by providing new instruments and equipment. Furthermore, MOCAH needs to improve the (IT) departments in all its arms, general directories, directories, and divisions with both new electronic device (computers and processors) and IT experts.
- **Lack of Heavy Machines and Equipment:** the current machines and equipment are not sufficient in terms of quality and quantity to support the process of projects execution.
- **Insufficient Budget:** as a part of the Kurdistan Regional Government, MOCAH' main budget comes from Iraqi federal government, which is unfortunately not sufficient much times, and even it has been cut by Iraqi government recently (from February 2014 till preparing this research). Accordingly, insufficient budget severely impacts MOCAH's organizational capabilities to step forward for more improvements.
- **Lack of Research and Development (R&D) Department:** despite the existence of number of senior engineers with high education in different engineering disciplines within MOCAH and from Kurdistan Region's universities and academic institutes, there is no specific department by which necessary researches can be conducted continuously for continuous development.
- **Bureaucracy and Routine:** in the daily transactions among MOCAH stakeholders and other government organizations. The long documentation processes conducted by traditional ways (papers, routines, and reworks) against

electronic means hinder the daily transactions, exchanging information, following up, and decision making processes in a rate that cause more delays and thereby delay damages.

- **Lack of Motivation:** provided by MOCAH to its staff and low salaries for the senior managers and experts compared to private sectors and international organizations in the region. For instance, the average annual base salary for a civil engineer employed in MOCAH is about $12,500 while in Turkey is around $34,700.[5]

4.4.2.3 MOCAH Opportunities

- **KRG Investment in Oil and Gas Sector:** the KRG started to explore and trade in oil and gas sector which opens doors to an independent economy from central government of Iraq which always creates unstable economic situation in Kurdistan Region.
- **Training and Scholarships:** provided by the KRG to tens of MOCAH employees to study abroad in advanced universities in USA, Europe, Australia, Canada, Japan, South Korea, and other countries in variety of fields , including Engineering and Project Management.
- **KRG Investment Law:** which attracts more Foreign Direct Investment (FDI) with its very flexible and supportive articles that provide international investors a wide

[5] http://www.payscale.com/research/TR/Country=Turkey/Salary

range of benefits in many sectors in Kurdistan Region, which in turn, can provide MOCAH to establish new relationships with international organizations that can help MOCAH to improve its strategies and organizational objectives. [6]

- **MOCAH Master Plan:** will provide the ministry with more opportunities to establish new projects through the fifteen years planned from 2015 to 2030, which includes thousands of mile of roads and highways with number of bridges overall Kurdistan Region, as explained in previous sections.

4.4.2.4 MOCAH Threats

- **Political Conditions:** the unstable political situations in the region adds more threats against economic stability of KRG which in turn affect negatively on MOCAH's activities and processes, especially after the terror attacks by what is called Islamic State in Iraq and Syria (ISIS). The war with ISIS enforced millions of people in Iraq and Syria to leave their origin areas and most of them fled to the Kurdistan Region as the safest area in the region. More than two millions of refugees were settled in Kurdistan Region which added more pressure on the KRG including MOCAH. The consequences were to add more demands of MOCAH's tasks to provide emergency projects and facilities to the huge number of refugees.

[6] The Official Website of the Kurdistan Board of Investment, http://www.kurdistaninvestment.org/

Furthermore, the relationship with Iraqi government was not stable and not supportive to support KRG's policies including MOCAH's polices regarding the construction activities.

- **Poor Communication and Coordination:** among MOCAH and other KRG's entities. Although MOCAH has a wide relationships with other KRG' organizations, UN's agencies, and International and local NGO's, the communication and coordination are still not sufficient, which adds potential risk of delays, inconsistency between MOCAH plans and KRG's and other organizations' plans and activities that need to be done parallel to MOCAH's projects.
- **High Rate of Salaries Competition:** high rate of salaries provided by local and international organizations to same employees who have the positions and responsibilities (as mentioned in weaknesses above), by which attracts MOCAH experts, senior engineers and managers to work out of MOCAH. Accordingly will increase the potential lack of skilled and professional management teams within MOCAH's organizational management system.
- **Poor Monitoring and Control system:** from the data provided by the expert engineer, Nariman Kakasur Awla from the Project Follow-up Department, KRG, the monitoring and control process for MOCAH process is poor and not effective to cover all the projects executed / under execution due to number of reasons, as follows:

- Most of the projects start late and therefore stay behind the planned completion date which leads to delay damages and cost overrun due to poor control process through project stages.
- Ineffective respond to monitoring reports in which monitoring teams explain the problems in project stages to be discussed and solved at time.
- High rate of change orders during the execution stage of the projects, which leads to more delays and cost overrun.
- Poor communication and coordination between executive teams and follow up/ monitoring teams which cause inconsistency and conflicts between projects' parties.
- Lack of advance quality controls labs to control the quality of materials.
- Lack of experience in bidding projects and contracting processes which cause potential risks of conflicts between the MOCAH, as the Owner, and the contractors.

5. INCORPORATE OPM3 INTO MOCAH

5.1 Introduction

MOCAH as a complex, large, and hierarchical organization with the challenges and tasks as discussed in section 4, needs to be assessed and continuously improved to increase its organizational maturity in terms of the domains of Project, Program, and Portfolio management. The research explains how to incorporate the OPM3 concepts, elements, and components to support MOCAH to assess its current organizational project management maturity and help Program/Project Management Office (PMO) of MOCAH to develop an effective progress improvement path that can help the leaderships and senior managers within MOCAH to identify the Best Practices with its constituent Capabilities to push the organization for future improvements.

