DISSERTATION

A PARADIGM OF WATER SUPPLY MANAGEMENT IN URBAN AREAS OF DEVELOPING COUNTRIES

Submitted by

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WE HEREBY RECOMMEND THAT THE DISSERTATION PREPARED UNDER OUR SUPERVISION BY ROBERTUS WAHYUDI TRIWEKO ENTITLED A PARADIGM OF WATER SUPPLY MANAGEMENT IN URBAN AREAS OF DEVELOPING COUNTRIES BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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Ad Maiorem Dei Gloriam

(For the Greater Glory of God)

ABSTRACT OF DISSERTATION

A PARADIGM OF WATER SUPPLY MANAGEMENT

IN URBAN AREAS OF DEVELOPING COUNTRIES

The two most critical problems of water supply services in Third World cities are low level of service and inability to improve and maintain the continuity of service. This study develops a paradigm of water supply management for Third World cities, and is intended to explain the reasons for these conditions and to develop strategies for improving service.

A comprehensive perspective is needed in the paradigm of water supply management in Third World cities. It is a concept, or frame of reference about water supply management, that explains a management system with technological, institutional, and financial subsystems to yield a pattern of results that are measured by level of service and management efficiency, all within an external environment with fixed physical and social characteristics. Lessons from past experience in Third World cities, which are presented in the form of 15 propositions, emphasize the special characteristics of cities in developing countries and the uniqueness of their water supply management. A guideline for developing strategies

to improve water supply service in urban areas of developing countries is developed based on these characteristics. The strategies include maintaining the balance between the economic and social functions of water, strengthening local institutions, reaching financial self-sufficiency and community management, and establishing integrated water management.

The case study of water supply management in Jakarta, Indonesia demonstrates the applicability of the paradigm in formulating the problems and in developing strategies in a typical large city of a developing country.

The study concludes that water supply management must be sensitive to the local physical and social environments. To handle complex problems of water supply management, a holistic management approach must be applied. In this case, the paradigm for water supply management can be used as a tool by the managers and decision makers to manage the dynamics of water supply problems in Third World cities.

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DEDICATION

To my wife Indras, and daughters Sari and Ratih

for their love and prayer

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LIST OF ABBREVIATIONS AND LOCAL TERMS

ADB	-	Asian Development Bank
BAPPENAS	-	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)
BPAM	-	Badan Pengelola Air Minum (Water Supply Management Board)
BKLH	-	Biro Kependudukan dan Lingkungan Hidup (Bureau of Population and Environment)
BOD	-	Biological Oxygen Demand
COD	-	Chemical Oxygen Demand
DAB	-	Direktorat Air Bersih (Directorate of Water Supply)
GOGCWS	-	General Organization for Greater Cairo Water Supply
IKK	-	Sub-district Water Supply Development Program
IWSSD	-	International Water Supply and Sanitation Decade
JICA	-	Japan International Cooperation Agency
lcpd	-	liter per capita per day
MHA	-	Ministry of Home Affairs
MOF	-	Ministry of Finance
MPH	-	Ministry of Public Health
MPW	-	Ministry of Public Works
MWA	-	Metropolitan Waterworks Authority of Bangkok
NGO	-	Non-Government Organization
PDAM	-	Perusahaan Daerah Air Minum (Water Supply Enterprise)
PDAM Jaya	-	Perusahaan Daerah Air Minum Jakarta Raya (Jakarta Water Supply Enterprise)
PERDA	-	Peraturan Daerah (Local Government Regulation)
PJSIP	-	PAM Jaya System Improvement Project
P4L	-	Pusat Penelitian dan Pengembangan Perkotaan dan Lingkungan (Center for Research and Development of Urban and Environment)
PPSAB	-	Proyek Pengembangan Sarana Air Bersih (Water Supply Facility Development Project)
UAW	-	Unaccounted-for Water
UNDP	-	United Nations Development Program
WHO	-	World Health Organization
WSC	-	Water Supply Cooperative

CHAPTER 1

INTRODUCTION

1.1 PROBLEM STATEMENT

The efforts to improve water supply service in urban areas of developing countries have been underway for a long time. The condition of water supply service in these urban areas was reported by Dieterich and Henderson in 1963, in their report to the World Health Organization (WHO) entitled "Urban Water Supply Conditions and Needs in Seventy-five Developing Countries." Since then, a lot of experience from developing countries has been shared through journals and professional meetings and is enriching the general body of knowledge in urban water supply management.

