An-Najah National University
Faculty of Graduate Studies

Process Protocol (P.P) as Coordination Tools between Designer, Consultant and Contractor (Construction Sector in Palestine Case Study)

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This Thesis is Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Engineering Management, Faculty of Graduate Studies, An-Najah National University, Nablus, Palestine.
2014

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Dedication

would like to dedicate this work to I

my wonderful family and my special husband for

their sacrifice and endless support.

Acknowledgment

First of all, thanks to Almighty Allah for help me conducting this research and give me the power to despite all difficulties.

I would like to thank my Supervisor, Dr.Ehab Hjaze who guided me at various stages from beginning to end in development this work, and I would like to thank Dr. Ümit Işıkdağ for help

I would like to thank my family and friends, who motivated me at every moment in moving ahead for the successful completion of the study.

Finally, thanks and regards to all those who supported me in any respect during the

Completion of this work.

الإقرار

أنا الموقعة أدناه مقدمة الرسالة التي تحت عنوان:

Process Protocol (P.P) as Coordination Tools between Designer, Consultant and Contractor (Construction Sector in Palestine Case Study)

تطوير البروتوكول أداه للتنسيق بين المصمم، الاستشاري والمقاول (قطاع المقاولات في فلسطين كحالة دراسة)

أقر بأن ما اشتملت عليه هذه الرسالة إنما هو نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، و أن هذه الرسالة ككل، أو أي جزء منها لم يقدم من قبل لنيل أي درجة علمية أو بحث علمي أو بحثي لدى أي مؤسسة تعليمية أو بحثية أخرى.

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Student's name: **اسم الطالبة:**

Signature: **التوقيع:**

Date: **التاريخ:**

Abbreviations

WB	West Bank
GDP	Gross Domestic Product
PCU	Palestinian Contractors Union
PECDAR	Palestinian Economic Council for Development & Reconstruction
NGOs	Non Government Organizations
FIDIC	International Federation of Consulting Engineers
PCBS	Palestinian Central Bureau of Statistics
USAID	United States Agency for International Development
MPWH	The Ministry of Public Work and Housing
IDB	Islamic Development Bank
UNRWA	United Nations Relief and Work Agency
UNDP	United Nations Development Program
EU	European Union
PP	Process Protocol
ANERA	American Near East Refugee Aid
AEC	Architecture, Engineering and Construction
NEDP	National Economic Dialogue Program
PNE	Palestinian National Economy
PM	Project Management
BIM	Building Information Modeling
PCPPF	Palestinian Construction Process Protocol Framework
P NA	Palestinian National Authority

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Process Protocol (P.P) as Coordination Tools Between designer, consultant and Contractor (Construction Sector in Palestine Case Study)

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Abstract

Construction as a vital sector in Palestinian industry faces many problems related to stockholders in construction project, starting from the owner to the consulting engineer and the contractor.

The main objective of this research is to study the current status of the construction industry in Palestine and explore the reasons behind the failures from the perspective of the relationship between the contractor, engineer and the owner. The research focuses on problems resulting from poor coordination, and provides an analysis regarding current construction processes in Palestine. Finally, the research presents a Process Protocol framework that is developed to with the aim of facilitating the coordination in construction projects.

This research used a triangulation of different methods. In this research the literature review was focused on identifying the problems in the construction industry in Palestine, and uncovering the details of process protocol approach/methodology. Furthermore the review of legal documentation related to the construction industry is also conducted prior to the development of the Process Protocol Framework. Semi-structured

interviews were used as the interview technique, where twenty experts including engineers, contractors, and project managers, were interviewed in a period of three months regarding i.) the major problems related to coordination and ii.) on the role of a process protocol in improving the coordination in construction projects. Six case studies are conducted during to understand the real-life processes and problems related to the coordination in these projects.

The analysis of these different sources of data lead to the result that there are problems in the construction sector related to the lack of coordination. this can be categorized in six major problems:"Managerial Information, Construction, legal, Technical, Design and Financial". Additionally, the construction process in Palestine is very simple in content. It is carried out as follows: planning phase "pre-project"; design phase" initial design, development of the design, document preparation, tendering ",then the next phase which is implementation or construction phase, and the final phase which is handing over then operation. These concepts need management skills which WB lacks.

The main result the researcher reached is that the Palestinian process protocol which are the modify of construction process in Palestine and depends on the principle of (PP)Process Protocol in UK with an action plan for implementation that is it suitable for government building projects which funded by donor.

The study recommends that government should examine and evaluate the regulations related to constructions processes, and form a specialized body that contains engineers, contractor, governmental decision makers, law specialists and college and university teachers in order to take care and adopt all issues related to the construction process, and conduct continuous training and education programs through lectures, training courses, seminars and workshops. The Ministry of Public Works and Housing is also recommended to establish a research and development unit (R&D) and action plan to improve this sector and to overcome the dynamic impact of all problems facing the construction sector that may appear as a result of the lack of coordination in the construction process.

Finally, the researcher suggest future framework to adopts and implements the Process protocol, this Framework consists of two strategies: " Short-term planning ” and Long-term planning " and these strategies consist of the following action plan elements: Regulatory and Institutional Framework, Technical Support Infrastructure, Construction Industry Actors, Identifying the Construction Process , Identifying the best practice to have strong coordination and advancing the construction process to achieve goals .

Chapter One

Introduction

Chapter One
Introduction

Each construction project is a unique and complex project. So understanding such a complexity and analyzing each project in all project life cycles is a necessity. (Conover, 2007).

The complex nature of construction industry raises the need of Project Management (PM) in Architecture, Engineering and Construction (AEC) industry, so the PM needs tools, techniques and skills that help to plan, coordinate, monitor, and control activities to meet the project requirements, that can do better with IT support and tools. Among all the tools of BIM technology is the current technology that is expected to set a standard in the future of AEC industry.

In most construction projects in Palestine there is a gap in the relationship between the design engineer and the contractor in terms of responsibilities, how to exchange information, understanding the project in addition to poor channels of communication. Because of this, most of the engineering projects face problems caused by this complex relationship.

The construction industry in Palestine is one of the key economic industries and is the main force motivating the Palestinian National Economy (PNE), which has witnessed noticeable expansion and activities since 1994 after the establishment of the PNA (Osaily, 2010).The construction industry can be viewed as a development tool for achieving goals in modern society. Construction Projects frequently fail, not only

because of the lack of technical skills and recourses, but also because of the inadequate coordination, integration, communication and control of project activities, people, stakeholders and contractors. In order to meet future demands and foster successful projects, this study targets to contribute to the modernization of the construction industry by addressing the difficulties related to the of lack coordination between all parties. The study in this context focuses on the adoption of coordinated and integrated project delivery with the help of a Process Protocol Framework. The main aim of this research is to formulate a Process Protocol Framework for the Palestinian Construction Industry with the goal of overcoming the coordination problems through increasing the awareness on different type's processes and process (based construction) management for all parties. The objectives of the research included i.) Identification of coordination problems through literature review, real life case studies, interviews and ii.) Identification of construction processes with real life case studies and iii.) Development of a process protocol framework based on knowledge gained regarding the coordination problems and current processes.

1.1 Research Problem

Construction as a vital sector in Palestine industry faces many problems, these problems are related to stakeholders in the construction project, starting from the owner to the consultant engineer and the contractor.

The contractor and engineer form the main parties of the contract, and the relationship between them is based on the International Federation of Consulting Engineers (FIDIC), and other laws and bid documents. Unfortunately, real construction sectors in Palestine do not apply the contents of these documents. Due to this; the construction industries have many problems related to this issue:

- They face a communication gap between all stakeholders.
- The construction processes in Palestine are simple and go through non-integrated stages for the construction process, and have weaknesses in project management and planning because of limitations of skills in project managements, and absence for management concepts, like Resources Management, Development Management, etc.
- Absence of implementation the applied regulations and laws related to construction sectors and the limitations of the relationship between Construction Industry Actors.
- They have real problem to achieve the visualization of client's requirements and the visualization of structural and spatial requirements of the projects; because of lack of planning.
- The construction sector in Palestine doesn't use modern systems in the documentation, design and construction and uses only traditional matters resulting in an inability to complete the activities within the specified schedules.

1.2 Research Questions

The construction sector must keep up with global developments in order to promote itself as an important sector. All methods should be used to support this sector and ensure high quality facilities at low costs.

To achieve this, the following questions need to be answered:

1. What are the most important problems in the construction sector in Palestine; especially in the WB, related to poor coordination between the contractor, owner, and engineer?
2. What is the concept of the construction process in WB?
3. What are the main factors causing failure in construction projects in the WB?
4. How can adopt the concepts of Process Protocol in construction industry in WB essentially in government projects?

These questions and others will be answered in this thesis, in order to improve the construction industry in WB.

1.3 Aims and Objectives of the Research

The main objective of this research is to devise a protocol for managing the construction process in Palestine which aims to develop this sector.

The protocol will consist of a general plan for developing construction activities including the main activities, their precedence

relationships and the role and responsibilities of different actors. This will be achieved through:

1. Review and study of the current status of the construction sector in WB and how we can manage information in construction projects between contractors and engineers in the light of such a study.

2. Analyze and identify the main problems in the construction sectors according to coordination.

3. Study and analyze the concept of Process Protocol to be introduction to adopt Process Protocol in construction process in Palestine.

1.4 Methodology

This study shall be accomplished within three main phases:

1) Literature review to give an overview and theoretical background on problems facing the construction sector, and Process Protocol.

- Study the status of the construction industry in Palestine, and the main problems related to coordination.
- Study the construction process in WB .
- The concept of Process Protocol, PP model and PP elements.

2) Study and analyze the current construction process as a Case Study.

- A series of semi-structured interviews and meetings with decision makers in the construction project, the Engineers Association, the

Palestinian Contracting Union and other related institutions to identify the coordination problem and construction process, and take case studies to help to achieve this.

- Documentary analysis: all collected data and information will be analyzed, compared and evaluated to assess the current situation

3) Expected Outcomes: Vision for a Unified construction process in Palestine "Palestinian Construction Process Protocol for building project which funded by donor"

- Proposed Framework to adopt PP involving all project partners.
- Proposed modification for construction process in government projects.
- Proposed recommendations that will help to develop and support the implementation of the Process Protocol in Palestinian construction projects.

1.5 The Importance of the Topic

- Identification of the existing constraints gaps and challenges which stand in the way of implementing PP in construction industry in Palestine.
- Trying to modify the construction process in government projects, and Development of a framework by using the PP to facilitate construction sectors, which is used as a guide to use it in construction industry to facilitate communication between engineers and contractors.

1.6 Summary of chapters

This dissertation consists of eight main chapters as follows:

- Chapter One: Introduction. This chapter represents an overview of the main objectives of the research, statement of problems, aims and objectives of the study, as well as the methodology.
- Chapter Two: Literature review. This chapter presents an overview of the construction sector in Palestine, the construction contracts, Construction Projects Participants, types of Construction Contracts, and Problems of coordination between project partners in construction projects in Palestine.
- Chapter Three: This chapter presents an overview of the concept of Process Protocol and Process Protocol Model.
- Chapter Four: Methodology. This chapter shows the methodology used in this research in order to achieve the required objectives., which includes review of literature related to the construction sector in Palestine and document reviews, personal interviews and case studies
- Chapter Five: This chapter includes Data analysis, results and discussions; identify the construction process in Palestine, the strategies for improving the coordination in construction process by adopting process protocol.
- Chapter Six: This chapter includes Conclusions and, Recommendations and Appendices.

1.7 Summary

In this research:

- Construction sector in the WB will be covered as a topic, by studying the construction process and problems facing the construction sector according to the lack of coordination. This is carried out by the use of case studies, and identifying the construction process in Palestine
- After collecting data concerning the construction process, this data is analyzed and studied, with the help of the literature review and the results and analysis of the interviews with partners.
- Suggestions a modified construction process in the government projects to improve and support this process.
- A framework with concepts of PP is designed to help managers organize their work and improve the construction process and manage construction projects in the West Bank.

Chapter Two

Background: The construction sector in Palestine

Chapter Two
Background: The construction sector in Palestine

The construction industry has unique characteristics compared with other industries, which have a significantly high rate of business failure, and collapse and bankruptcy. These are common terms in the industry due to the many risks inherited in how this industry operates significantly, affected by economic, environmental and political cycles, and this is due to many uncertainties resulting from many players of multiple disciplines who are brought together at various stages throughout a single project. (Enshassi,Al-Hallaq et al., 2006).

One key feature that distinguishes the construction industry from others is the relative ease of entry, giving rise to a large number of construction firms competing fiercely in a competitive fragmented market (Enshassi et al., 2006). Unfortunately, there are indications that more than 50 percent of new contractors in the USA alone fail within the first five years of operation (Grosskopf, 2005), this is because of several problems ranging from contract administration, complex and lengthy payment procedures, delayed payments, lack of coordination, etc.

Palestine is not an exception. Construction industry is complex and influenced by factors which may cause weakness or strength. In Palestine, this industry has been affected by factors including changing economy, Israeli occupation, Intifada, closures and factors inhibiting the industry regarding the mismanagement of projects and the lack of skills and technology (Enshassi,Abu Rass , 2008).

2.1 Overview on Construction Industry in Palestine

The construction sector is one of the key economic sectors and is the main force motivating the Palestinian National Economy (PNE). It is one of the leading sectors that achieved high rates of economic growth in the 1970s up to the mid1980s. From then onwards, this sector has been subjected to many setbacks which have decreased its role in building the Palestinian economy in contrast with its counterparts in many developing and neighboring countries (Enshassi,Al-Hallaq et al., 2006).

The construction sector contributes 15.4% to the Palestinian GDP (Gross Domestic Product) (PCBS,2013) which is a large proportion, thus positively affecting various economic, social, educational and vocational sectors in addition to other Palestinian institutions (PCU, 2006), and increased value added of the construction sector increased by 9.3% during the first three quarters of 2013 compared with the same period in 2012, administrative records also showed an increase in the number of building licenses issued in Palestine (14.0%) . The total number of workers in the construction sector during the first three quarters of 2013 increased by 12.0 % compared with the same period of 2012, (PCBS,2013).

This sector is very important for growth as it carries significant forward and backward linkages, ranging from simple manufacturing plants to major construction materials and processing industries. In addition, the construction sector has also provided an impetus for local investment, and has contributed to the consolidation of the Palestinian economic base.

2.2 Construction Contractors in Palestine:

The contractor in Palestine as a major partner in any construction project, whether the individual or company, must be registered and classified at the Palestinian Contractor's Union (PCU,2014).