Section 4 provided an understanding of MOCAH's vision, mission, strategic plans, MOCAH's organizational breakdown structure (OBS), and MOCAH's SWOT analysis to determine MOCAH's current Strengths, Weaknesses, Opportunities, and potential Threats as (general background) of MOCAH.

Section 3 provided details about OPM3 components concerning its elements (Knowledge, Assessment, and Improvement), Domains (Projects, Programs, and Portfolios), Best Practices (BPs), Capabilities, Outcomes, Key Performance Indicators (KPIs), Improvement Stages (Standardize, Measure, Control, and continuously Improvement-SMCI), and Organizational Enablers (OEs-Structural, Cultural, Technological, and Human-Resource).

MOCAH's activities are guided by a cross-functional board of directors consists of two deputy ministers, five general directors, several consultants and advisors. The board of directors has regular monthly meeting to direct the ministry activities and set the strategic plan and identify the main organizational objectives. While the general directors supervise the implementation of the strategies by directing the project management processes. The MOCAH's OBS was illustrated in the previous section in detail.

A conceptual model of MOCAH's OBS in relation to the OPM3' Domains (Projects, Programs, and Portfolio) assists the analysis. Figure 9 illustrates how MOCAH's OBS can be represented in terms of the domains of Projects, programs, and Portfolios.

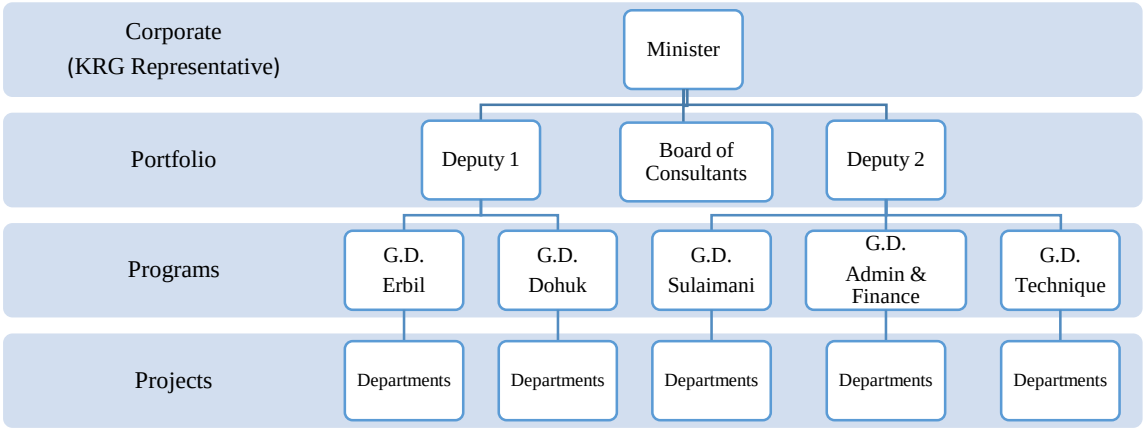

Figure 9. Conceptual MOCAH's OBS in Terms of (PPP) Management Domains
(Adapted from PMI OPM3, 2013)

5.2 OPM3 Process Overview

According to the OPM Experts LLC assessor, the assessment emphasized analyzing the project management processes illustrated in which are detailed in the forms of Best Practices shown in Table 8. Each Best Practice consists of separate Capabilities with its constituents of Outcomes and Key Performance Indicators (KIPs).

Table 8. Project Management Processes

Key Structures and Processes Applicable to Project Management	
Governing Bodies and Policies	Risk Response Planning
Initiation	Procurement Planning
Project Plan Development	Solicitation Planning
Scope Planning	Project Plan Execution
Scope Definition	Quality Assurance
Activity Definition	Project Team Development
Activity Sequencing	Information Distribution
Activity Duration Estimating	Project Solicitation
Schedule Development	Project Source Selection
Resource Planning	Contract Administration
Cost Estimating	Performance Reporting
Cost Budgeting	Integrated Change Control
Risk Management Planning	Scope Verification
Quality Planning	Scope Change Control
Organizational Planning	Schedule Control
Staff Acquisition	Cost Control
Communications Planning	Quality Control
Qualitative Risk Analysis	Risk Monitoring and Control
Quantitative Risk Analysis	Contract Closeout
	Administrative Closure

5.3 OPM3 Assessment Steps

As discussed previously, PMI OPM3 (2008) illustrated that there are five main steps to conduct the OPM3 assessment: (prepare for assessment, perform assessment, plan for improvement, implement improvement, and repeat the process):

5.3.1 Step One: Prepare for Assessment

The first step for an organization in the assessment process is to prepare for assessing its current organizational project management maturity in relation to OPM3 model. This step involves two levels of understanding:

A. Understanding the organizational strategic objectives and the degree of maturity needed to execute these strategies,
B. Understanding the components of OPM3 and how to use them to attain the desired level of the organization's maturity within the specified scope of the assessment process.

It is significant to prepare the organization for the assessment process by justifying the areas of the organization to be included in the assessment process, identifying the stakeholders to be engaged in the process, and determine the techniques and tools necessary to conduct the interviews at a specified time.

Accordingly, the assessment scope of MOCAH was limited to an evaluation of the Project Management Domain and excluded the Programs and Portfolios Domains. And within the project management domain, the assessment only included the Standardization level and excluded the Measurement, Control, and Improvement levels.

