



**DEVELOPING A REPRESENTATIVE PROJECT LIFE CYCLE FOR CAR
RECYCLE INDUSTRIES IN CYPRUS. ANALYSIS OF STAGES AND THE
ASSOCIATED RISKS MANAGEMENT OF EACH STAGE.**

By

GEORGIOS I. KOLOKOTRONIS

A THESIS REPORT

Presented to the Project Management Program in the

School of Management of

City University of Seattle

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE OF PROJECT MANAGEMENT



June 2009



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This Master Thesis was elaborated in the frame of the collaboration of the City University of Seattle and the Graduate Technological Education Institute (T.E.I.) of Piraeus to fully implement at TEI of Piraeus Campus the CU's MS in Project Management Program approved by the Hellenic Ministry of National Education and Religion Affairs as by decision E5/58291 published in the Hellenic Government Gazette (FEK) B/924/5- July-2005.



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THE THESIS ADVISE/EXAMINE COMMITTEE:

a) Kontesis K.

b) Kokkosis A.

c) Besseris G.

Print or type name

Signature

Date(yy/mm/dd)

THE PROGRAM DIRECTOR:

Print or type name

Signature

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I owe a massive debt of gratitude to my parents, Ioanni and Theodora, for their unreserved support during my studies.

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Special thanks to my professor Dr. Kosta Kontesi who has significantly influenced my thinking about the topic of my master thesis and who contributed his expertise and energy during its implementation.

Biography

Georgios I. Kolokotronis

Georgios I. Kolokotronis is an assistant manager in his family business, N & G Kolokotronis Spare parts and Car Recycle, based in Nicosia-Cyprus. His business is pioneer in the sector of car dismantling and recycling. From his early years, he had been involved in market and had gained great experience on how market and business function.

He finished senior high school in June 1999. In July 1999, he enlisted in the National Guard of Cyprus where he served his military national service for twenty six months. In January 2002 he began his studies in the Technological Educational Institution of Athens in the sector of Biomedical Engineering. In October 2006 he completed his studies and worked in his company until October 2007 when he started his postgraduate studies in City University of Seattle in program, “Master of Science in Project Management”.

Thesis checklist

STUDENT NAME

KOLOKOTRONIS	GEORGIOS	IOANNIS	20099728
(Last name)	(First, Middle,)	(Father's name)	(I.D.#)

ADDRESS

7, IKONIOU	NICOSIA	CYPRUS	2028
(Number, Street)	(City)	(State/Country)	(Zip/Country)

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Last name	First, Middle,	Father's name	I.D.#

ADDRESS

7, IKONIOU	NICOSIA	CYPRUS	2028
Number, Street	City	State	Zip/Country

COURSE

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a) Kontesis K

b) Kokkosis A.

c) Besseris G.

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Abstract

Cyprus, as a new member of European Union Community, is required to comply with European Union directives and regulations regarding matters of management of hazardous waste. A critical step toward this direction is the reconcilments of the development of car recycle industries with European End of Life Vehicle Directive. Project management techniques utilization contributes to the establishment of a representative project life cycle which serves as a guide to those who are interested to develop car recycle industries. This representative guidebook contains all the stages which are necessary to the development of a car recycle industry, the associated risks management of each stage, and the applicable regulations and European directives.

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CHAPTER 1 - INTRODUCTION

1.1 Nature of the study

Cyprus, as a new member of European Union Community, is required to comply with EU directives and regulations. According to European ELV Directive all cars that come to the end of their life must be recycled because they are a considerable source of environment pollution.

Cyprus's market is not familiar with the car recycle field. Potential entrepreneurs willing to get involved in this field face the absence of basic knowledge and guidelines for the development of a car recycle industry.

By using project management principles I will establish a practical and complete guidebook which will serve as a guide to these entrepreneurs.