According to PCU, the "contractor "is any legal person who shall have the right to practice construction contracting profession in accordance with operative regulations and laws (PCU, 2014).

According to PCU ,the contractors are classified according to their specialties, and they are divided into five categories each of which shall be sub-categorized into several specialties and every category may have a grade from (1 -5) where 1 is the highest.

These categories are: (PCU, 2014).

1. Road Construction contractors: which include road construction ,all kinds of open and paving and surfacing work, bridges ,etc.
2. Building contractors: the establishment, implementation and maintenance of public buildings and residential schools, hospitals, hotels, housing projects and industrial projects and concrete works including infrastructure extension.
3. Water and sewer contractors: which include implementation and maintenance of water and sewer projects, rain and sewage projects and irrigation and drainage projects and water treatment plants.

4. Electro-mechanics contractors: All the business of mechanical, electrical and plumbing, such as extensions of telephone networks, water systems and drainage, gas, heating, air conditioning and refrigeration.

5. Public works and maintenance contractors: maintenance works in the areas of buildings, water / sewer, electricity, mechanics, and the creation of walls and fences, sidewalks and walkways.

2.3 Major Types of Construction Projects

The broad spectrum of constructed facilities may be classified into four major categories, each with its own characteristics, these categories are: (Elbeltagi, 2009)

1. Residential Housing Construction.

Residential housing construction includes single-family houses, multi-family dwellings, high-rise apartments. Residential housing designs are usually performed by architects and engineers, and the construction is executed by contractors who hire subcontractors for the structural, mechanical, electrical and other specialty work.

2. Institutional and Commercial Building Construction

Institutional and commercial building construction encompasses a great variety of project types and sizes, such as schools and universities, medical clinics and hospitals, recreational facilities and sports stadiums,

retail chain stores and large shopping centers, warehouses and light manufacturing plants, and skyscrapers for offices and hotels.

3. Specialized Industrial Construction.

Specialized industrial construction usually involves very large scale projects with a high degree of technological complexity, such as oil refineries, steel mills, chemical processing plants and coal-fired or nuclear power plants.

4. Infrastructure and Heavy Construction

Infrastructure and heavy construction includes projects such as highways, mass transit systems, tunnels, bridges, pipelines, drainage systems and sewage treatment plants.

2.4 Sectors Working in Construction Industry in Palestine.

Many sectors play a key role in the development of the construction sector in Palestine. According to (PCU, 2003), these sectors can be classified as follows:

2.4.1 The Private Sector

This sector involves the construction contracting which includes any work pertaining to the construction of buildings, roads, installations, various engineering projects in addition to the operation and maintenance of such construction projects (PCU, 2013). And also include the engineering sector which represent the individual engineers, engineering

advisory offices which register the engineers, testing laboratories, private project owners such as investors and private sector corporation. This sector additionally includes manufacturing construction materials such as concrete, bricks, stone crushers, asphalt products and finally the service sector which consists of transportation companies, importing firms and insurance corporations (Abdulhadi ,1994).

2.4.2 The Public Sector

The public sector is the governmental institution that owns or manages public projects. The construction sector is directly connected with governmental institutions; they may be the owner of a construction project, or they may control and supervise the construction sector in accordance with the Law (Saqfelhait,2012).

The governmental institutions directly related to construction sector are the Ministry of Public Works and Housing, Ministry of Labor and Palestinian Standards Institute. On the other hand, governmental institutions indirectly contributing to construction sector are: Ministry of National Economy, Ministry of Planning and International Cooperation, Palestinian Water Authority, Palestinian Energy Authority, Ministry of Health, Ministry of Higher Education, Ministry of Local Government, Ministry of Finance, Ministry of Transportation and Communications, PECDAR as well as other official institutions and ministries (Abedmousa,2008) .

2.4.3 Donor "International Financing of Construction Sector"

Because of the economic situation of the Palestinians and the financial failure, the most vital projects in Palestine depend on aid from donor countries.

This third party affects and works in construction sectors which are called the Donor" International Financing of Construction Sector" who finance many project in Palestine. These bodies and organizations that offer grants to the construction sector in Palestine are the World Bank (WB), the Islamic Development Bank (IDB), the United Nations Relief and Work Agency (UNRWA), the U.S. Agency for International Development (USAID), United Nations Development Program (UNDP), the European Union (EU), German and Japanese institutions, Welfare Association and World Vision (PCU, 2013. Abdulhadi, 1994).

So we can divide the construction projects in Palestine according the previous classification:

1. Projects in Private Constructions.
2. Projects in Public Structures Funded by International Donors.
3. Projects in Public Structures Funded by Governments.

2.5 Construction Project Participants

Most construction projects have many actors playing key roles in the implementation of the project like contractors, project managers, supply

managers, site managers, and other service subcontractors, design engineers, structural engineers, mechanical engineers, subcontractors, owners and donors. All these roles can be gathered into only three categories of actors. Then each actor can develop as many roles as necessary. The three types are: (Elbeltagi, 2009)

1. The **owner** ***(The Client)***, whether public or private, who funds the project. The owner engages as many architects, engineering firms, and contractors as necessary to accomplish the desired work (Clough, 1981). In order to achieve success, owners need to define accurately the projects objectives. They need to establish a reasonable and balanced scope, budget, and schedule and also need to select qualified designers, consultants, and contractors.

2. The **Architect-Engineer**, also known as the design professional, such as: architects, engineers, and design consultants. The major role of the design professional is to interpret or assist the owner in developing the project's scope, budget, and schedule and to prepare construction documents.

3. The **General Contractor** (The Construction Professionals) Bockrath (2000) defines the contractor as the party who undertakes supplying goods or performing a construction job or other projects for the owner. The prime contractor is responsible for delivering a complete project in accordance with the contract documents. In most cases, the prime contractor divides the work among many specialized contractors called subcontractors.

2.6 Types of Construction Contracts

A Contract is an **"**Agreement between two or more parties that creates for each party a duty to do something (e.g., to provide goods at a certain price according to a specified schedule) or a duty not to do something " (Owen, Gwyn, 2003)**.**

A construction contract is between two parties:

- An owner who is referred to as the employer. S/he decides that there is a need for the project and pays for the project. The employer will need to establish his/her requirements, decide who will prepare the detailed design and check that the construction meets the requirements (Bockrath, 2000).

- A contractor who will prepare all or any part of the design as required by the employer and will actually construct the work (Bockrath, 2000).

There are many different types of construction contracts. Regardless of the type of contract, the goal of any contract is to achieve the desired objectives of the project in less time, with the same quality and at the lowest price possible, while giving the contractor an opportunity to make a fair profit.

The selection of the contract type to be used for a construction project is made by the owner, acting upon the advice of his engineer and his legal advisor. The selection must meet the owner’s objectives and take into account the constraints that might relate to the project. Consultants and contractors should be fully informed about the project objectives and

constraints. The scope and the nature of the project will primarily affect the selection of the type of contract (Elbeltagi, 2009).

According to Fisk and Reynolds, the construction contracts may be classified into the following types:

- Lump Sum Contracts
- General (traditional) contract Method "Unit Price".
- Cost Plus Contracts.
- Design-Build Contracts.
- Turnkey Contracts.
- Management-Oriented Contracts.
- Construction by Day Labor.
- Target Estimate Contracts.
- Guaranteed Maximum Price Contracts.
- Contracts with Quantities.
- Construction Management Contracts.
- Separate contract Method.

2.7 Contracting Methods in Palestine

The selection of the contract type in Palestine depends on several factors such as agency type, project type, and sponsor identity. Sometimes

the local agencies are enforced to use the sponsor country contract for projects financed by that sponsor. Also the agency may use more than one type of contract according to the project type. Most of the agencies presume the special conditions in order to overcome some of the general condition provisions that are not suitable for the agency (Enshassi & Abu Rass, 2008).

According to the previous construction contracts; and as a result of interviews, the researcher identifies the general type of contract methods in Palestine to be as follows:

1. “General (traditional) contract Method” Unit Price.

2. “Separate contract Method”.

3. “Direct Labor/Force account Method”.

4. Turnkey contract.

In Palestine there are two other types of contracting methods: lump-sum and (BOT) Build–operate–transfer, these two types are limited in use.

2.8 Introduction to coordination Problems in the construction sector

The construction industry is inherently an uncertain industry; this uncertainty arises from the nature of the industry itself- the competitive tendering process, the company's turnover, site production rates and the weather (Harris & McCaffer, 1998). As a result of these variables, this sector faces many problems and barriers. One of these problems in

Palestine is the lack of coordination between project partners in the construction projects.

According to Malone (1994) “Coordination is the act of managing dependencies between activities”. For Singh (1992) identifying coordination “is the integration and harmonious adjustment of individual work effort towards the accomplishment of the larger goal.”(Mohd Noor, 2011).

The process of construction involves the organization, administration, and coordination of all resources as labors, materials, equipment and monetary. These must be integrated in the most efficient manner possible to complete construction projects on schedule, within the budget and according to the standards of quality and performance specified by the project owner or designer (Mohd Noor, 2011).

According to Oscar (1983) “Ninety percent of all problems on site are due to late or inadequate information.” Late information transaction on site can cause a thousand of dollar losses (Mohd Noor, 2011).

The coordination between stakeholders of the project including all project inputs as resources, information, and material will produce output which includes resources, information and materials.

The basic and most essential inputs of any project are the main ideas, goals, bills of quantities, specifications, drawings, schedules, contracts, work plans and responsibilities. It is important to clarify these inputs to all

parties. The most important output item is the result of the project, such as building a school, hospital ... etc.

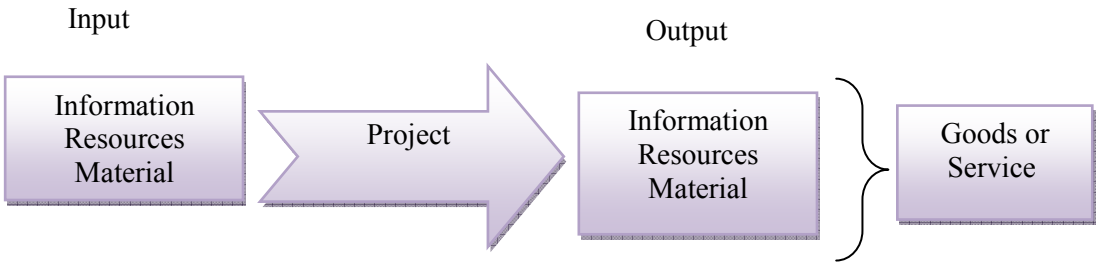

Figure (2.1): project process

In Palestine, lack of coordination in projects causes a lot of problems which lead to delay in the construction projects and most of these projects are over budgeted and lack the required quality (Abdulhadi, 1994).

2.9 Summary

This chapter presented an overview of construction projects in Palestine, Construction Contractors and there actors. It highlighted the main contract type and the sector work in constructions.

Then the researcher indicated that there are problems in the traditional construction process, which have been addressed in many research investigations, during the past few years. One of these problems is the problem of coordination in the construction process between project partners.

To solve this coordination problem we need a new process to help construction sectors to improve their business along with the best solution strategies which are suggestions on how we can implement the "**Process Protocol**" to develop and support the construction project in Palestine.

Chapter Three

Process Protocol

Chapter Three
Process Protocol

In the previous chapter, the researcher introduced the Palestinian construction sectors and highlighted its coordination problems.

This chapter will introduce the main concepts of (PP) Process Protocol which was adopts in Britain, and helps in organizing and developing the construction sectors in Palestine. It will also discuss PP definitions, and show their objectives, phases, models, Principles, and many other important aspects.

3.1 Overview

In Britain, many governmental and institutional reports, such as Latham (1994) and Egan (1998) concluded that the construction industry in the UK is plagued with a number of problems, such as weakness in the co-ordination and communication in the project, and the construction process is an irregular process with minimum research and development. It lacks customer focus and has many problems in contractual relationships. These factors are called inhibitors to the industry's performance (Brown, Eric).

To help eliminate these inhibitors, the Engineering and Physical Science Research Council (EPSRC) funded projects under the Innovative Manufacturing Initiative (IMI) ‘Construction as a Manufacturing Process’ initiative (Kagioglou, Cooper, 2001).

The project brought together a number of companies, IT specialists, clients representing the construction supply chain, and the University of

Salford's research expertise which was contributed to the development of the Generic Design and Construction Process Protocol (GDCPP), (Cooper, 2012).

The main aims of the project were to:

- Improve the construction industry and analyze the current practices, and compare the best practices in the construction process.
- Identify the Information Technology (IT) requirements needed to support the Process Protocol, (Kagioglou, Cooper, 1998).
- "Map the entire project process from the client's recognition of a need to operations and maintenance" (Cooper, 2012).

3.2 Process protocol definition

Harrington (1991) refers to a process as "any activity or group of activities that takes an input, adds value to it and provides output to an internal or external customer.

And the process protocol according to the Process Protocol website is:

" *A common set of definitions, documentations and procedures that provides the basis to allow a wide range of organizations involved in a construction project to work together seamlessly*" " (Process protocol website).

3.2.1 What is the Process Protocol Model?

The process protocol model is an improved representation of the design and construction process. It organizes the necessary construction processes into four phases: pre-project, pre-construction, construction and post-construction. Then the stages are divided into ten phases. Also, the participants within the Process Protocol are organized into activity zones, see Figure (3.1) (Cooper, Kagioglou, 1998)

A framework of common definitions, documents and procedures were developed to help construction project participants work together seamlessly.