The Standardization level emphasizes on the following elements:

- Process Ownership (Process Governance)
- Documented Processes (Methodology)
- Communication to Necessary Stakeholders (Training)
- Consistent Implementation of Work Methods (Compliance)

5.3.2 Step Two: Perform Assessment

In this step, the research attempts to develop a framework to assess MOCAH's degree of maturity of organizational project management. The main phases of this step are:

A. Review of which OPM3's Best Practices are and are not demonstrated (currently) by MOCAH, which cannot be determined by conducting the Self-Assessment Mechanism (SAM) but can be determined by OPM3 ProductSuite. The assessor report indicated that there were no artifacts provided by MOCAH due to the lack of the Standardization of the project management processes.

B. Conducting interviews with stakeholders to develop a list of Best Practices that are not currently demonstrated by the organization should be considered as "target Best Practice" (PMI OPM3, 2008). The stakeholder's job titles were identified as shown in Table 9. Identifying job classifications is significant to know where to plan for improvement in the next step of the OPM3 Improvement Cycle.

Table 9. MOCAH's Stakeholders

No.	Job Titles
1	Senior Engineer - General Directorate of Roads and Bridges
2	Senior Engineer - Director of Road Protection and Maintenance
3	Consultant Engineer - General Directorate of Roads and Bridges
4	Senior Project Manager - General Directorate of Roads and Bridges
5	Project Manager - Ministry of construction and Housing
6	Project Manager - General Directorate of Roads and Bridges
7	Project Manager - Ministry of construction and Housing
8	Laboratory Manager - Directorate of Laboratory
9	Senior Manager - Directorate of Laboratory
10	Project Manager - Director of Road Protection and Maintenance
11	Senior Project - Directorate of Roads and Bridges
12	Project Manager - Director of Road Protection and Maintenance
13	Project Manager - Director of Road Protection and Maintenance

According to OPM assessor report, the SAM tests no Capability Statements and the results of its question about many processes are only by single answer Yes/No, which make the results ineffective to make the right decisions. However, the processes applied the SAM then ProductSuite for good measure.

Furthermore, the assessor report illustrated that the results of the SAM applied to MOCAH were 100% for the assessment of the standardization of all project management

processes. In other words, MOCAH interpreted the SAM questions in a way that was confusing and led the responder(s) to answer optimistically where the opposite was appropriate. When the ProductSuite assessment questions applied, MOCAH scored 0% against the Capabilities Statements for the standardization of project management processes, as in Appendix A. Thus, these two different results for the same processes revealed that SAM is not appropriate and ProdcutSuite should be applied instead (Schlichter J. report). The OPM3 expert noted that this point is the most important of any for the wider audience of the project management profession.

Regarding the ProductSuite application, the score summary of the assessment process was provided by the OPM assessor and it can be illustrated as in Table 10 and the raw data can be found in Appendix A.

Table 10. Summary of the Assessment Scores

	Best Practice Category	**Available Points**	**Awarded Points**	**Score (%)**
1.1	Standardization of Project Management Processes	504	126	**25%**
1.2	Organizational Enablers	684	258	**38%**
Total		**1188**	**384**	**32%**

Table 10 shows that the MOCAH has awarded 126 points of 504 points available, which gives a score of **25%** for Standardization of project management processes, and 258 points of 684 points available, which gives a score of **38%** for Organizational Enablers. As the total score, MOCAH has awarded **384** points of **1118** points available, which gives total score of **32%**.

5.3.3 Step Three: Plan for Improvements

Based on the two assessment steps, MOCAH may be able to provide an effective plan for potential organizational improvements. The results of the assessment steps should be documented and analyzed to (recognize and prioritize) the desired/successful Outcomes, that have not been observed by MOCAH.

The prioritizing of Capabilities with its constituent successful Outcomes, can be achieved from a review of the (Interrelationships and Dependencies) between the Best Practices, Capabilities, Outcomes, and Key Performance Indicators (KPIs) explained in previous sections of this research.

This will support MOCAH to search for the Capabilities that are associated with these desired successful Outcomes and a top priority in MOCAH's improvements plan.

Table 11 documents that MOCAH's assessment process was limited to the Standardization level with a score of only 25% of the process improvements stages and the other stages (Measurement, Control, and Improvements) were not applicable for the scope of this research.

Table 11. Score Summary for Process Maturity and Organizational Enablers

Stage	Process Maturity Score	Organizational Enablers Score
Standardize	**25%**	**38%**
Measure	NA	
Control	NA	
Improve	NA	

Therefore, there are significant and large areas remain to be addressed by MOCAH's leaderships to obtain reliable and constant implementation of required approaches in project management processes recommended by the report.

However, a score of 25% refers to the existence of a governing body as board of directors within MOCAH, as explained in MOCAH's OBS in previous sections of this research. This can be considered as a strength point by which MOCAH can enhance its project management standardization through characterizing polices, verifying and recording processes, and evaluating compliance which need to be undertaken by the board of directors in the future.

Accordingly, the report recommends MOCAH to dedicate more efforts and allocate more resources to have a clear understanding of identifying its polices to determine and document required processes and train the stakeholders to be familiar and capable to implement the project management processes based on systematic and institutionalized polices and processes within MOCAH.

Table 11 also indicates that the score summary for the Organizational Enablers (OEs) within MOCAH was 38% which is summarized from the raw data provided in detail in Appendix A. The raw data shows that Best Practices categorized for the OEs were focusing on:

- Organizational PM Policy & Vision
- Strategic Alignment
- Resource Allocation
- Management Systems
- Sponsorship
- Organizational Structures
- Competency Management
- Individual Performance Appraisals
- Project Management Training
- Project Management Communities
- Project Management Practices
- Methodology
- Project Management Techniques

5.3.4 Step Four: Implement Improvements

After completing "**Step Three"** above and the improvement plan has been established, MOCAH could implement the plan continuously. At this point it is important to understand that the changes that the organization makes are themselves projects to be

planned and allocate necessary resources for implementing them successfully. The organization should approach the planning and implementation of desired changes as projects (PMI OPM3, 2008). This is true because the organization's objectives can be achieved successfully through delivering successful projects, and projects are defined as successful projects by its successful/desired Outcomes. Accordingly, MOCAH should start its assessment, and thereby, implement the improvements plan within its Projects Domain, and then step forward to support its Programs and Portfolios Domains.