1.2 Needs assessment

Stakeholders of this representative project life cycle for car recycle industries are the potential entrepreneurs who will get involved in the car recycle field, the competent government authorities, the local society, especially the habitants of the region area, and the Republic of Cyprus in general. Additionally, more stakeholders may result in the course of my project. The representative guide will provide stakeholders with a view of the stages which are necessary to the development of a car recycle industry, the applicable regulations and European ELV Directive, and the associated risks management of each stage.

- Potential entrepreneurs will derive benefit from the guidebook as it will serve them as a guide for the development of the Car Recycle Industry.
- The competent government authorities' main concern is the compliance of Cyprus with the European ELV Directive. The development of this Car Recycle Industry is a critical step towards this direction.
- Local society concerns about of the environmental impact of such development in their region.

- Furthermore to the environmental and public health benefit, the Republic of Cyprus will also gain from an economic point of view since the recycled products will be exported as raw materials to the other European Countries.

1.3 Purpose of the study

Purpose of the study is to establish a practical and complete guidebook to serve as a guide to potential entrepreneurs who are willing to develop a car recycle industry in Cyprus. The guidebook will reveal all the necessary stages to the development of a car recycle industry, the applicable regulations and European ELV Directive, and the associated risks management of each stage.

1.4 Relation to the program of study

My first contact with the project management science came through the course PM501 (Introduction to Project Management). This course provided me with the basic knowledge of this science and gave me an understanding of the project planning and how it is associated with the project life cycles as well as the risks that are associated with the project planning and how they can be managed. PM504 (Project Planning and Control), provided insight into project planning –planning and executing processes, and risk management –risk assessment, risk analysis, risk handling. PM508 (Project Risk and Decision), will provide me with a useful knowledge of risk management but is a course takes place next semester.

1.5 Definition of terms

Special term used is:

European ELV Directive: European End of Life Vehicle Directive.

CHAPTER 2 – PROBLEM STATEMENT

2.1 Problem definition

Cyprus is non-compliant with the European End of Life Vehicle (ELV) Directive and regulations, regarding the development of Car Recycle Industries.

2.2 Rationale

Cyprus is newly affiliated with the European Union (EU). It is well known that EU regulations are very strict concerning matters of environmental and public health. Cars at the end of their life are a considerable source of pollution. Eight to nine million cars are scrapped each year in the European Union. The project refers to the development of a representative project life cycle, according to the European End of Life Vehicle (ELV) Directive, that should be used by potential entrepreneurs willing to get involved in the recycling sector. This thesis is extremely useful due to the absence of a similar representative in the market of Cyprus.

2.3 Objectives

My objective is to use project management principles to establish a practical representative project life cycle which will serve as a guide to potential entrepreneurs willing to get involved in the recycling sector. The representative guide will contain all the stages which are necessary to the development of a car recycle plant, the applicable regulations and the European ELV Directive, as well as the associated risks management of each stage.

CHAPTER 3 – REVIEW OF LITERATURE

Introduction

My research is based on literature obtained from a variety of resources, books, web-pages, articles and journals. Deriving appropriate and sufficient knowledge, I am in a position to establish a representative project life cycle (guidebook) for the development of car recycle industries in Cyprus.

The literature review includes information concerning the project life cycle and the associated risks management of each stage of the project life cycle.

3.1 Project definition

A project can be defined as a sequence of activities undertaken to accomplish a temporary endeavour (with a defined completion date) to create a unique product, service or result (Pmbok, as cited in Loch, DeMeyer and Pich, 2006).

3.2 Project life cycle definition

As the projects are unique involving a certain degree of risk, companies performing projects will generally subdivide their projects into several project phases to provide better management control. Collectively these project phases are called the project life-cycle (Pmbok, as cited in Burke, 2003).

An ideal project life cycle cannot be defined with a specific way. Some organizations use a single life cycle for their projects, while others choose the most appropriate one. These cycles define the technical work in each phase involved, and how to control and approve each phase, when deliverables are to be generated and how each one is reviewed and validated.