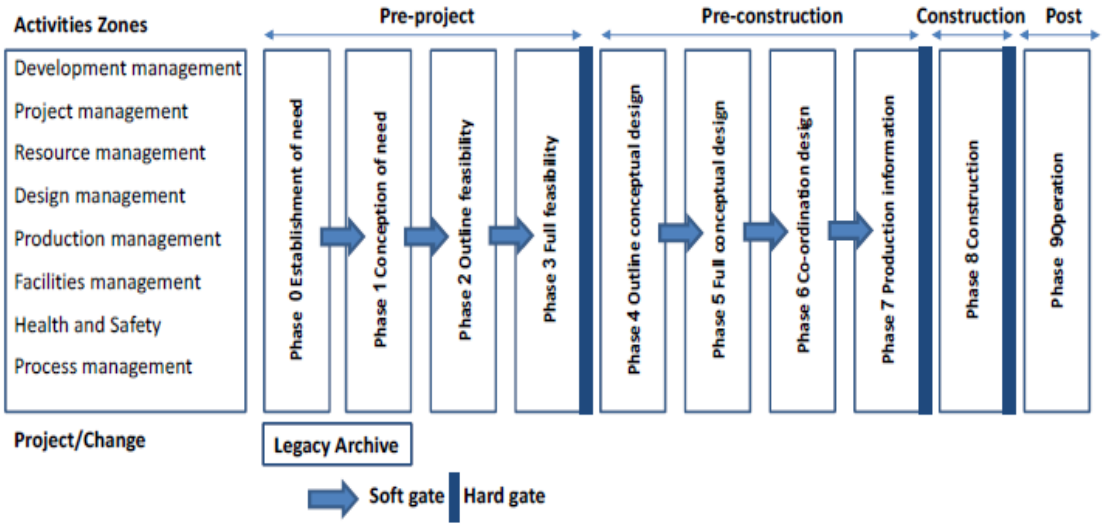

Figure (3.1): Process protocol Model ,source: P.P Website.

The key attributes of this framework encompass the following concepts: (Goulding, Alshawi)

Activity Zones: A structured set of sub-processes designed to support the solution.

Deliverables: Outputs from project and process information, used to create the Phase Review Report.

Phase Review & Stage Gate Processes: Generic processes within the stages, separated by decision gates (Phase Review Meetings) needed to fix and approve the information prior to progression.

Gates & Phase Reviews: Project and process review points, used to examine progression, dependent upon predefined criteria. Gates are either Hard (prevent progression) or Soft (accept conditions and allow Concurrency.

Legacy Archive: Mechanism for storing, recording and retrieving project and process information.

Phase Review Report: Document of deliverables presented at the phase review gates, the information of which is subsequently stored in the legacy archive.

The table below show the ten phases and its concepts:

Table (3.1) Process protocol Phases, source: P.P Website

Phases	Name	Question	Prime Activity Zone Responsibility	Definitions
Phase 0	Demonstrating the Need	'What is the Problem?'	Development. M Project .M Facilities .M Resource .M Process .M	Establish and demonstrate the client's business needs and ensure problems defined in detail. Identifying the key stakeholders and their requirements will enable the development of the Business Case as part of the client's overall business objectives.
Phase 1	Conception of Need	'What are the options and how will they be addressed?	Development. M Project .M Facilities .M Resource .M Process .M Design .M	The initial statement of need becomes increasingly defined and developed into a structured brief. To this end, all the project stakeholders need to be identified and their requirements captured. Based on those, the purpose of this phase is to answer the question "What are the options and how will they be addressed?"
Phase 2	Outline Feasibility	'Which option(s) should we consider further?'	Development. M Project .M Facilities .M Resource .M Process .M Design .M	Many options could be presented as possible solutions to the identified problem. The purpose of this phase is to examine the feasibility of the project and narrow down the solutions that should be considered further. These solutions should offer the best match with the client's objectives and business needs.
Phase 3	Substantive Feasibility Study & Outline Financial Authority	'Should the proposed solution(s) be financed for development?'	Health & Safety, Statutory and Legal .M Development. M Project .M Facilities .M Resource .M Process .M Design .M	The decision to develop a solution or solutions further will need to be informed by the results of the substantive feasibility study or studies. The purpose of this phase is to finance the 'right' solution for concept design development and outline planning approval.

Phases	Name	Question	Prime Activity Zone Responsibility	Definitions
Phase 4	Outline Conceptual Design	'How does the solution translate to an outline design?	Health & Safety, Statutory and Legal .M Development. M Project .M Facilities .M Resource .M Process .M Design .M Production .M	The purpose of this phase is to translate the chosen option into an outline design solution according to the project brief. A number of potential design solutions are identified and presented for selection. Some of the major design elements should be identified.
Phase 5	Full Conceptual Design	'Can we apply for planning permission?	Health & Safety, Statutory and Legal .M Development. M Project .M Facilities .M Resource .M Process .M Design .M Production .M	The conceptual design should present the chosen solution in more detailed form to include M&E, architecture, etc. A number of build ability and design studies might be produced to prepare the design for detailed planning approval.
Phase 6	Co-ordinate Design, Procurement & Full Financial Authority	'Are the major design elements fixed?'	Health & Safety, Statutory and Legal .M Development. M Project .M Facilities .M Resource .M Process .M Design .M Production .M	he purpose of this phase is to ensure the co-ordination of the design information. The detailed information provided should enable the predictability of cost, design, production and maintenance issues amongst others. Full financial authority will ensure the enactment of production and construction works.
Phase 7	Production Management	'Is the detail 'right' for construction?'	Health & Safety, Statutory and Legal .M Development. M Project .M Facilities .M Resource .M Process .M Design .M Production .M	The detail of the design should be determined to enable the planning of construction including assembly and enabling works. Preferably no more changes in the design should occur after this stage. Every effort should be made to optimize the design after consideration of the whole lifecycle of the product.

Phases	**Name**	**Question**	**Prime Activity Zone Responsibility**	**Definitions**
Phase 8	Construction	Are we ready to hand-over the facility?'	Development. M Project .M Resource .M Production .M Health & Safety, Statutory and Legal .M Process .M	The design fixity and careful consideration of all constraints achieved at the previous phase should ensure the 'trouble-free' construction of the product. Any problems identified should be analyzed to ensure that they do not re-occur in future projects.
Phase 9	Operation & Maintenance	What can we learn?'	Development. M Project .M Resource .M Production .M Health & Safety, Statutory and Legal .M Process .M	The facility is handed over to the client as planned. The post project review should identify any areas that need to be considered more carefully in future projects. The emphasis should be in creating a learning environment for everybody involved. As built designs are documented and finalized information is deposited in the Legacy Archive for future use.

3.2.2 Activity Zone

An Activity Zone is a structured set of sub-processes involving tasks which guide and support work towards a common objective (process protocol website). Nine activity zones in the Process Protocol Map are to represent the different groups of Participants involved in a single construction project. They are: (Song, Ghassan, Cooper)

Development Management responsible for creating and maintaining business focus throughout the project.

Resources Management responsible for the planning, co-ordination, procurement and monitoring of financial, human and material resources.

Design Management responsible for the design process, which translates the business case and project brief into an appropriate product definition.

Facilities Management responsible for ensuring the cost efficient management of assets and the creation of an environment that strongly supports the primary objectives of the building owner and/ or user.

Health & Safety, Statutory and Legal Management responsible for the identification, consideration and management of all regulatory, statutory and environmental aspects of the project.

Project Management responsible for effectively and efficiently implementing the project to agreed performance measures, in collaboration with Process Management.

Process Management develops and operates the Process Protocol and is responsible for planning and monitoring each phase.

Production Management is responsible for ensuring the optimal solution for the build ability of the design, the construction logistics and organization for delivery of the product.

These activity zones have inter-relationships and generally overlap and are interactive. For example, Design Management often has important input in the Production Management and Facilities Management activity zones, amongst others, and vice-versa.the Figure (3.2) shows the inter-relationships diagram.

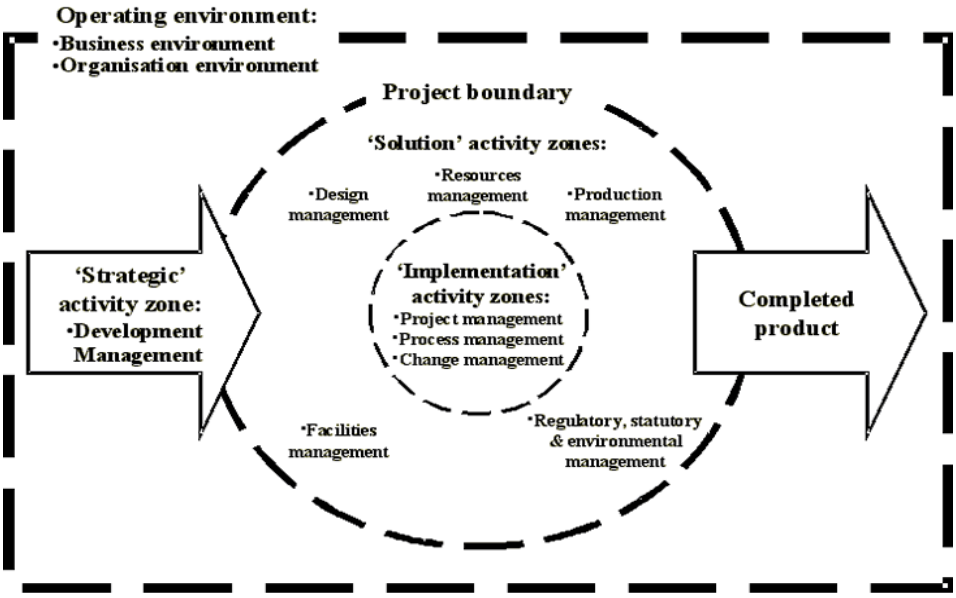

Figure (3.2) Inter-relationships diagram, source: P.P Website.

And the table below shows the Inter-relationships diagram element description:

Table (3.2) Inter-relationships diagram Description , source process protocol website

Element	Description
The operating environment	The external business environments and internal organizational environments which interact to create a given business need
The project boundary	The actual project.
The 'strategic' activity zone	The Development Management input which gives overall direction, business logic and energy for the project.
The 'solution' activity zones	Those activities which generate the technical substance of the product, by translating and operationalizing the direction given by the Development Management

3.2.3 Concept of Process Protocol

The concept of the Process Protocol was based on a number of issues and deficiencies of current practices in the construction industry, through

study and comparison between the best practices in the construction process in order to improve the sector.

The need is to specify if the model is able to represent all parties in the construction of this process to provide an overview of the design and construction process, (Cooper, kagioglou &other, 1998).

3.2.4 Principles of the Process Protocol

The Process Protocol is based on six principles that are fundamental to an improved construction process. According to (Cooper, kagioglou &others, 1998), these principles are:

1. Whole project view: they can learn all the activities without marginalizing any of them, and the conceptualizing design and construction ensures that all the issues are considered.

2. Consistent process: Consistent processes facilitate continual improvement in design and construction by adoption of a standardized approach to performance measurement, evaluation and control (Cooper, kagioglou &other,1998)

3. Progressive design fixity: In the Process Protocol phase, reviews provide an opportunity to examine the work executed in a particular phase. The progress needs to be approved before the planning, resourcing and execution of a new phase are possible. This allows a progressive fixing and/or approval of design information throughout the

process, resulting in increased predictability of construction works (kagioglou,Aouad, &others)

4. Co-ordination for all stakeholders involved in the building process to work seamlessly together. In the Process Protocol, the co-ordination of the process falls under the responsibility of the Process and Change Management Activity Zones. The actions of the Process Manager are supported by the Change Manager, through which all information related to the project is passed (Cooper, sexton, sheath &others, 1998).

5. Stakeholder involvement and team work: process participants are described in terms of the activities that need to be undertaken in order to achieve a successful project and process execution. Working in multi-functional teams can also foster team environment and encourage appropriate and timely communication and decision-making (Cooper, sexton, sheath &others, 1998).

6. Feedback: The introduction of phase reviews in the Process Protocol provides an opportunity to record project experience throughout the process. This information can be utilized in later phases of the construction process or on future projects (Cooper, sexton, sheath &others, 1998).

3.2.5 Process Protocol rules

1. Process Level: the process model contains three levels. Level 1 with high level processes and their deliverables; level 2 contains the sub

processes of the original processes at Level I and illustrates any potential relationships between the processes. Level 3 contains the sub processes of the Level 2 processes (Cooper,Lee,2012).

2. Deliverable.

3. Logical Relationships: There are two types of logical relationships. The first one is process decomposition in which the high level can be composed of several processes in a lower Level (Figure 3.3). The second is logical dependency, which means that one Process is dependent on the completion of another process. (Figure 3.4) (Cooper, Lee, 2012).

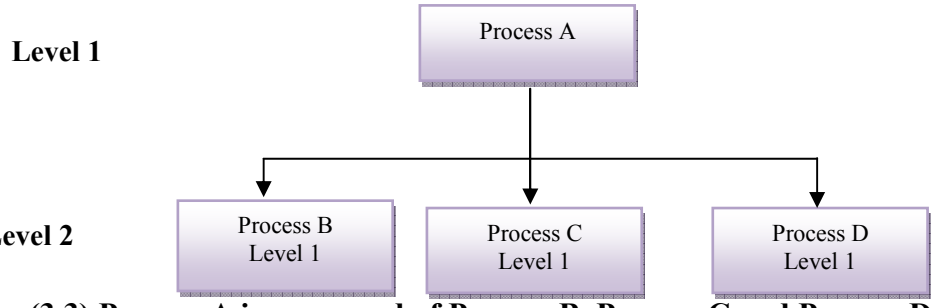

Figure (3.3) Process A is composed of Process B, Process C and Process D

Source (Song Wu, A .Ghassan, Cooper .R, *IT Support For Process Protocol.*)

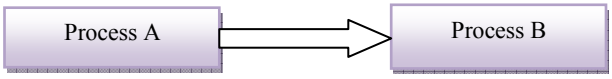

Figure (3.4) Process B is dependent on Process A

Source (Song Wu, A .Ghassan, Cooper .R, *IT Support For Process Protocol.*)

3.2.6 The major benefits of process protocol

According process protocol website, the major benefits of process protocol are: (Cooper, kagioglou &others, 2000).

1. The archiving and retrieval of project information.
2. Rapid communications.
3. Effective co-ordination.
4. The visualization of client’s requirements.
5. The visualization of structural and spatial requirements.

3.3 Summary

This chapter dealt with the Construction Process Protocol which was developed in the UK to overcome the construction process gaps in the UK. It discussed the principles, on which it was developed, the state-gate process, Process Protocol Stages/Phases, Activity Zones, Process Protocol rules and Concepts of Process Protocol.

Additionally, it discussed how PP can be applied to solve problems, such as weaknesses in co-ordination and communication in the project, and how it can eliminate this problem. This is called the key inhibitor to the industry's performance.

In the next chapter the researcher suggests the possible methodology so as to adopt P.P concepts in Palestine to improve communication and coordination and to eliminate the major cultural, behavioral, organizational and institutional barriers that currently exist between project participants.

Chapter Four

Methodology

Chapter Four
Methodology

This chapter presents and discusses the methodological approach the researcher used in studying the current situation of the construction sector in Palestine, and it identifies the main problem in this sector due to the absence of coordination between designers, consultants and contractors. Then the researcher tries to identify the construction process as a process protocol.