Through the process of the implementation of improvements plan MOCAH may face many challenges that can create potential (Resistance to Change). Among these factors; the organizational structure, leaderships, traditional management process, financial, policies, cultural, technological, and human-resources factors. Therefore, MOCAH should consider that the implementation of improvements (changes) will need step-by-step change management processes that can support MOCAH's implementation of OPM capabilities to ensure the correct process of the improvements implementation.

MOCAH should be able to create a (Readiness-to-Change) environment across its domains of projects, programs, and portfolios management, which means continuously standardize, measure, and control the process of improvements and control any potential inconsistency between the desired level of organizational maturity and the actual outcomes of the process. Consequently, the process may provide less progress on the improvement path at the beginning of the process, which is possible for the first stages. MOCAH, however, should not stop implementing the process and should repeat the steps of improvement provided by OPM3 Improvement Cycle.

5.3.5 Step Five: Repeat the Process

After the implementation of the four steps explained above, MOCAH may have clearer idea about its current organization maturity state and the results may lead the decision makers to decide whether to continue on the same improvement plan or to modify it. The modification of improvement plan may needs more effective assessment steps to recognize the Capabilities that are still not observed by MOCAH through the first attempts to apply the OPM3 improvement cycle. Repeatedly implementing the assessment processes will enhance MOCAH's capability to recognize its weaknesses and gaps in terms of OPM and realize the Best Practices that are existent and what are not. Then it supports the stakeholders including project managers to implement the OPM processes in a systematic manner which lead to deliver the projects successfully.

5.4 Summary and Findings

To apply the OPM3 standard to assess the OPMM of MOCAH, this research conducted an analysis of the OPM assessment conducted by OPM Experts LLC. The processes included the application of both SAM and ProductSuite mechanisms. The necessary data was collected from varied resources within the MOCAH and from other KRG's resources. After the data was collected, the OPM assessor analyzed it and reported the results to be studied by the MOCAH's leaderships in order to take necessary actions per the recommendations provided by the report. The scope of the assessment was limited to the Project Management Domain and the Standardization level of the process improvement stage. The summary of the results showed that the score of the project

management processes at the standardization level was 25 percent, the score of the OEs was 38 percent, and the total score was 32 percent, as explained in previous sections of this research.

From the score results, this research documents that MOCAH should focus on completing the agenda of Standardization of Project Management and the agenda of Measurement of Project Management. Then it may conduct additional research regarding improvements in other levels of the process improvement stages and for the Programs and Portfolios Management Domains. Furthermore, the assessor's report provides an important roadmap to support MOCAH for enhancing its organizational project management performance to achieve its objectives of more consistent, reliable, and predictable projects. The recommendations and the roadmap are explained in detail in the following section.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

In this section, conclusions, recommendations, and a Roadmap are provided. The conclusions include a summary of the research content and the findings obtained from the results of the report provided by the OPM assessor.

The recommendations were categorized into three categories as follows:

1. Recommendations for MOCAH's project management processes,
2. Recommendations for the Standardization of project management domain,
3. Recommendations for the Organizational Enablers (OEs).

Finally, the roadmap consists of five phases to implement specified recommendations under specific Organizational Enablers category.

6.2 Conclusions

6.2.1 Summary

As one of the vital ministries within Kurdistan Regional Government (KRG), since its establishment in 2004, MOCAH was tasked to face many challenges due to the enormous urgent infrastructure development and construction requirements. The physical destruction and harmful policies of Iraqi governments undermined the infrastructure in Kurdistan Region.

The research problem identified that MOCAH is challenged by organizational and project management issues including: Lack of organizational and project strategies,

insufficient budget, and poor quality controls. Due to the lack of effective assessment and organizational project management performance, the current structure and operational procedures of MOCAH is not optimal to successfully deliver current and future infrastructure needs of the Kurdistan Region.

The main objective of this research was to incorporate the OPM3 standard to support MOCAH's leaderships with clear understanding of MOCAH's current status in terms of organizational project management capabilities and to identify the strengths and weaknesses in the areas that need more attention. Accordingly, to provide a well-structured roadmap as an effective basis for decision making and prioritizing of the best practice, and thereby select and implement the right projects in the way.

To obtain the research objective, the research provided a literature review of the fundamental concepts of OPM, PMO, Maturity Concepts, OPMM, maturity models, OPM3 examples and case studies, OPM3 concepts and other related materials to support MOCAH with further understanding of OPM process knowledge and what OPM3 standard is and how to utilize it.

Furthermore, the research included the background of the organizational environment as MOCAH within KRG, including a brief of Kurdistan Region and Kurdistan Regional Government background. In addition, the research provided a comprehensive overview of MOCAH by using SWOT Analysis to analyze the general status of MOCAH determining the strengths, weaknesses, threats, and opportunities. The main objective of SWOT analysis was to illustrate the internal and external factors that

directly and/or indirectly impact on MOCAH's performance in general context of OPM processes.

The scope of the research was limited to Project Management Domain and the Standardization level of the process improvement stages. Therefore, the domains of Programs and Portfolios Management were excluded and the other stages of the process improvement (Measurement, Control, and Improvement) were not applied in the assessment process in this research. Accordingly, more researches and studies are recommended and for that, a roadmap was established.