Those efforts culminated in the International Drinking Water Supply and Sanitation Decade (1981 - 1990). "Technology is not enough," became a popular slogan during the Decade and emphasized the importance of an interdisciplinary approach for improving water supply service, rather than a single-discipline approach from the engineering aspect only. The task of an engineer is not limited to the planning, design,

construction, and operation of the engineering systems, but extends to the need to develop cooperation with other disciplines in an interdisciplinary team.

Even though a lot of experience about level of service has been gained during the Decade, it has been recognized that the condition of water supply service in those areas has not improved satisfactorily. Improvement of the system cannot keep up with the increasing demand, due to the economic recessions experienced by developing countries and other social, economic and environmental conditions. In such situations, a change of policy and strategy might be needed in order to meet present demand and maintain continuity of the service.

The slow development of water supply service in urban areas of developing countries raises two key questions:

(1). Why is the condition of water supply service in those areas still poor, with low levels of service and an inability to significantly improve service?

(2). In such a condition, how can we improve the service?

The future improvement of water supply service in urban areas of developing countries will depend on our ability to absorb the lessons learned from past experiences and use them for solving present problems, or for planning future actions. "Experience is the best teacher," is a proverb that is also applicable to the case of water supply management in Third World cities. It should be noted, however, that experience is more useful when used along with a process of reflection and

evaluation.

Within the above spirit, this study summarizes the lessons learned from water supply management in Third World cities, and organizes that body of knowledge in a systematic way, so that it will be more useful for improving service in those areas. In other words, this study formulates a paradigm of urban water supply management for developing countries. The paradigm is a tool, which can help policy makers and water managers to formulate the nature of the problems.

1.2 THE ROLE OF A PARADIGM IN WATER SUPPLY MANAGEMENT

Etymologically, the word "paradigm" originated from the Latin word *paradigma*. The latter came from the Greek word *paradeigma* which was spelled as *paradeiknunai*, meaning "to exhibit." In modern English, paradigm means "a pattern, model, or example."

In the literature, there are many definitions of "paradigm." Kuhn (1962) defined paradigm as "a framework for the organization of knowledge." Bailey (1978) defined paradigm as "a perspective or frame of reference for viewing the social world, consisting of a set of concepts and assumptions." Paradigm is "the mental window" through which the researcher views the world. What he or she sees in the social world is something that objectively exists, but is interpreted by his or her paradigm. According to Vlachos (1990), "paradigm" is a tentative explanation about a phenomenon which is generally

complex. In the absence of an agreed upon model, he added, paradigms can serve as organizing schemes. For Huey (1991), "a paradigm is simply the conventional wisdom about how things have always been done and must continue to be done."

It can be summarized that a paradigm is a framework in which to analyze phenomena in the real world, based on the perception of the person(s) involved in the subject area. Such a framework is necessary for classifying existing knowledge in a systematic way. In the management area, a useful paradigm can help managers determine the best management principles, based on past experience, that can be used as the basic philosophy for managing the system. A paradigm provides a direction for policy making and strategy formulation for system development.

The main components of a paradigm are a metaphysical belief, symbolic generalizations, exemplars, and values (De Mey, 1982; Kuhn, 1961). In this study, the metaphysical belief of the paradigm is a framework of how the knowledge of urban water supply management will be organized. Symbolic generalizations are presented as a set of propositions generated from experience in developing countries. Exemplars are typical examples that explain in concrete cases the pattern of a specific aspect of urban water supply management.

In scientific development, De Mey (1982) identified two functions of a paradigm: an economical function and a psychological function. A paradigm has an economical function,

because it represents a vast amount of knowledge in a relatively simple scheme. According to Kuhn (1962), it is "a convenient device for summarizing what is already known." The psychological function of a paradigm relates to its guiding function with respect to the exploration of the unknown. In this case, a paradigm provides a guideline for researchers for fruitful investigations into the unknown (De Mey, 1982).

The paradigm which is developed in this study is intended to summarize the lessons learned from past experience so that they can be used as guidelines for managing water supply systems in Third World cities. Specifically, the paradigm will be useful for improving water supply management in urban areas of developing countries in the following ways:

a. The paradigm classifies and represents existing knowledge in urban water supply management in a systematic way so that its role in water supply development can be better appreciated.

b. The paradigm underlines principles of management which are accepted as optimal management practices by water supply agencies in urban areas of developing countries.

c. The paradigm provides a framework for developing a strategy of service improvement.

d. The paradigm identifies the areas which are important for the further development of management practice, but in which the knowledge is limited or absent. Such insight will give direction and orientation for further studies

in water supply management in those specific areas.

A paradigm might be changed in the future as a result of new experience, understanding and expectation. Nevertheless, it is important for the managers and decision makers in developing countries to have a paradigm as the basic philosophy or guidance for managing water supply systems.