The adopted methodology used to accomplish this study includes review of literature related to the construction sector in Palestine and document reviews, personal interviews and case studies, to analyze the current situation of the construction sector in Palestine.

4.1 Data Collection and Analysis

Because this research will be based on the Contractors, Engineers, Owner, Project Managers experience and responsibilities who workers in the construction sector, and analysis the reality of the situation, qualitative research will be used.

The researcher uses many ways to gather information in this research. Mason (2002) thoroughly examines three of the main methods used for collecting qualitative data. They are interviews, observations from case studies and document reviews.

Following is a brief introduction to each method:

4.1.1 Interviews

Interviews are probably the most widely employed methods in qualitative research; the “interview” is a managed verbal exchange (Ritchie & Lewis, 2003).

The process of interviewing entails asking questions, listening to individuals, and promoting conversations in order to gain information and understand opinions (Walliman, 2006; O’leary, 2004).

The researcher uses interviews for data collection with the intent of estimating the characteristics of a large population of interest based on a smaller sample from that population.

These interviews were in the form of face-to-face interpersonal role situations, in which the interviewer asks respondents questions designed to receive answers pertinent to the research questions. Interviews can take three forms: unstructured, structured and semi-structured interviews (Naoum, 2007).

In this research, semi-structured open-ended interviews were used in interviewing twenty experts from engineers, contractors, project management… etc. These interviews were used in this research to support the objective of the research; they were used to answer questions to the research problem. They were conducted over a period of two months to discuss the opinions.

Before starting the interview the researcher introduced herself and clarified the objectives of the interview. The researcher used open-ended questions, some prepared before interviews, and other questions aroused during the interviews. During the interviews the researcher took down notes on the opinion of the interviewee about the discussed issues. Once the interview ended, the researcher analyzed responses based on main targets listed below to answer these questions. The main targets are:

1. What is the construction process in WB?

2. What is the major problem related to coordination issue in the construction project in WB?

3. How can the coordination in the construction process be improved by adopting process protocol?

The interview form is elucidate in Appendix 1 .

4.1.2 Document Review

Document Review "is the process of analyzing documents, entails collecting, reviewing, examining and analyzing relevant documents". (O'Leary, 2004).

These documents refer to many things as research journals, previously published studies, legal documents, published books, censuses, video sources, maps, photographs…etc.

For this study, many documents were reviewed to find out the most important studies and documents that documented all the problems in the

construction sector in Palestine, and about the concept of process protocol, in addition to a review of laws related to the construction sector and how they organize this sector.

4.1.3 Case Studies

In order to meet the objectives of this study, and in order to investigate the construction process in Palestine, and the main problems that face the construction due to lack of coordination between all partners; a case study method of research will be used.

In the case study the researcher explores a single entity or phenomenon (‘the case’) bounded by time and activity, and collects detailed information through a variety of data collection procedures over a sustained period of time, in order to reconnaissance and explore the case study.

In this research six case studies will be dealt with, in an attempt to understand the reality of the construction process in Palestine and identify the common coordination problem facing this sector.

4.2 Summary

In this chapter the researcher clarified the methodology that was adopted to conduct the research. It consists of the qualitative method approach. Document review were used as qualitative methods to understand the problem of Palestinian construction industry and construction processes, and two case studies were analyzed. Then the

researcher conducted semi-structured interviews to make validation of research.

In the next chapter the expected outcomes are develop and modify the construction process in government projects, to enhance the construction sector to eliminate inhibitors which led to the decline in this sector. Moreover, strategies to solve this coordination problem are proposed and the best solutions will be how to utilize the "Process Protocol" for better arrangement, development and support for the construction industry in Palestine.

Chapter Five

Data Analysis and Results

Chapter Five
Data Analysis and Results

Based on the literature review, the case study and the semi-structured interviews with twenty interviewers who have long experience in construction industry and work in WB, this chapter clarifies data collection and analysis to approach these targets:

1- Identify the construction process in Palestine.

2- Identify major problems related to coordination issues in the construction project in WB.

3- Suggest the strategies for improving the coordination in construction process by adopting process protocol.

5.1 Case study Results and Analysis

Based on six case studies, the researcher works on figuring out and understanding the current situation of the construction process in Palestine in order to identify this related process and its problems.

In Palestine the project is usually financed by foreign aid which called Donor. This finance is part of the state budget, especially the Ministry of Finance, where all projects are under the authority of the Ministry of Finance. However, some projects are self-financed such as the Ministry of Public Works and Housing, the Ministry of Higher Education ... etc.

The nature of governmental projects in Palestine is complex because of the administrative and technical procedures, where the project passes posed by the government through several stages as in any project, but the procedures are formal.

5.1.1 Identify the construction process in Palestine

To identify the construction process in Palestine in the building projects, the researcher adopted the strategy of observation of the case study in order to identify traits and characteristics of this process, and try to identify the simple construction process for this case.Then the researcher registered the notes immediately, which came from responsible people as project managers, engineers, contractors and discusses the results with them to produce the best results. Table (5.1) which show Case studies detail.

For more detail about this projects see appendix 3.

Table (5.1): Case Studies Details

Project #	Project name	Contract Type	Donor	Owner	Project type
1	Mohammed Bin Rashid Al Maktoum Schools	Unit price	Mohammed bin Rashid Al Maktoum Charity and Humanitarian	The Ministry of education	Building
2	The Palestinian central Bureau of Statistics (PCBS) – Nablus Office	Unit price	Islamic Development Bank.	The Palestinian central Bureau of Statistics (PCBS)	Building
3	Construction of accommodation Building and Mess-Hall in Nwaemeh Camp - Jericho City	Unit price	USAID	Ministry of Public Works and Housing	Building
4	Construction of Multi Multi-center activities of the Scout Group of Hattin - Nablus	Unit price	UNDP	Ministry of Youth and Sports	Building
5	Rehabilitation of the Traffic building of the Ministry of Transport	Lump sum	USAID	Ministry of Transportation	Building
6	Construction Of Additional Floor Above Salfit Municipality-Salfit City	Unit price	CHF	Salfit Municipality	Building

The construction process in building project as any project process started from the owner , the owner has made the request to the responsible party of government such as Ministry of Education or Ministry of Public Works and Housing which is the reference of all government projects , that they need specific project , the government developed project idea, Pre-economic feasibility study and feasibility study and outline financial authority which almost the Ministry of Finance through the donor, this stage named Pre-Project phase .The next phase is pre –construction phase which include Preparation of Design and contract Documents Which is entrusted to Design and supervision Department if the government department have ability to design , or the owner was make a tender in order to provide engineering services to prepare the design , This designs may include describing the project the location, areas ,material specification and identify ways of construction , architectural design, mechanical and electrical design , as well as the estimated cost of the project. After the owner agrees to the preliminary designs and but his remarks if it's necessary, the final design accepted and go to more details , all necessary documents details, sections , and BOQs and tender document for construction was prepared then and the Contracts signature between the owner and the winner contractors which can select them according laws.

After this the construction phase to implement the project started. this stage include all the activities of the contractor relating to the preparation of the project, procurement of materials and equipment,

manufacture and preparation of materials inside and outside the site, whether performed by the prime contractor or by subcontractors, during this stage, the contractor shall prepare a large amount of documents, such as workflow, drawings, financial claims, records, work orders, plans to work, all this documents become part of the administrative records and must be kept in the project file.

It is common that the owner during this phase prepare some amendments to the contract documents such as Change Orders, Variation Order resulting from the urgent need to make some adjustments on the nature or extent of the work or its value.

The final phase are post- construction phase When the contractor finish all work according to the contract, the contractor may be have some of commitments after this, such as maintenance work.

The figure (5.1) shows the simple construction process in building project, this figure represent the four phases.

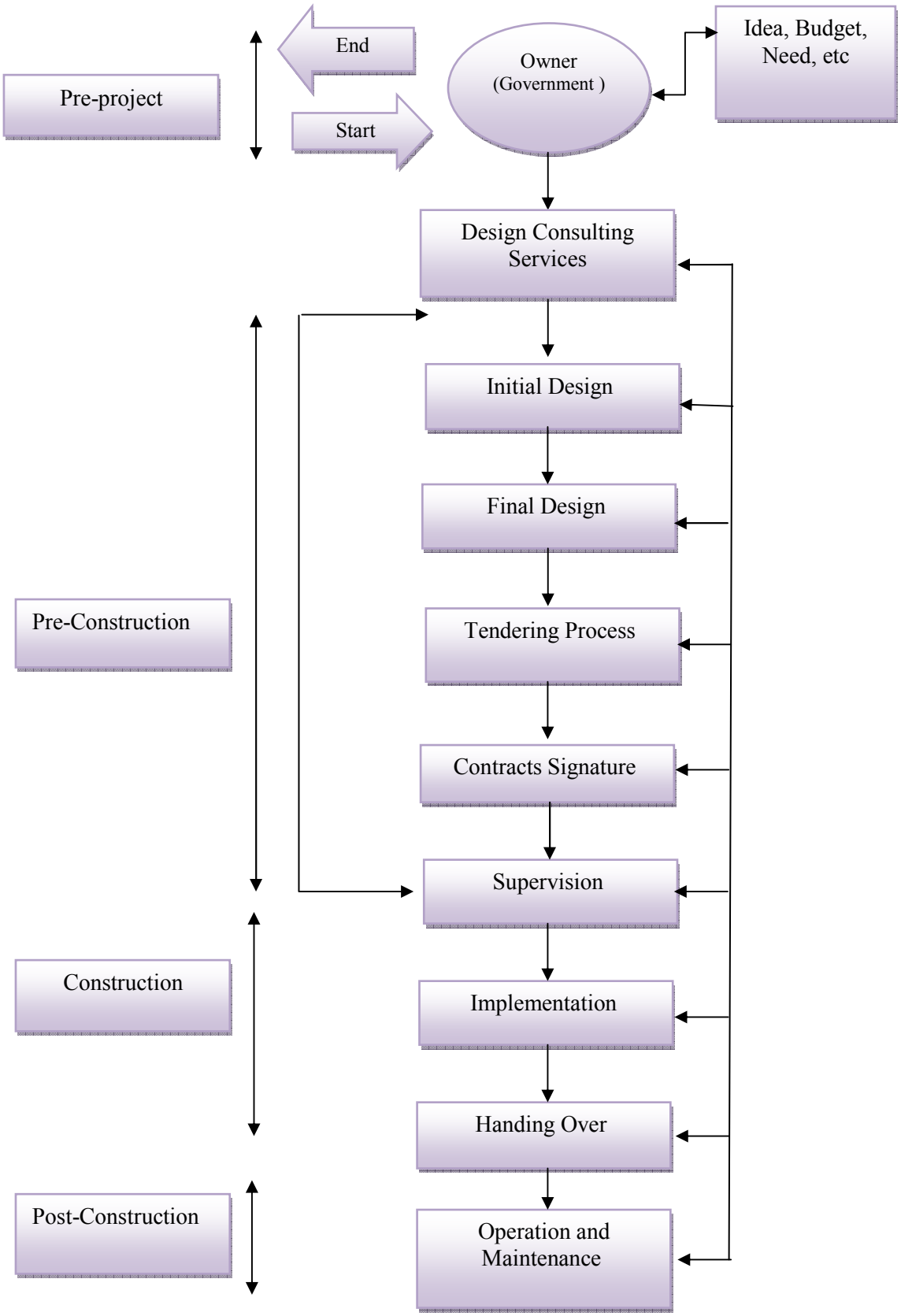

Figure (5.1) Construction process in Palestine

5.1.2 Identify major problems related to coordination issues in the construction project in WB.

Like all Palestinian economic sectors, the construction sector faces many tremendous problems and challenges which prevent it from developing.

The greatest problems that directly affects coordination is according to Al-Hallaq (2006) the lack of experience in the line of work, and lack of experience in contracts, lack of using project management techniques,lack of communication system ,lack of using computer applications, estimating practices, absence of construction regulations, un-coordinated design (structural, mechanical, electrical, etc), rushed design, legal disputes during the construction phase, new governmental acts or legislations, gaps between the implementations and the specifications due to misinterpretation of drawings and poor communication between involved parties.

According to Najmi (2011), the lack of coordination is a changes in the scope of work, and the owner comes the plans and the changes in drawings and the redesigns, the owner also gives the main funding of the project which suffers from lack of commitment on behalf of the funder in maintaining timely cash flow. The designer's drawing that can be described as poor and has mistakes, and the designs are sometimes incompatible with each other (architectural, structural mechanical and electrical). It also

suffers from lack of accuracy and incompatible quantities when compared with the actual work.

In the six case studies, the main problem facing the stakeholders can be summarized as follows in table (5.1):

The main problems face this projects that there was no coordination between the designers, consultant resulting in many conflicts in drawings and there were many engineering roles in the project, this resulting many sources of decision which are different in most cases.

In addition they have financial failure of the government this cause Delay in financial payment to the contractor, also Poor use of advance engineering design software and no cash flow management system this lead to be the project late and over budget.

Also the government tendering system requirement of selecting the lowest bidder without technical assessment resulting poor planning and poor management and technical performance.

Unclear communication path between partners, slowness in decision making, effects of social and cultural conditions, rushed bidding process are the problems common to all projects.

Table (5.2): Case Studies Problems

Problem	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
Changing the design more than once	□	□				□
The project was over budgeted	□	□	□			□
The project was late	□	□	□	□	□	□
The long time to accept any order	□	□		□		□
No coordination between partners	□	□	□	□	□	□
There were many engineering roles in the project	□	□	□		□	□
Delay in financial payment to the contractor	□	□	□	□	□	□
No cash flow managements system.	□	□				□
Financial problems between the government and the designer office.	□	□	□	□	□	
Financial failure of the government	□	□	□	□	□	
Poor use of advance engineering design software	□	□	□	□	□	□
Government tendering system requirement of selecting the lowest bidder	□	□	□	□	□	□
Poor qualification of consultant engineer's staff assigned to the project	□	□	□	□	□	□
A lot of changing orders	□	□	□		□	□
Insufficient data collection and survey before design.	□	□		□	□	□
Rework due to workers' mistakes.	□	□	□		□	
Unclear and inadequate details in drawings.	□	□	□	□	□	□
Poor planning and poor management and technical performance	□	□	□	□	□	□
Effects of social and cultural conditions.	□	□	□	□	□	□
Poor qualification of the contractor's technical staff assigned to the Project	□	□	□	□	□	□
Too much paper work	□	□			□	□
Unclear communication path between partners	□	□	□	□	□	□
Slowness in decision making	□	□	□	□	□	□
Rushed bidding process	□	□	□	□	□	□
Obsolete technology	□	□	□	□	□	□
Late reviewing and approving of design documents	□	□			□	□

5.2 Document review and interviews Results and Analysis

Based on the literature review, the researcher relied on references, previous research, the laws and regulations to access the targets of the research.