The assessment process was conducted under the sponsorship of His Excellency the Minister of MOCAH. John Schlichter, a founder and leader at OPM Experts LLC, was the OPM assessor who conducted the assessment process with collaboration and participation of MOCAH stakeholders. The stakeholders included the Deputy Minister, Director Generals (DGs), Minister's Advisor, and Senior Engineers/Managers from different departments within MOCAH.

The assessor prepared a comprehensive report included the process of organizational project management maturity assessment for MOCAH. The report provided the scope of the assessment process, the methodology, SAM and ProductSuite mechanisms applied for the assessment process, analyzing the data collected, and reporting the results to provide substantial recommendations and establish the roadmap for more prospective improvement.

6.2.2 Findings

The results of the assessment process showed that the score of the Standardization level of process improvement stages, within the Project Management Domain, was 25%, the score of the Organizational Enablers (OEs) was 38%, and the total score for MOCAH was 32%. More information about the assessment results can be found in Appendix A. These results were limited to the Standardization level and Project Management Domain, which means MOCAH has to dedicate more efforts to obtain higher level of maturity of process improvements stages and in Programs and Portfolios Management Domains.

In general, the results of the assessment process indicate that MOCAH has a low level of maturity in practicing the organizational project management knowledge and processes accordingly, the OPM assessor has provided important recommendations and developed a roadmap to help MOCAH's leaderships to identify the available Best Practices to be enhanced, and distinguish the necessary areas to be addressed for further improvements in the future. The recommendations and the roadmap are explained in the following sections.

6.3 Research Significance and Contributions

The findings of the research and the recommendations have significant contributions to MOCAH as follows:

- The assessment OPM3 process provides MOCAH an understanding of the necessity of establishing an effective project management office (PMO) and the standards of project management performance and practices.

- The assessment results will help MOCAH to identify the gap between its strategy and successful projects.
- The findings illustrate the current status of MOCAH in terms of organizational project management maturity in project management domain.
- The results can be used as initial framework for conducting the assessment process in program and portfolio management domains in the future.

6.4 Recommendations

The recommendations are provided based on the results and findings of the research as follows:

6.4.1 Recommendations for MOCAH's Project Management Processes

According to the research findings, MOCAH needs more to do in order to enhance its OPM performance utilizing global standards and metrics, such the well-known standards of the Project Management Institute (PMI); *A Guide to The Project Management Body of Knowledge Guide (PMBOK Guide).*

The assessment results shows that MOCAH has not acquired full understanding of knowledge of project management processes. Therefore, it is strongly recommended that MOCAH's leaderships should undertake imperative steps to identify the list of the project management processes explained by the (PMI PMBOK Guide), as explained in Appendix A, and take necessary actions to train project managers, document control the inputs, and

document the outcomes. This is significant for MOCAH to have a clear understanding of the fundamental concepts of PM knowledge, skills, tools, and techniques to be applied systematically through the management process groups; Initiating, Planning, Executing, Monitoring and Controlling, and Closing.

6.4.2 Recommendations for the Standardization of Project Management Domain

The scope of the research was limited to the Standardization of project management domain. As such, the analysis focused on the elements of: documented processes, process ownership, training, and compliance policy. For this part of the process, the result of the assessment process provided general recommendations regarding the standardization as follows:

- The main elements of standardization including project managers training, process documentation, polices governing process, and compliance policy processes, should be considered by MOCAH's leaderships as critical requirements. Therefore, it is recommended that MOCAH should involve a PMI subject matter expert to conduct the training processes include these standardization elements. The PMI expert involvement supports MOCAH's leaderships to identify the crucial characteristics for MOCAH to be determined for each process in a manner that appropriate and aligned with MOCAH's strategies.
- It is recommended that MOCAH's leaderships should procure PMI compliant templates for PM artifacts, particularly the BOT International's Process-On-Demand (POD) detailed in PMI PMBOK Guide.

- MOCAH should document its performed project management processes in terms of inputs, tools and techniques, and outputs in order to characterize the variations of its projects and distribute these documents to share it on a local communication network.
- The engagement of a PMI expert is recommended to support MOCAH's leaderships with development of a metrics program which encourage MOCAH to better perform its project management practices emphasizing on relevant clients of these practices. This is significant for MOCAH to achieve the Control level of maturity in OPM3.
- Finally, MOCAH should conduct a follow-up assessment after achieved improvements to exhibit advancement and develop a framework for following steps.

6.4.3 Recommendations for the Organizational Enablers (OEs)

The PMI OPM3 (2013) defined the OEs as structural, cultural, technological and human resource practices that can be leveraged to support and sustain the implementation of Best Practices in projects, programs, and portfolios. As described in section 3 of this research, the PMI OPM3, 2013 categorizes the OEs best practices into several varied groups. Based on the findings of the assessment processes, the research recommended MOCAH for the OEs Best Practices groups as in Table 12.