1.3 STUDY OBJECTIVES

The primary objective of this study is to develop a paradigm of urban water supply management in developing countries. This paradigm will provide a tentative explanation about the complexity of the water supply management problems in Third World cities. The paradigm rationalizes characteristics of water supply service in Third World cities, in the context of their physical and social environments. It identifies critical variables which influence the condition of water supply service in those areas.

The second objective relates to the effort for improving water supply service in those areas. This study develops a guideline to formulate a strategy for the development of water supply service in urban areas of developing countries. It identifies the potentials for improving water supply service, as well as the constraints that limit those efforts.

1.4 SCOPE OF THE STUDY

The scope of the study is limited to water supply management in urban areas of developing countries. Water supply management is defined as all efforts for providing water supply service which comprises the application of technology, institutional arrangement, and financial management. The focus of this study, however, is not limited to the operation and management of the water supply systems on providing the service, but on a broader perspective of policy and strategy formulation for improving water supply service in those areas.

The word "urban" is used in contrast to "rural." An urban area is defined as an area with a high population density and predominantly non-agricultural economic activity. The size of the city is not specified further, whether it is a small town, large city, or a metropolitan city. The available literature and the case study, however, refer to the condition of an urban agglomeration, which is a critical trends in developing countries.

The term "developing countries" is used to contrast with the term "developed countries," and it is used interchangeably with the terms "Third World countries," and "Less Developed Countries." These refer to the countries (most in Africa, Asia, and Latin America) in which the status of economic development is relatively lower than in developed or industrialized countries.

1.5 RESEARCH PLAN AND STUDY ORGANIZATION

This research was carried out in three stages: (1) developing a framework; (2) literature review; and (3) case study.

The first stage of paradigm development formulates a framework of how the researcher sees the phenomena of water supply management, and how the researcher wants to organize the accumulation of knowledge in those areas. Metaphysical belief is the main perception of the researcher in relation to the problem of water supply management in urban areas of developing countries.

The purpose of the second stage is to summarize the lessons learned about water supply management in Third World cities, which are found in the literature. The relevant literature is classified according to different issues as they are outlined in the framework. The findings from the studies, field experience from different places, and opinions from experts and managers in water supply are summarized, absorbed, and synthesized so that general problems of water supply in those areas and different approaches for solving the problems can be identified. The framework becomes a "filter," selecting lessons learned from past experience. The lessons learned from developing countries are presented as a set of propositions. The propositions explain the characteristics of Third World cities, the condition and characteristics of their water supply service, and management principles for improving the

service. Typical examples found in the literature from Third World cities support the developed propositions. A guideline for developing a strategy to improve water supply service in Third World cities is proposed, based on the lessons learned from developing countries.

The third stage demonstrates the applicability of the paradigm as a framework for evaluating and explaining the condition of urban water supply management, and to help the policy and strategy formulation in a specific area. Water supply management in Jakarta, Indonesia is selected for the case study. The data used in this study is mainly cited from the secondary sources available in the master plan and other documentation. Interviews with the officers of the Jakarta Water Supply Enterprise (PDAM Jaya) provide detailed information about some interesting topics. Data about water supply management at the national level and general government structure of Indonesia provides a background to the water supply management in Jakarta.

This work is composed of six chapters as illustrated in Figure 1.1. Chapter 1 discusses the background of the problem, study objectives, and the approach to implement the study. This chapter also demonstrates the contribution of this study to the body of knowledge in urban water supply management. The second chapter develops a framework of water supply management in Third World cities. This chapter stresses the need for a comprehensive perspective for solving the complex problems of