In most construction project they have standard form for different construction process ,this standard will be applicable in all construction project , the goal of this is to establish a fair balance between the rights and obligations of the owner , the contractor and engineers, and in order to regulate the construction sector, in Palestine Public procurement law , FIDIC, Consultant working Manual is a standard form of engineering contract in all construction project.

5.2.1 Identifying the construction process in Palestine

According to the laws and government instructions, the construction process in **public sector** which **funded by Donor** and owned or managed by the **governmental institution,** can categorize the as below: Figure (5.2), Figure (5.3), Figure (5.4).

But unfortunately, this process doesn't ideally applied for many reasons, including, weakness ability of project management and planning in many project because of limitation of skill, most projects will be funded by donors, who put their own condition for the implementation of projects, the documentation of information very weak in most of the construction projects in WB, culture and lack of work ethics, etc.

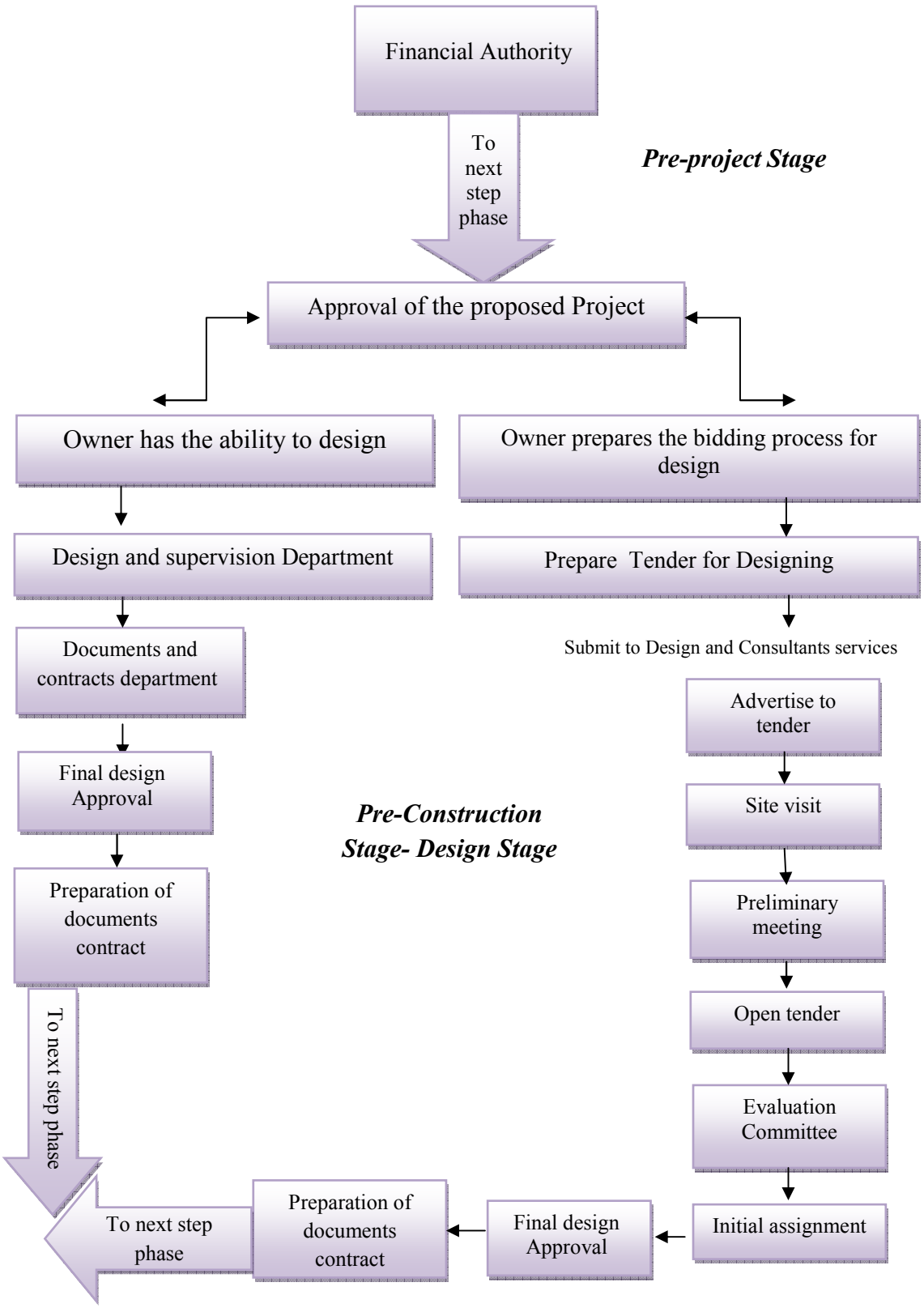

Figure (5.2) Pre-project, Pre-construction (design stages)

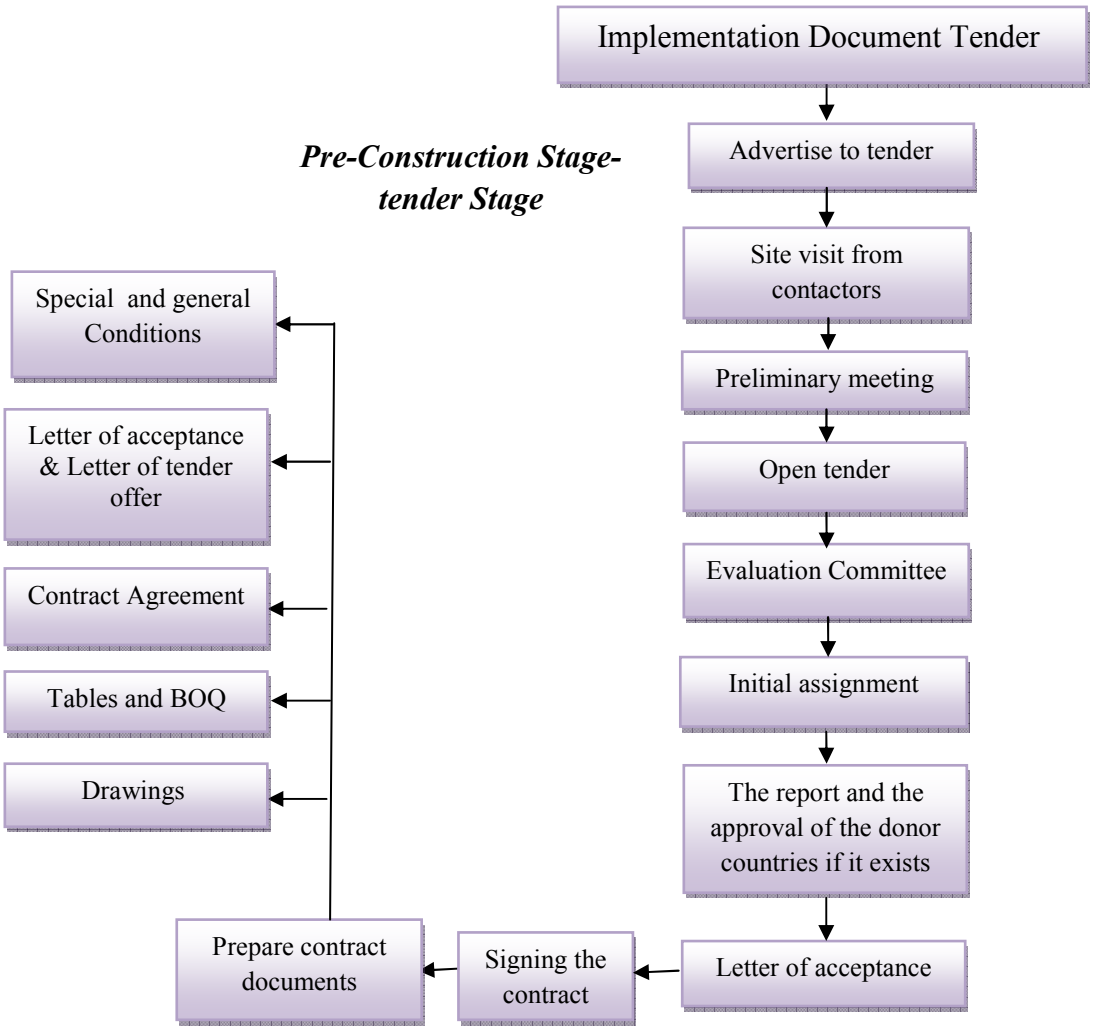

Figure (5.3): Pre-construction stage

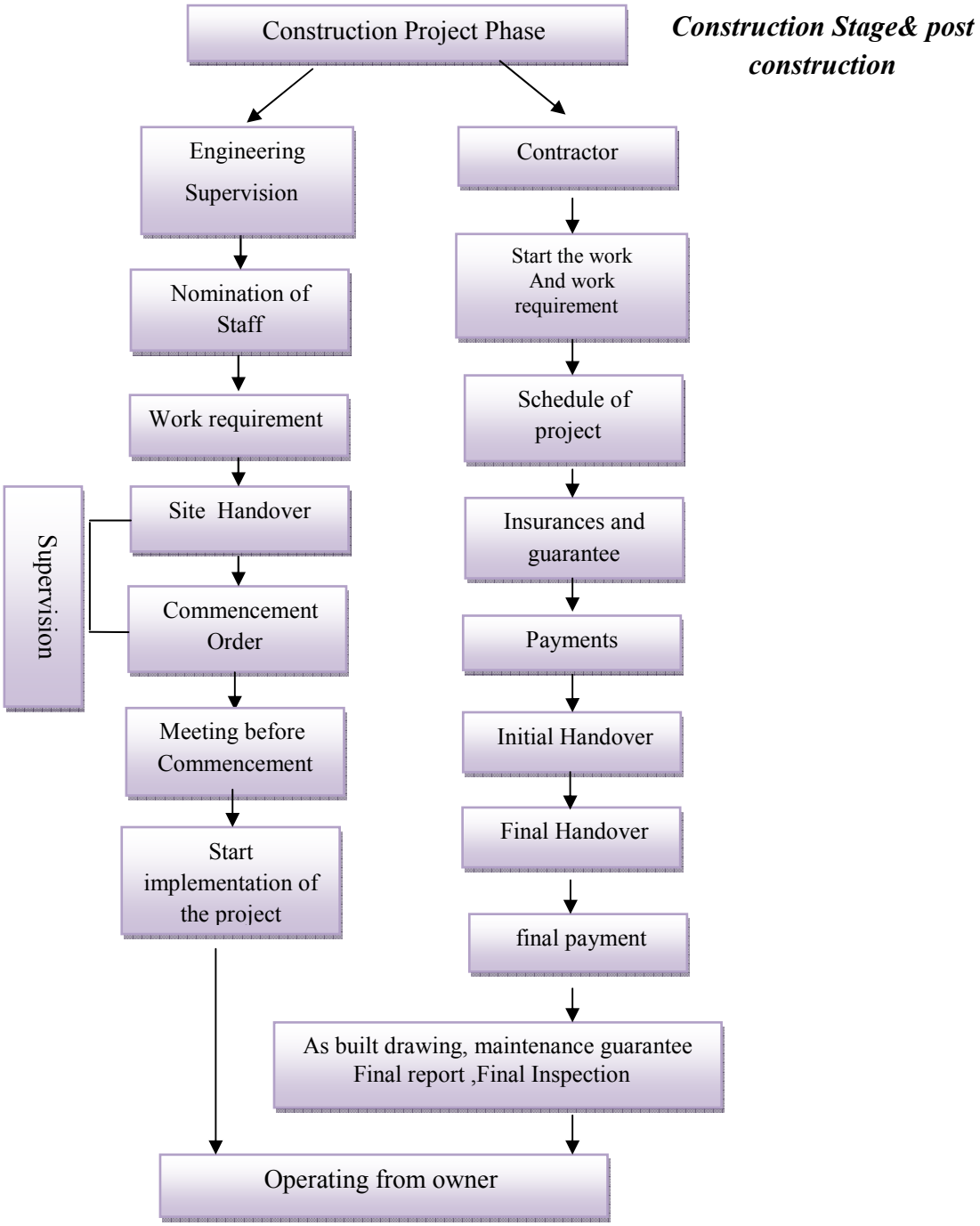

Figure (5.4) Construction Stage& Post construction

5.2.2 Identifying major problems related to coordination issues in the construction project

In the construction industry, there are always a number of different parties involved in a single construction project; it is often very hard to

coordinate the project team members in a project, simply because they all operate in different ways.

Hence, the importance of this research begins. The objectives of this part of the research are to highlight the sector problems and obstacles related to lacking coordination from the perspective of local contract parties; project owners, consultants, contractors and donors.

Based on the responses from the interviews with 20 respondents with various experiences in the industry, it can be summarized that there are six major problems in construction processes related to coordination, this can be summarized in table (5.3).

The Construction environment information problems are any problems related to the coordination of information environment in the project and be the result of a lack of management information such as change order ,and the managerial information problems are related of the concept of project managements including planning ,controlling … etc, but the legal problems are weakness in the harmonization of laws and absence of these law and sometimes ambiguity, and the financial are all problems related to financial managements by owner or contractors, and the engineering design problems related to all problems occur in the design phase ,finally the technical problems are issues which support the project which have weakness in Technical support for the project, team ,and resources

Table (5.3) major problems related to coordination issues in the construction project

Group	Problems
1.Construction environment information	• Unclear or contradictory information and not detailed enough. • Work not accurately completed. • Late response to site problems. • Actual quantities differ from the contract quantities. • Gaps between the Implementation and the specifications due to misinterpretation of drawings. • Working Program not detailed enough, and late changes on working Program • Failure to communicate essential construction information to the right person at the right time. • Rework due to errors • Changing orders. • Uncompleted drawings and documents according to schedule.
2.Managerial information	• Unclear job duties. • Too much paper work. • Unclear communication path between partners. • Insufficient staff to coordinate the site work and the technical administration work. • Poor planning and poor management and technical performance. • Poor site management and supervision • No clear authority. • Slowness in decision making. • Changes in project scope and requirements.
3.legal	• Ambiguity of work legislations. • Legal disputes during the construction phase among the parties of the contract • Changes in government regulations and laws. • Change in government policies.
4. Financial	• Delayed payments on contract. • Financial failure of the contractor. • Poor cost and quantity practices. • No cash flow management system. • Delay in collecting payments.