Table 12. OEs Recommendations

OEs Best Practice Category	Recommendations
Sponsorship	Eliminate the obstacles to project management processes and share these process amongst peers and clients.
Organizational Structures	Further analysis of MOCAH's organization structure for better support organizational objectives.
Benchmarking	Compare with similar organizations to recognize reliable best practice metrics and plan for continuous improvements for these metrics.
Strategic Alignment	Assign responsibility and accountability of a designed business change management program to suitable right people.
OPM Policy and Vision	Establish OPM policy, set clear vision for MOCAH, train project managers to acquire OPM knowledge, and share the organization goals.
Management Systems	Characterize MOCAH's Project, Program, and Portfolio Management Framework.
OPM Methodology	Document the organizational project management methodology that fulfill MOCAH's needs.
Project Success Criteria	Arise awareness of the success criteria for projects among MOCAH's project managers.
Project Management Techniques	Integrate captured data from industry with MOCAH's planning models to incorporate project management tools, techniques, measurements, and consistent estimating processes that should be provided to MOCAH's stakeholders and managers.
Resource Allocation and Competency Management	Assign resources based on necessary activities and training required for project management processes to improve individual skills and then assess MOCAH managers' competency regarding the areas of management, leadership, and communication.
Project Management Training	Conduct and promote training to enhance project management policies and performance for MOCAH's employees according to well-defined programs that match each individual's role in the related projects.
Project Management Practices	Distinguish the program manager role, emphasizing on MOCAH's organization interests and compliance of program managers with responsibilities and concession for their relationships and activities related to their programs.
OPM Communities	MOCAH's PMO should encourage its project managers to join external PM teams to develop their skills and strength internal practices within MOCAH.

Table 12. Cont'd

OEs Best Practice Category	Recommendations
Knowledge Management and Project Management Information Systems (PMIS)	MOCAH's PMO should document lessons learned the PMIS requirements and share it across its related departments. This will support the PMO to analyze and document the stakeholders' needs for knowledge management and PMIS and assess their effectiveness after using it in MOCAH's projects.
Project Management Metrics	Describe and assemble a standard set of metrics from entire projects. These metrics includes clients' satisfaction and quality metrics which MOCAH should determine required costs and efforts compared with the benefits from collecting these metrics.

6.5 Roadmap

Based on (PMI OPM3, 2013), the completed and revised assessment and improvement work can be documented by the improvement roadmap. After completing the improvement processes of MOCAH, the organization's location on the continuum of OPM maturity against the Best Practices of OPM3 standard was evaluated. Accordingly, the roadmap will support MOCAH's leadership to realize the organization's current maturity based on existent Best Practices and how to step forward to obtain more Best Practices that help the organization to achieve more improvements in the future. And thereby to enhance the linkage between the organization's strategies and its successful projects.

Based on the assessment report the research provided a roadmap that MOCAH's leaderships should take into consideration for future assessment and improvements,

utilizing OPM3 standard's concepts. The roadmap includes five phases in which each phase explains significant tasks for MOCAH to be implemented according to associated recommendation provided for each task. The roadmap phases and its recommendations are illustrated in Table 13.

Table 13. Roadmap

Phases	Tasks	Recommendations to be Implemented
Phase 1	-Establish process governance frame for PM standardization.	- OEs for Organizational Project Management Policy & Vision. - OEs for Strategic Alignment.
Phase 2	-Distribute governance policies for PM in MOCAH.	- OEs for Sponsorship - OEs for Organizational Structures. - OEs for Management Systems. - OEs for Project Success Criteria.
Phase 3	-MOCAH's PM documentation.	-OEs for OPM Practices. -OEs for OPM Methodology. -OEs for OPM Techniques.
Phase 4	-Stakeholders training for governance body, policies, and documentation processes	-OEs for PM Training. -OEs for Competency Management. -OEs for Individual Performance Appraisals. -OEs for Resource Allocation.
Phase 5	-Establish metrics for polices and characteristics of PM activities.	-OEs for PM Metrics. -OEs for OPM Communities. -OEs for Benchmarking. -OEs for Knowledge Management and PMIS.

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APPENDIX A.

SCORE SUMMARY FOR PROJECT MANAGEMENT

	Best Practice Category	Available Points	Awarded Points	Score (%)
1.1	Process Ownership	126	126	100
1.2	Develop Project Charter	9	0	0
1.3	Identify Stakeholders	9	0	0
1.4	Develop Project Management Plan	9	0	0
1.5	Collect Requirements	9	0	0
1.6	Define Scope	9	0	0
1.7	Create WBS	9	0	0
1.8	Define Activities	9	0	0
1.9	Sequence Activities	9	0	0
1.1	Estimate Activity Resources	9	0	0
1.11	Estimate Activity Durations	9	0	0
1.12	Develop Schedule	9	0	0
1.13	Estimate Costs	9	0	0
1.14	Determine Budget	9	0	0
1.15	Plan Quality	9	0	0
1.16	Develop Human Resource Plan	9	0	0
1.17	Plan Communications	9	0	0
1.18	Plan Risk Management	9	0	0
1.19	Identify Risks	9	0	0
1.2	Perform Qualitative Risk Analysis	9	0	0
1.21	Perform Quantitative Risk Analysis	9	0	0
1.22	Plan Risk Responses	9	0	0
1.23	Plan Procurements	9	0	0
1.24	Direct & Manage Project Execution	9	0	0
1.25	Perform Quality Assurance	9	0	0
1.26	Acquire Project Team	9	0	0
1.27	Develop Project Team	9	0	0
1.28	Manage Project Team	9	0	0
1.29	Distribute Information	9	0	0

APPENDIX A Cont'd

	Best Practice Category	Available Points	Awarded Points	Score (%)
1.31	Conduct Procurements	9	0	0
1.32	Monitor & Control Project Work	9	0	0
1.33	Perform Integrated Change Control	9	0	0
1.34	Verify Scope	9	0	0
1.35	Control Scope	9	0	0
1.36	Control Schedule	9	0	0
1.37	Control Costs	9	0	0
1.38	Perform Quality Control	9	0	0
1.39	Report Performance	9	0	0
1.4	Monitor & Control Risks	9	0	0
1.41	Administer Procurements	9	0	0
1.42	Close Project or Phase	9	0	0
1.43	Close Procurements	9	0	0