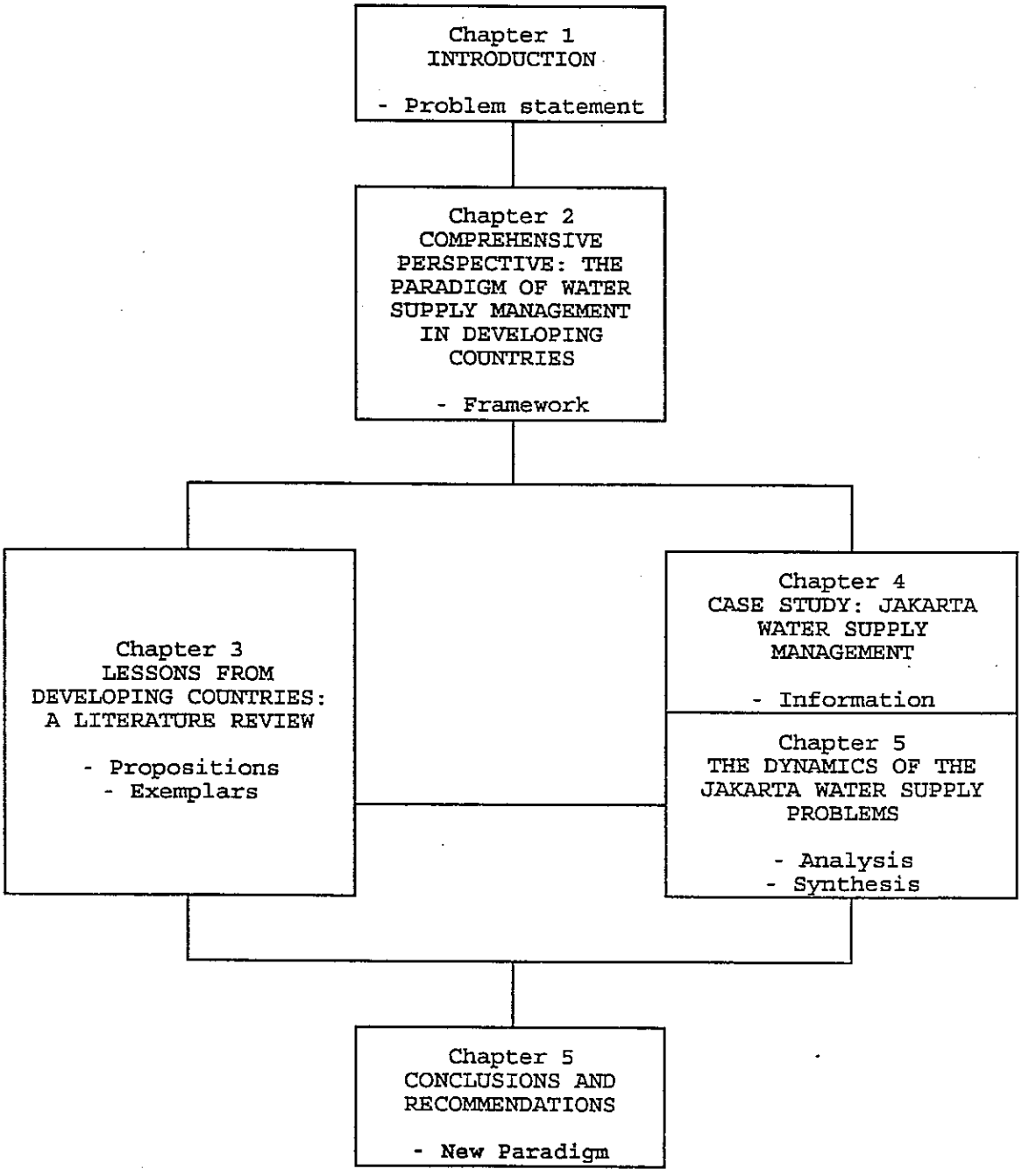

Figure 1.1 The framework of the study process

water supply management in developing countries. The third chapter summarizes the lessons learned from past experience in developing countries using the framework developed in Chapter 2. The lessons are underlined and presented in a series of propositions. Chapters 4 and 5 demonstrate the applicability of the paradigm in problem architecture and strategy formulation using the case of Jakarta water supply management. Chapter 4 provides the background information for the case study, while the analysis, discussions, and proposed strategy for the service improvement are presented in Chapter 5. The last chapter summarizes the overall findings of the study and proposes recommendations for further research.

1.6 CONTRIBUTION

The significance of this study lies in its concern with the problem architecture of water supply management in urban areas of developing countries. The complexity of the problems makes problem formulation a critical stage for improving water supply service in those areas. Classifying and restructuring the problems will help us to understand the relationships among those problems and formulate a strategy to solve them comprehensively.

The paradigm developed in this study recapitulates the existing body of knowledge related to urban water supply management in developing countries. Lessons learned from past experience and from different parts of the world are screened

and presented in a systematic way, so that they will be more useful for coping with the problems strategically. By doing this, this study also evaluates the progress of the research activities in this subject. Therefore, this study also provides a direction and orientation to the future studies of urban water supply management in developing countries.

This study demonstrates the linkage between water supply management with their environment. This study explains the dependency of water supply performance on its environmental as well as the impact and consequences of the service to the environment quality. Interdependency among different variables involved in water supply development convinces us that an interdisciplinary approach to improve water supply service in urban areas of developing countries is a critical need.

This study underlines the important role of a paradigm as a foundation of water supply management practices in Third World cities. It is not claimed that the paradigm developed in this study is the only and the best representation of water supply condition in those areas. However, it is expected that this study will provide the basis for further discussion among different parties involved in water supply development in those area.