5. Engineering Design	• Design changes by owner or his agent during construction. • Un-coordinated design (structural, mechanical, electrical, etc.) • Design errors and omissions made by designers. • Insufficient data collection and survey before design. • Mistakes and delays in producing design documents • Late reviewing and approving of design documents • Conflicts between consultants and design engineers. • Unclear and inadequate details in drawings. • Delay in review and adoption of design documents.
6. Technical	• Rushed bidding process, and unclear. • poor project program or phasing of work. • insufficient technical support . • Incompetent project team. • Obsolete technology. • Poor use of advanced engineering design software • Lack of owner experience in construction projects

5.3 The strategies for improving the coordination in construction processes by adopting process protocol

Construction process is a very difficult process to manage because it involves thousands of decisions, sometimes over a period of years, with numerous interdependencies, under a highly uncertain environment. Add to that the large number of personnel, such as architects, project managers, contractors, structural engineers, service engineers and donors.

In the West Bank, the construction process also has many gaps starting from the early stages of the project (pre-project stage) moving on to the other stages (pre-construction stage, construction, post-construction).

During the development of the Protocol, and after review and analysis of contemporary construction processes, practices and study of the concept of the Generic Design and Construction Process Protocol (GDCPP) which was developed in the UK ,the concept will be applied in construction processes and integrated into the construction industry.

5.4 Development of Palestinian Construction Process Protocol

When analyzing the construction process in six cases studies, we shows that all projects pass through four simple phases, and this process have a gap and problem when move from phase to another one; As a result of this the construction process in Palestine need to improve and support to avoid coordination problem, and we can modify the process at each stage and doing the controlling in all phases as shown below in Figure(5.5), Figure (5.6),Figure(5.7), Figure(5.8).

The modification in this process started from pre- project stage, because most of coordination problems started from this stage, because it is important to establish the client's needs and ensure problems are defined in detail, and we must identifying the key stakeholders and their requirements as part of the client's overall objectives, after this we must outline financial authority especially in government projects because they have financial failure in government, the goals and initial cost estimation also will be developed.

The next steps are the engineering office or design department in the government submits a tender in order to provide engineering services, the

initial design, final design ,and tender document will be prepared , and the bidder process also prepared in preparation for construction stage with all basic activities, then post- construction stages which Problems identified should be analyzed to ensure that they do not re-occur in future projects.

The project execution plan which the owner must prepared in the pre- project phase is sets out the strategy for managing the project over the project phases, which include roles, responsibilities and authorities, Contracting and procurement strategy, operational strategy.

The modification in the construction process by adding a clear information exchange and reference information need to process, and identify the actors needed for each activity.

The other modification include addition some of managerial concept represented by **Gate**, this gate means after any stage we must doing important activities including : Meeting sharing with all partners , Archive Document, maintaining records of all drawings, information, directives, verbal instructions, and documents received from the consultants and the client and also insert project management skill like Risk Management, Time Management, Cost Management, Quality Management, Change Management ,Software Management, Facilities Management, Design Management, , Development Management, Facilities Management, Process Management, etc .

The intent of each gate is to assure a high quality of work performance at each phase of the project.

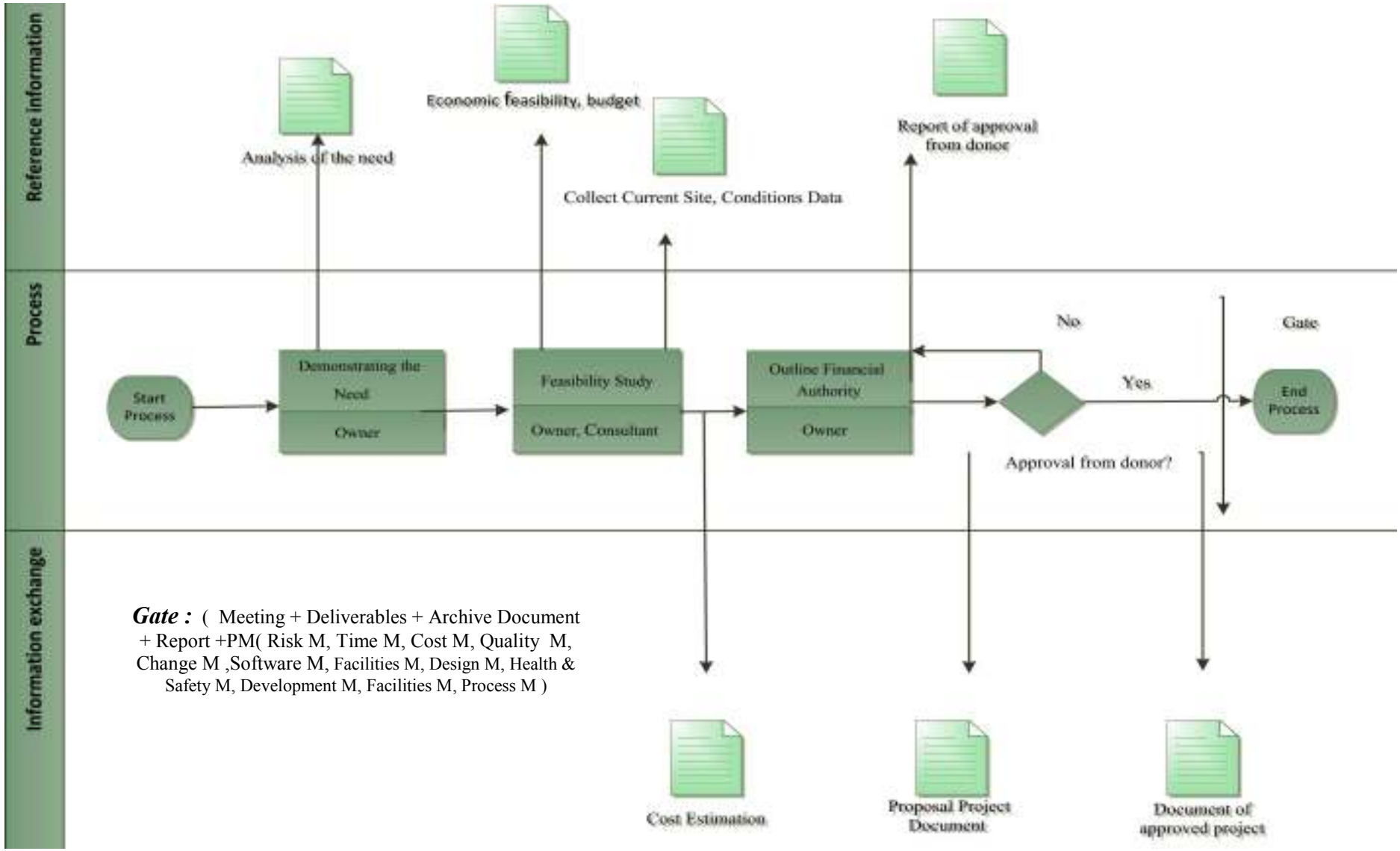

Figure (5.5): Pre-project stage , (Modified)

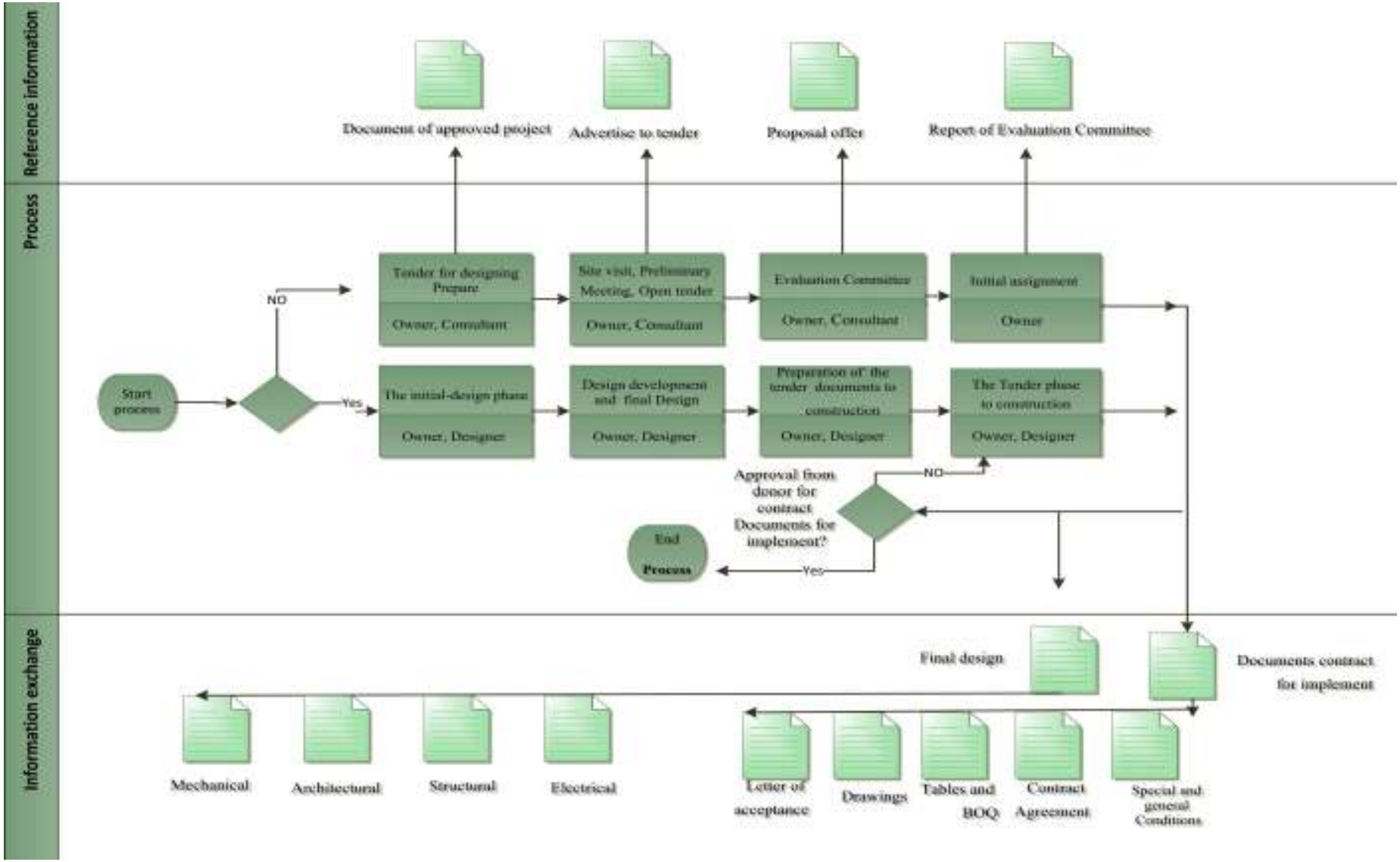

Figure (5.6) Pre-construction (design stages) (Modified)

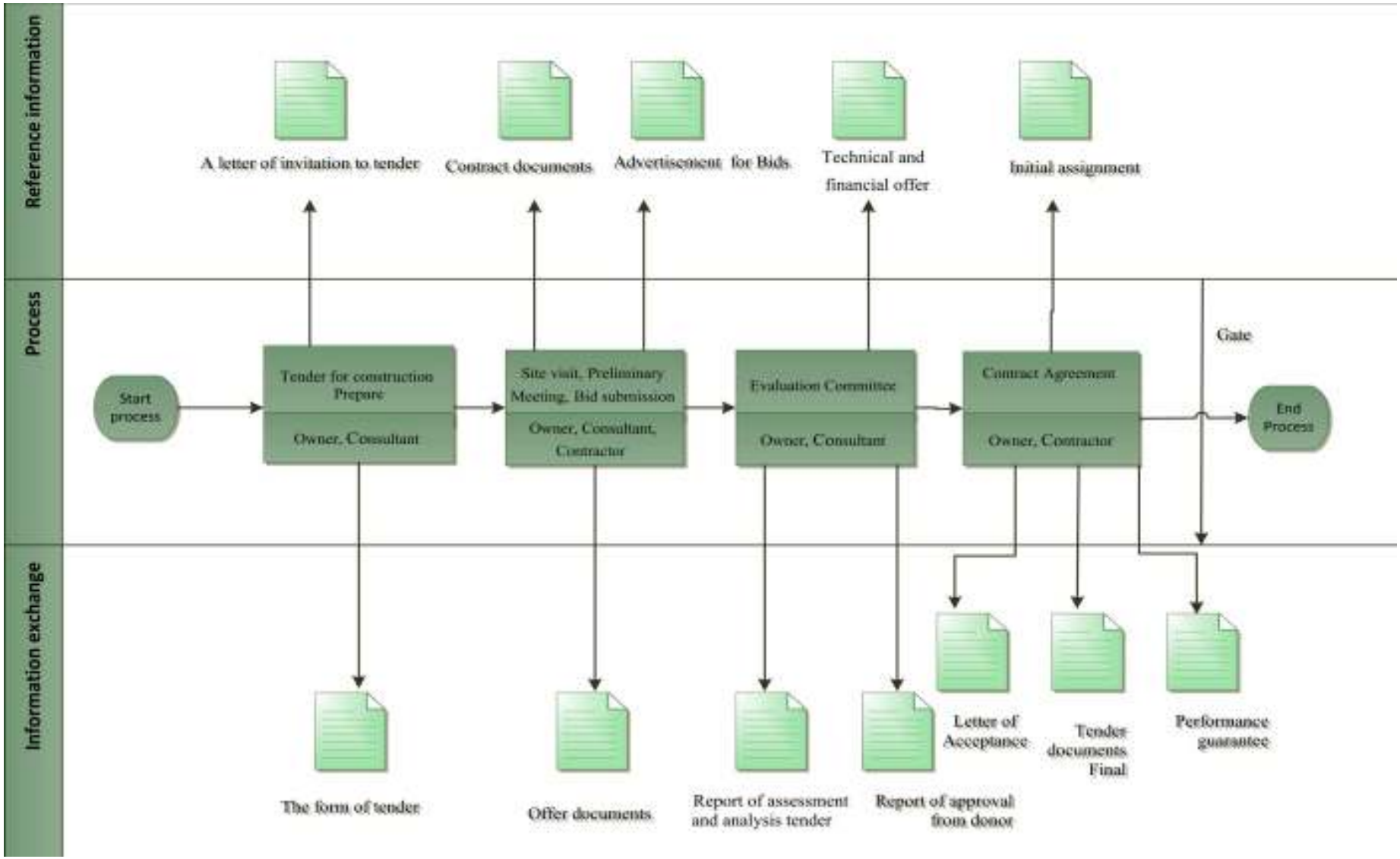

Figure (5.7) Pre- construction ,tender stage (Modified)