Score Summary for Process Maturity and Organizational Enablers

Stage	Process Maturity Score	Organizational Enablers Score
Standardize	**25%**	**38%**
Measure	NA	
Control	NA	
Improve	NA	

APPENDIX A Cont'd

Score Summary for Organizational Enablers

	Best Practice Category	Available Points	Awarded Points	Score (%)
1.1	Organizational PM Policy & Vision	96	9	9
1.2	Strategic Alignment	21	12	57
1.3	Resource Allocation	18	4	22
1.4	Management Systems	24	7	29
1.5	Sponsorship	21	8	38
1.6	Organizational Structures	27	13	48
1.7	Competency Management	162	59	36
1.8	Individual Performance Appraisals	12	2	17
1.9	Project Management Training	30	22	73
1.1	Project Management Communities	21	8	38
1.11	Project Management Practices	48	22	46
1.12	Methodology	30	14	47
1.13	Project Management Techniques	45	23	51

APPENDIX B.

MOCAH PLANNED ROADS PROJECTS (2015-2030)

Planned Project ID	No of Lanes	Length Km	Intervention	Completion Year	Budget $US Million	Governorate Name
R-89	Single	7.17	New Roads	2015	11.5	Erbil
R-55	Single	2.29	New Roads	2015	3.7	Erbil
R-80	Single	2.99	New Roads	2015	4.8	Sulaimani
R-56	Single	7.14	New Roads	2015	11.4	Sulaimani
R-83	Single	1.7	New Roads	2015	2.7	Sulaimani
R-67	Single	1.53	New Roads	2015	2.4	Sulaimani
R-70	Single	15.36	New Roads	2015	24.6	Sulaimani
R-65	Single	5.66	New Roads	2015	9	Sulaimani
R-69	Single	2.46	New Roads	2015	3.9	Sulaimani
R-42	Single	4.02	New Roads	2015	6.4	Sulaimani
R-36	Single	19.14	New Roads	2015	30.6	Sulaimani
R-94	Single	1.97	New Roads	2015	3.2	Sulaimani
R-84	Single	38.24	New Roads	2015	61.2	Sulaimani
R-61	Single	2.23	New Roads	2015	3.6	Sulaimani
R-85	Single	36.89	New Roads	2015	59	Sulaimani
R-60	Single	7.6	New Roads	2015	21.2	Sulaimani
R-91	Single	5.44	New Roads	2015	8.7	Erbil
R-78	Single	7.53	New Roads	2015	12.1	Erbil
R-77	Single	18.47	New Roads	2015	29.6	Sulaimani
R-93	Single	10.73	New Roads	2015	17.2	Sulaimani
R-72	Single	15.73	New Roads	2015	25.2	Sulaimani
R-76	Single	14.28	New Roads	2015	22.8	Sulaimani
R-82	Single	15.63	New Roads	2015	74	Sulaimani
R-32	Single	39.43	New Roads	2015	63.1	Sulaimani
R-08	Dual (2 Lanes)	59.87	New Roads	2015	267	Sulaimani
R-51	Single	9.79	New Roads	2015	15.7	Sulaimani
R-79	Single	4.9	New Roads	2015	13	Sulaimani
R-66	Single	5.8	New Roads	2015	9.3	Sulaimani
R-13	Single	5.83	New Roads	2015	9.3	Sulaimani
R-87	Single	9.53	New Roads	2015	5.5	Dohuk

APPENDIX B. Cont'd

Planned Project ID	No of Lanes	Length Km	Intervention	Completion Year	Budget $US Million	Governorate Name
R-57	Dual (3 Lanes)	36.75	New Roads	2015	147	Erbil
R-43	Dual (2 Lanes)	15.4	New Roads	2020	46.2	Sulaimani
R-68	Single	13.34	New Roads	2015	21.3	Dohuk
R-26	Single	4.18	New Roads	2020	10	Erbil
R-64	Single	5.62	New Roads	2015	4	Dohuk
R-74	Single	6.34	New Roads	2015	10.1	Dohuk
R-90	Single	4.15	New Roads	2015	6.6	Dohuk
R-86	Single	4.53	New Roads	2015	7.3	Dohuk
R-81	Single	0.76	New Roads	2015	1.2	Dohuk
R-71	Single	4.78	New Roads	2015	7.6	Dohuk
R-05	Single	8.02	New Roads	2015	12.8	Dohuk
R-92	Single	15.46	New Roads	2015	25	Sulaimani
R-18	Dual (3 Lanes)	176.25	New Roads	2015	654	Dohuk
R-22	Dual (2 Lanes)	34.64	New Roads	2025	103.9	Erbil
R-73	Single	12.5	New Roads	2015	20	Dohuk
R-35	Dual (2 Lanes)	27.82	New Roads	2030	83.5	Erbil
R-23	Single	37.78	New Roads	2025	104	Sulaimani
R-24	Single	22.48	New Roads	2025	89	Sulaimani
R-34	Dual (2 Lanes)	43.62	New Roads	2030	149	Sulaimani
R-03	Single	37.99	New Roads	2025	74	Sulaimani
R-29	Single	27.92	New Roads	2030	163	Sulaimani
R-21	Dual (2 Lanes)	22.19	New Roads	2025	53	Erbil
R-45	Dual (2 Lanes)	39.48	New Roads	2025	118.4	Erbil
R-52	Dual (2 Lanes)	47.13	New Roads	2015	131	Erbil