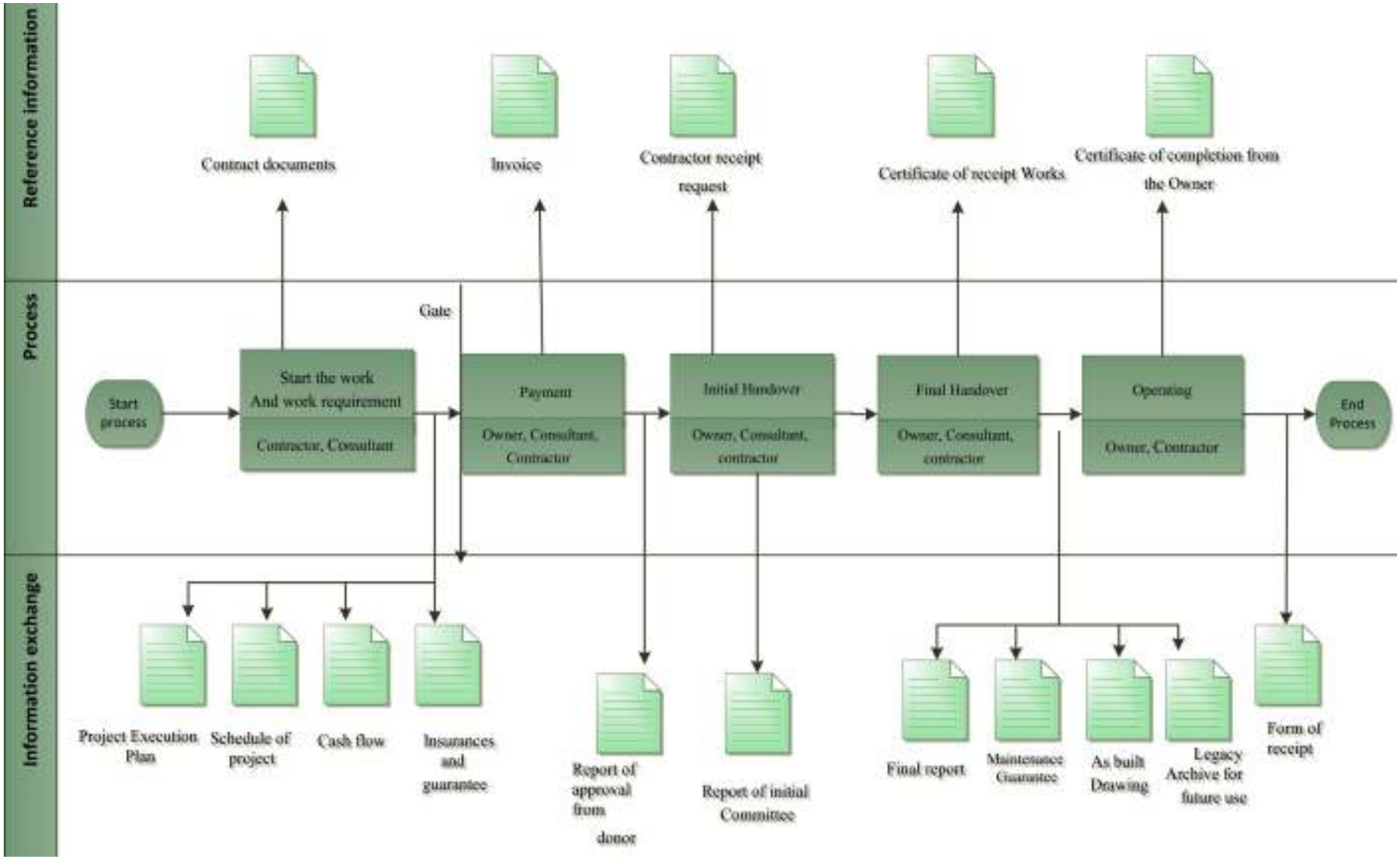

Figure (5.8) Construction and Post- Construction stage (Modified)

5.5 Summary

According to what has been previously reported, the construction processes facing many problems need re-thinking during the current situation.

The process protocol is the best solution for developing the construction process in the WB, however; this shift into the establishment of a new process for the construction industry requires a new way of thinking entailing a change of culture and working practices. Furthermore, it requires a good understanding of current and future trends, and effective communication mechanisms agreed upon by all participating parties. This can lead to project success such as: Completion of the project within the allocated time, keeping the project within the budgeted cost at the proper quality or specification level with acceptance by the customer with mutually agreed upon scope changes.

The researcher suggests modifications to the construction process which applied in WB by adding some of PP element and concepts to support the construction process.

Chapter Six

Conclusions and Recommendations

Chapter Six
Conclusions and Recommendations

The construction industry is a development tool for achieving goals in modern society, and Construction Projects frequently fail, not only because of the lack of technical skills and recourses, but also because of the inadequate coordination, integration, communication and control of project activities, people, stakeholders and contractors.

The WB has witnessed major developments both positive and negative in the construction sector in the last decade. In order to meet future demands and foster successful projects, it is hoped that this study may contribute to the development of Palestine by helping define some of the difficulties facing the construction project related to the of lack coordination. It aims at suggesting new ways of thinking to use new art of project management by adopting the idea of the participation of all parties in the same framework of the project which is called process protocol of construction projects in Palestine.

6.1 Conclusions of the research

The aim of the research is to study the current status of the construction sector in Palestine and to explore the reasons for the failure of this sector from the perspective of the relationship between the contractor and the engineer and the owner. It studies the problems resulting from poor coordination and the reasons leading to it. In order to do this the researcher depended on project reviews –case studies and previous studies to identify the construction process in Palestine in order to search for the practices

which cause the problems in the construction industry. Through this we can create and adopt a process involving all parties using technology to support it and try to apply the concept of process protocol in construction industry in Palestine to be standardized.

These problems can be categorized into six major problems in construction processes related to coordination which are managerial information, construction, legal, technical, design and financial.

Then the researcher identified the construction process in Palestine to understand this process deeply, and suggested the strategies for improving the coordination in construction processes by adopting process protocol.

6.2 Recommendations

This study is the first step in a series of studies and evaluations for the construction process in Palestine to approach promising developments and targets. To achieve these targets, this industry will need to make radical changes and these processes should be explicit and transparent to the industry, and stakeholders.

This industry should create an integrated project process within the key elements as construction process and process protocol to create substantial changes in its culture and structure, and to improve management and supervisory skills at all levels. It is also required to support sustained improvement including standardization of new technology and new techniques.

Following this research, which included interviews and discussions with professional people, these guidelines are suggested:

- The government is recommended to examine and evaluate the regulations related to constructions, and give more focus on contracts laws and regulations. They must speed up the ratification of proposed laws on topics directly related to construction contracts and integration of all laws government-issued. They need to approve all draft laws to improve the existing practices of the construction in Palestine.

- It is highly recommended to form a specialist body that contains engineers, contractor, and decision makers from governmental bodies, law specialists and teachers in colleges and universities in order to take care and adopt all issues related to the construction process. They must conduct continuous training and education programs through lectures, training courses, seminars, and workshops that help them to be familiar with engineering and legal issues related to constructions. This helps in strengthening management skills and decision-making.

- The Ministry of Public Works and Housing is recommended to establish a research and development unit (R&D) to improve this sector and to overcome the dynamic impact of all problems facing the construction sector that may appear as a results of the lack of coordination in the construction process.

- Finally, all Palestinian contractors, engineers, decision makers and all partners in the construction process are invited to re-think about all

wrong practices and openness globally to use technology and new applications to keep abreast of development.

6.3 Proposed Framework and Further Studies

In this research the construction process in Palestine and its problems are studied, then the concept of Process Protocol is discussed, and the current situation needs to be developed. The researcher suggests a framework to adopt the process protocol in UK to be suitable for the conditions of the construction industry in WB, this frame work called Palestinian Construction Process Protocol Framework, PCPPF.

The researcher suggests that to applied PP as in UK to be suitable for construction conditions in WB, a practical framework that contains the concepts and principles of the PP in UK, because we should not adopt the Process Protocol Model in UK and apply it in Palestine because of this reasons:

- Poor planning and poor management and technical performance.
- The process of the construction projects in West Bank needs more work to organize the phases in the project and keep on the modifications needed at each stage and control in all stages.
- Most of the projects in WB are on a small scale so they don't need high administrative skills, because it will be a burden on the budget of the project.

- The Project in the UK is quite different from Palestine, where the UK had applied this protocol after several studies and research were carried out by specialists besides many workshops.
- The managerial concepts in the activity zone are not found in Palestine.
- The documentation of information is very weak in most of the construction projects in WB.
- The role of the government in Palestine is relatively absent where the laws and legislations related to construction sectors do not regulate and decide.
- It is difficult to change the culture of firms and to overcome the lack of work ethics.
- The modern construction techniques especially in project management and implementation have not been used by the majority of the contractors and sub-contractors.

The conceptual framework depends on the principle of PP in UK with an action plan for implementation once being suitable with the construction sectors in Palestine. This Framework consists of two strategies: short-term and long term:

Regulatory and Institutional Framework

The general description of the legislative and regulatory is the ambiguity, overlap and lack of legislative harmonization. The secondary

legislations and the administrative procedures are still missing many laws thus hampering their proper application. This is all associated with the weakness in the administrative personnel in the public institutions and ministries who are responsible for the implementation of these laws. (Legal Framework Regulating the Palestinian Economy, NEDP)

It is clearly noted that specific laws such as the company law or trade law do not correspond to the developments in this sector. For example, there are various references to organize a tender: bidding law and procurement law, and unfortunately these references are drafts, not laws. So we must consolidate all efforts of all sides whether construction industry actors, governments, contractors unions, engineering associations and NGOS for the ratification of unified economic, social and political laws.

Technical Support Infrastructure

Support for the construction sectors requires necessary research along with the support of government institutions. Training programs should be compulsory for contractors, engineers and subcontractors to develop their management abilities, skills and knowledge so as to be able to discuss the problems of this sector.

Construction Industry Actors

It is necessary to activate the role of Palestinian Contractors Union (PCU) and Engineering Association in organizing the profession, and to act more professionally with all clients, without being biased for a certain party

for special interests, so that they have the ability to plan, design, monitor and control.

Identifying the Construction Process

Every project is divided into discrete phases, each of which has its purpose, duration and scope of work. The end of every phase is a decision point where past progress is revised and all key decisions are made for the continuation of the project.

Identify best practice to have strong co-ordinations

Identifying strategic activities and potential delays, liaison with the clients and the consultants, ensuring the timeliness of all work carried out, maintaining records of all drawings, information, directives، verbal instructions, and documents received from the consultants and the clients, maintaining proper relationships with clients, consultants and the contractor, managing the quality of all work carried out.

Advancement in the construction process

This includes all managerial practices such as: Development Management, Health & Safety, Statutory and Legal Management, Project Management …etc.

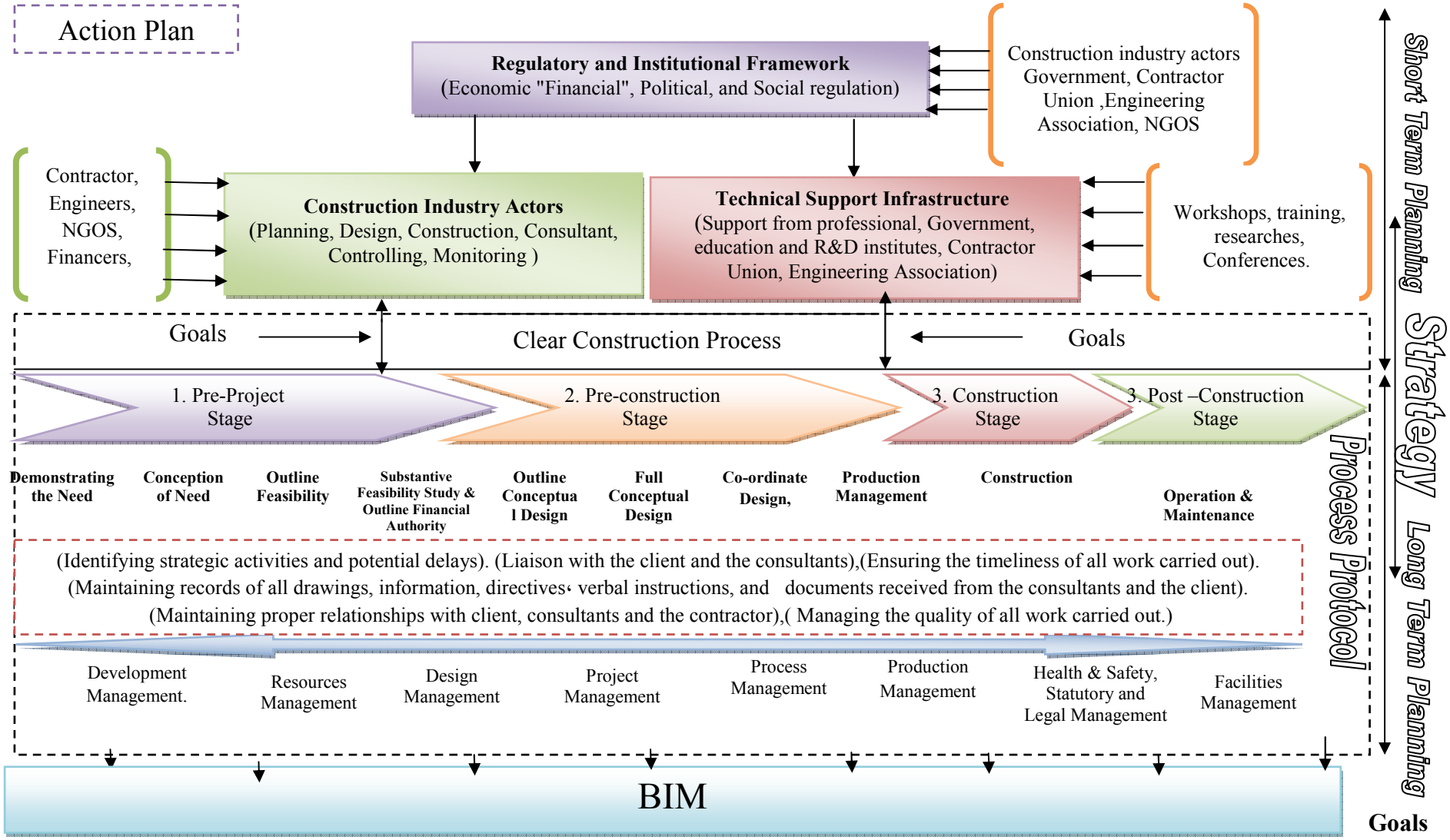

Figure (6.1): Conceptual Framework for Construction Process

6.4 Summary

This study opens the way for other researchers to continue work to improve the construction sectors in several areas including:

- Proposal project which aims to work on a common database including all parties of the project, and including all the elements of the administrative management of the project. Also, including all project stages.

- Study of existing projects in the West Bank, which use technology of BIM in an attempt to analyze and evaluate these efforts.

- Study how we can adopt PP, through this protocol we can develop a guide that will focus on the process to implement Building Information Modeling throughout the stages of a building project, and try to persuade all parties to adopt BIM in construction projects, after identifying what BIM is and why it is different, and how it will help to improve the construction sector in Palestine, and how BIM can overcome the problems due to lack of coordination between the parties.

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Appendices

Appendix (1): Semi-Structured Interview Form

Dear Sir / Madam

Appreciate your kind help, the researcher studied the current status of construction sector in Palestine and identify the most important problems relating to poor coordination between the contractor, owner, and engineer. your opinion is very important to support the construction sector, It helps to propose strategies to solve this coordination problem and the best solutions strategies will be suggestions are to how can implement the "**Process Protocol**" to develop and support the construction project then we can develop a guide that will focus on the process to implement Building Information Modeling **BIM**; all information of this interview will be used for research purposes and will not be used for any other purpose.

Many thanks in advance.

Student: Eng. Mariam Zuher Hashash

Supervisors: Dr. Ehab Hgazi & Dr. Ümit Işıkdağ

PART One: General Information

- The Workplace city: _____.
- Practical experience in the construction sector_____.
- Indicate the nature of the institution that has worked during the last years.

Contracting ☐

Governmental institution ☐

NGOs ☐

International institution ☐

Engineering office ☐

- **Respondent qualification:**

Master degree ☐

Bachelor ☐

Diploma ☐

High school ☐

Less than high school ☐

PART TWO: Identify the construction process in Palestine

• What are the stages of the project from beginning to end?

• Do you prepare a plan for your project?

• What are the phases to decide the final design?

• What are the stages of the tender?

• What are indicators that your project might fail?

• Types of engineering contracts that use in many construction projects?

Lump Sum Contracts ☐

Unit Price Contracts ☐

Cost Plus Contracts ☐

Turnkey Contracts ☐

Design Build Contracts ☐

Management-Oriented Contracts ☐

Construction by Day Labor ☐

Guaranteed Maximum Price Contracts ☐

Construction Management Contracts ☐

Other ----------

PART Three: Identify major problem related to coordination issue in the construction project in WB.

• What is the major problem face the construction project related to the lack coordination between all stakeholders?

• In all project phases list the problem face the construction project related to the lack coordination according to:

A. Problems related to the design.

B. Administrative (Managerial) problems.

Problems related to the tender documents.

C. Problems related to the implementation of the project.

D. Problems related to Legal issue.

E. Problems related to the financial issue.

F. Problems related to the Technical issue.

G. Problems related to the Construction information

PART Four: Suggest the strategies for improving the coordination in construction process by adopting process

• What do you know about the concept of coordination in construction projects?

• Does the company or Workplace develop a strategic plan for work?

• What are indicators that your project might fail?and what is the reason of these fail?

• What do you think about the laws related construction projects?

• Do you have previous knowledge about the concept BIM or Process Protocol?

• Do you think management concepts applied in most of construction projects?

• Are you ready at this stage to introduce information technology to construction projects?

Note : ----------

Appendix (2): List of Interviewees

1	Eng . Osama Break	Nablus Municipality	Director of programs and projects at the Center for Economic Development
2	Nidal Salama	Contractors	Nidal salamh contracting company
3	Eng.Samir Antar	Nablus Municipality	Project manager
4	Eng.Nabih sleem	Contractor	Nidal salamh contracting company
5	Eng.Ola malhees	Engineering office	Dar_Alomran Office
6	Eng . Marwan Juma	Contractor	Qrtaga contracting company
7	Eng. Hassan Odeh	Welfare Association	Project manager
8	Eng. Bashar Guenazaa	UNDP	Project manager
9	Eng. Marah masri	Ministry of Public Works and Housing	Project manager
10	Eng. Rafeef karaz	Islamic Bank	Site engineering
11	Eng.Bayan Barqawi	CHF	Site engineering
12	Eng. Rita yaseen	Welfare Association	Site engineering
13	Eng. Alaa Break	Contractor engineering	Rawabi
14	Eng. Fkhre safade	Ministry of Education and Higher Education	Director of buildings department in MOHE
15	Eng. Said hawash	Contractor engineering	Tubelh engineering office
16	Eng. Rania Taha	Nablus Municipality	Site engineering
17	Bassam Jaber	Ministry of Public Works and Housing	Director General at MPWH -Central Tendering Department
18	Mahde salamh	Contractor	Al-thunaiya contracting company
19	Eng. Abdall Qadara	Engineering office	Qadara engineering office
20	Eng. Raneen Bizreh	Engineering office	Arabic home engineering office

Appendix (3): Case Studies Details

Project 1: Mohammed Bin Rashid Al Maktoum Schools:

Mohammed bin Rashid Al Maktoum Charity and Humanitarian, in the United Arab Emirates, submits grants for building many projects in Palestine –West Bank.

One of these projects is the construction of several schools in many villages including Till, Rujeib, Beta, and Tammoun village.

These schools have the same design, and were established between 2010 and 2011. Each one consists of two floors , and contains nine classrooms, a headmaster room, teachers room, computer laboratory, physics and chemistry laboratory, and ten bathrooms for students and two for management and one for the disabled. They have an outdoor yard, a cafeteria and wall around the school, with a total area of 1,365 m².

In this study, the researcher focuses on one of these schools which is Mohammed Bin Rashid Al Maktoum School in Till Village.

- Project: Mohammed Bin Rashid Al Maktoum Schools
- Supervision : PECDAR
- Client: The Ministry of Education, Till Village Council.
- Donor: Mohammed Bin Rashid Al Maktoum Charity and Humanitarian.

Project 2: The Palestinian central Bureau of Statistics (PCBS) – Nablus Office:

The Palestinian central Bureau of Statistics (PCBS) project is financed by the government through donor.

The Project is a complete processing the center ,by completing the non-structural work such as tiles, plastering, air Conditioning and other works.

The project is located in Nablus City, with an area of about 400 square meters and consists of a room to insert information, a meeting room and staff rooms and offices, along with a director and secretarial room.

- Project: The Palestinian central Bureau of Statistics (PCBS) – Nablus Office.
- Supervision : Ministry of Public Works and Housing
- Client: The Palestinian central Bureau of Statistics (PCBS).
- Donor: Islamic Development Bank.

Project 3: Construction of accommodation Building and Mess-Hall in Nwaemeh Camp -Jericho City

The project consists of accommodation building (three floors and a basement) and dining hall (two floors) in the Nu'ayma in Jericho city.

The total area of the project are more than 7500 m², and the total value of the project are 11,000,000 NIS.

- Project: Construction of accommodation building and mess-hall in Nwaemeh camp -Jericho City
- Supervision : Ministry of Public Works and Housing
- Client : Ministry Of Public Works and Housing.
- Donor: USIAD .

Project 4: Construction of Multi Multi-center activities of the Scout Group of Hattin -Nablus

The project is for the construction and finishing center Hittin Sports Club Nablus city.

The total area of the project are more than 400 m²,and the total value of the project are 100,000 Euro .

- Project: Construction of Multi - Activities Center to Hittin Club-Nablus
- Supervision : UNDP , Engineering Office
- Client : Hittin Club.
- Donor: UNDP .

Project 5: Rehabilitation of the Traffic building of the Ministry of Transport

The project is the rehabilitation of a building for the Traffic Department of the Ministry of Transport in the Ramallah area, they consisting of three floors , the ground floor area about 800 m² , the second floor area 950 m² The third one area about 480 m ² , the total value of the project are 2,600,000 NIS .

- Project: Rehabilitation of the Traffic building of the Ministry of Transport
- Supervision: USAID.
- Client: Ministry of Transportation.
- Donor: USIAD.

Project 6: Construction Of Additional Floor Above Salfit Municipality- Salfit City.

The project is for the construction and finishing additional floor in salfit municipality.

The total area of the project are more than 350 m²,and the total value of the project are 430,000 NIS .

- Project: Construction Of Additional Floor Above Salfit Municipality- Salfit City
- Supervision: CHF, Salfit Municipality engineer.
- Client: Salfit Municipality.
- Donor: CHF.

جامعة النجاح الوطنية
كلية الدراسات العليا

تطوير البروتوكول أداه للتنسيق بين المصمم، الاستشاري والمقاول (قطاع المقاولات في فلسطين كحالة دراسة)

إعداد
مريم زهير الحشاش

إشراف
د. إيهاب حجازي
د. أوميت اشيك داغ

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في الإدارة الهندسية بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.
2014م

تطوير البروتوكول أداه للتنسيق بين المصمم، الاستشاري والمقاول
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الملخص

قطاع الانشاءات في فلسطين كقطاع حيوي في الصناعة الفلسطينية يواجهه العديد من المشاكل المتعلقة بالعلاقه مابين اصحاب المصلحه في المشروع بدءا من المالك إلى المهندس الاستشاري والمقاول.

ان معظم مشاريع البناء في فلسطين تعاني من فجوة في العلاقة بين المصمم، والاستشاري والمقاول من ناحيه المسؤوليات، وتبادل المعلومات، وفهم المشروع و نقص في قنوات الاتصال والتنسيق وهذا يؤدي الى وجود علاقه معقده ينتج عنها عدد كبير من المشاكل في المشاريع الهندسيه.

الهدف الرئيسي من هذا البحث هو دراسة الوضع الحالي لقطاع الإنشاءات في فلسطين واستكشاف الأسباب الكامنة وراء فشل هذا القطاع في ضوء العلاقة بين المقاول والمهندس والمالك .علاوة على ذلك، يدرس هذا البحث المشاكل الناجمة عن ضعف التنسيق بينهم ، وتحليل عملية الانشاءات الحالية في فلسطين من أجل وضع إطار اولي للدراسات المستقبلية و لتطوير هذه العملية من خلال مفهوم Process Protocol.

من أجل تحقيق أهداف هذه الدراسة، تم استخدام ثلاث طرق لجمع المعلومات البيانات : دراسات الحالة حيث تم اخذ سته حالات دراسيه ،مراجعه الادبيات ، ومقابلات شبه منظمة مع عشرون من الخبراء في قطاعات البناء والتشييد.

ومن ثم تحليل هذه المصادر المختلفة للبيانات وكانت النتيجه أن هناك مشاكل في قطاع البناء والتشييد لها علاقه بانعدام التنسيق بين اصحاب المصلحه ،حيث تم تصنيف هذه المشـــاكل الى ست مشكلات رئيسية هي": المعلومات الإدارية، معلومات البنـــاء، المشـــاكل القانونيـــة، المشاكل التقنية،مشاكل متعلقه بالتصميم والمشاكل الماليه . "بالإضافة إلى ذلك، فإن عملية البناء في فلسطين هي عمليه بسيطة جدا في المحتوى .ويتم ذلك على النحو التالي :مرحلة التخطـــيط "ما قبل المشروع"؛ مرحلة التصميم "التصميم الأولـــي، وتطـــوير تصـــميم وإعـــداد الوثـــائق والمناقصات"، ثم المرحلة التالية وهي مرحلة التنفيذ أو البناء، والمرحلة النهائية هـــي مرحلـــه التسليم والتشغيل وهذه المفاهيم بحاجة إلى مهارات اداريه وتقنيه وفنيه وللاسف فـــان قطـــاع الانشاءات في فلسطين يفتقر الى هذه المفاهيم .

النتيجة الرئيسية التى توصلت اليها الباحثة هي البروتوكول لعملية البناء في فلســـطين والتي هي تعديل في عملية البناء في فلسطين وتعتمد على مبدأ (Process Protocol) المعتمد في المملكة المتحدة مع خطه عمل لتنفيذ ذلك المفهوم بما يتناسب مع قطاع الإنشاءات فـــي فلسطين في مشاريع الابنيه المملوكه من قبل الحكومه والممولة من قبل الجهات المانحه.

توصي الباحثه الحكومة بدراسة وتقييم اللوائح المتصلة بعمليات البناء، وتشكيل هيئـــة متخصصة تحتوي على المهندسين والمقاولين، وصناع القرار الحكوميين والمتخصصـــين فـــي القانون و المعلمين في الجامعات من أجل رعاية وتبني جميع القضايا المتعلقة في عملية البناء، وتنفيذ برامج التدريب والتعليم المستمر من خلال المحاضرات والدورات التدريبيـــة والنـــدوات وورش العمل .وأوصت وزارة الأشغال العامة والإسكان أيضا إلى إنشاء وحدة البحث والتطوير (R & D), وعمل خطة لتحسين هذا القطاع والتغلب على تأثير هذه المشاكل التي تواجه قطاع البناء والتشييد التي قد تظهر نتيجة لانعدام التنسيق في عملية البناء.

وأخيرا، تشير الباحثة الى اطار مستقبلي لتتبنى وتنفذ هذا البروتوكول ، و يتكون هذا الإطار من استراتيجيتين" :التخطيط على المدى القصير "والتخطيط على المدى الطويل "وهـــذه الاستراتيجيات تتكون من عناصر خطة العمل التالية : الاطار التنظيمي و المؤسســـي والبنيـــة

التحتية والدعم الفني، المشاركون في قطاع النشاءات والمقاولات ، التعرف على عملية البنـــاء وتحديدها ، وتحديد أفضل الممارسات الاداريه لخلق تنسيق بين جميع الاطراف والمضي قدما في عملية البناء لتحقيق هذه الأهداف.

ومن خلال تبني فكره process protocol يكون لدينا قاعده للتركيز على مفهـــوم نمذجه معلومات البناء BIM ومحاوله اعتماده في مشاريع البناء للمساعده في التغلب علـــى المشاكل الناتجه عن عدم وجود تنسيق بين اطراف المشروع .