APPENDIX B. Cont'd

Planned Project ID	No of Lanes	Length Km	Intervention	Completion Year	Budget $US Million	Governorate Name
R-11	Single	37.61	New Roads	2015	116	Sulaimani
R-19	Dual (2 Lanes)	90.73	New Roads	2030	272.2	Erbil
R-28	Single	8.72	New Roads	2030	14	Erbil
R-33	Single	2.39	New Roads	2030	3.8	Dohuk
R-46	Dual (2 Lanes)	3.45	New Roads	2020	10.4	Dohuk
R-38	Dual (2 Lanes)	34.93	New Roads	2030	104.8	Erbil
R-88	Single	6.38	New Roads	2015	10.2	Erbil
R-49	Single	12.5	New Roads	2020	20	Dohuk
R-48	Single	8.98	New Roads	2020	14.4	Erbil
R-47	Single	5.97	New Roads	2020	9.6	Erbil
R-41	Single	4.34	New Roads	2020	6.9	Dohuk
R-02	Single	14.83	New Roads	2020	23.7	Sulaimani
R-09	Single	13.37	New Roads	2030	21.4	Sulaimani
R-27	Single	10.86	New Roads	2030	17.4	Erbil
R-50	Single	8.93	New Roads	2020	14.3	Dohuk
R-06	Single	4.97	New Roads	2030	7.9	Erbil
R-58	Dual (3 Lanes)	143.54	New Roads	2015	1062.2	Erbil
R-54	Dual (3 Lanes)	55.64	New Roads	2020	411.7	Sulaimani
R-16	Dual (3 Lanes)	44.6	New Roads	2025	330	Dohuk
R-20	Dual (3 Lanes)	9.5	New Roads	2025	70.3	Dohuk
R-63	Dual (3 Lanes)	69.19	New Roads	2020	512	Erbil
R-17	Dual (2 Lanes)	9.78	New Roads	2015	25	Dohuk
R-01	Dual (2 Lanes)	7.74	New Roads	2020	23.2	Erbil

APPENDIX B. Cont'd

Planned Project ID	No of Lanes	Length Km	Intervention	Completion Year	Budget $US Million	Governorate Name
R-62	Dual (2 Lanes)	45.9	New Roads	2015	120	Erbil
R-99	Dual (2 Lanes)	12.49	New Roads	2015	37.5	Erbil
R-95	Single	8.64	New Roads	2015	13.8	Erbil
R-98	Single	13.57	New Roads	2015	21.7	Sulaimani
R-105	Single	13.95	New Roads	2020	22.3	Dohuk
R-96	Single	26.46	New Roads	2020	42.3	Erbil
R-100	Dual (2 Lanes)	69.63	New Roads	2020	208.9	Erbil
R-97	Single	1.06	New Roads	2020	1.7	Dohuk
R-25	Single	77.48	New Roads	2015	124	Dohuk
R-40	Single	2.77	New Roads	2020	4.4	Dohuk
R-10	Single	14.85	New Roads	2020	23.8	Dohuk
R-15	Single	10	New Roads	2020	16	Dohuk
R-104	Single	8.76	New Roads	2020	14	Dohuk
R-44	Single	4.66	New Roads	2020	7.5	Dohuk
R-53	Dual (2 Lanes)	3.65	New Roads	2015	10.9	Erbil
R-12	Single	37.81	New Roads	2015	25.8	Sulaimani
R-59	Single	7.66	New Roads	2015	12.3	Sulaimani
R-75	Single	14.78	New Roads	2015	23.6	Sulaimani
R-102	Single	11.96	New Roads	2020	19.1	Erbil
R-39	Single	5.14	New Roads	2015	0.5	Dohuk
R-37	Single	5.67	New Roads	2015	5	Dohuk
Total		2406.7			8927.6	

APPENDIX C.

MOCAH PLANNED BRIDGES (2015-2030)

Proposed Bridge ID	Proposed Bridge Name	Dam	Crossing River Width	Completion Year	Governorate Name
B-16	Proposed Bridge B-14 - Bekhma Dam	Bekhma	27	2020	Erbil
B-12	Proposed Bridge B-18 - Bekhma Dam	Bekhma	21	2020	Erbil
B-13	Proposed Bridge B-17 - Bekhma Dam	Bekhma	20	2020	Erbil
B-11	Proposed Bridge B-19 - Bekhma Dam	Bekhma	46	2020	Erbil
B-17	Proposed Bridge B-13 - Bekhma Dam	Bekhma	44	2020	Dohuk
B-10	Proposed Bridge B-20 - Bekhma Dam	Bekhma	0	2020	Erbil
B-09	Proposed Bridge B-3 - Gomaspan Dam	Gomaspan	24	2015	Erbil
B-05	Proposed Bridge B-9 - Taqtaq Dam	TaqTaq	42	2015	Sulaimani
B-08	Proposed Bridge B-4 - Taqtaq Dam	TaqTaq	48	2015	Sulaimani
B-06	Proposed Bridge B-6 - Khewata Dam	Khewata	65	2015	Sulaimani
B-07	Proposed Bridge B-5 - Khewata Dam	Khewata	47	2015	Sulaimani
B-15	Proposed Bridge B-15 - Mandawa Dam	Mandawa	26	2020	Erbil

APPENDIX C. Cont'd

Proposed Bridge ID	Proposed Bridge Name	Dam	Crossing River Width	Completion Year	Governorate Name
B-02	Universal Bridge instead of Hafiz and Barslin Bridges	Crossing Stream	0	2015	Erbil
B-04	Kolasotawo - Korashala Bridge	Crossing Stream	715	2015	Sulaimani
B-03	Parwiz Khan Bridge	Cross Border	0	2015	Sulaimani
B-21	Grega Bridge	Crossing Stream	0	2020	Dohuk
B-01	Omarbil Bridge	Crossing Stream	0	2015	Sulaimani
B-19	Zimkan Bridge	Crossing Stream	0	2015	Sulaimani