Project Management Institute (2004) noted that:

“The completion and approval of one or more deliverable characterizes a project phase. A deliverable is a measurable, verifiable work product such as a specification, feasibility study report, detailed design document or working prototype. These are part of a process designed to ensure project control and to attain the desired outcome. In any specific project, for reasons of size, complexity, level of risk and cash flow constraints, phases can be further divided into sub-phases, for monitoring and control” (p.22).

3.3 Project life cycle models

Cleland & Ireland (2002) state that “Using a model of the project’s life cycle is useful in identifying and understanding the total breadth and longevity of the project” (p.44).

Some project life cycle models suggest four or five phases, while others may suggest more. The phases of the project life cycle and what happens during its cycle depend on the distinctive nature of the project.

3.3.1 Four phase project life cycle models

Cleland & Ireland (2000) suggested a general project life cycle which contains four phases: conceptual phase, planning phase, execution phase, and termination phase.

A model suggested by Burke (2003) consists of the concept and initiation phase, the design and development phase, the implementation or construction phase, and the commissioning and handover phase.

Another model suggested by Verzuh (2005) consists of the phases define, plan, execute, and close out.

Meredith & Mantel (2006) also suggested a model with the headings: conception of ideas, selection of the best one, planning, scheduling, monitoring, and control project progress, and evaluation and termination.

All the above four phase models have in common that in the first phase a need or opportunity for a product, facility or service established and feasibility of proceeding with a project is evaluated in order to move to the next phase. Another important issue of this phase is a preliminary analysis of risks and the resulting impacts on a project. In the second phase the guidelines set by the feasibility study are used to design the product, outline the build-method and develop detailed schedules and plans for making or implementing the product, facility or service. In the third phase, project starting to implement as per the baseline plan developed in the previous phase. Finally, in the fourth phase project confirmed that it had been implemented or built to the design and was terminated.

3.3.2 Five phase project life cycle models

Cleland & Ireland (2002) suggested a broad notion of the life cycle of a generic project which consists of conceptual phase, definition phase, production phase, operational phase, and divestment phase.

A model suggested by Lewis (2005) consists of the initiation phase, planning phase (strategy first), planning for implementation, execution and control, and closeout.

Kerzner (2006) also suggested a five phase project life cycle which consists of conceptual phase, planning phase, testing phase, implementation phase and closure phase.

As far as the five phase project life cycle models are concerned they include common characteristics such as those of four phase project life cycle models in each phase with a difference. The difference is a transition phase between planning and implementation phase which actually is a planning of how the project will be done, what must be done, who will do it and so on. This phase could be considered as the final testing before a project moves from planning to implementation phase.

3.4 Project risk definition

Project Management Institute (2004) defined that “Project risk is an uncertain event or condition that, if it occurs, it has a positive or a negative effect on at least one project objective, such as time, cost, scope, or quality” (p.238).

The conditions that may contribute to project risk include aspects of the project's or organization's environment, such as poor project management practices, lack of integrated management systems, dependency on external participants who cannot be controlled, and others. Risks are present in all projects and they could be perceived as threats to project success or as opportunities to enhance chances of project success. If the risks perceived as threats to the project, they might be accepted while thus were in balance with the reward that may be gained. If the risks perceived as opportunities, they might be pursued to benefit the projects' objectives.

The successful management of risks depends on proactively and consistently actions throughout the project life cycle.

3.5 Project risk management (PRM)

Loch, DeMeyer and Pich (2006) defined project risk management as the “art and science of identifying and responding to project risk throughout the life of a project and in the best interest of its objectives” (p.10).

Project risk management is a cyclic process extending project planning by identifying, appraising and managing related risks. It supports the project’s base plan components and revises its targets when demand. It also has a mission to achieve the sated project’s goals despite the risks.

3.6 Risk management processes

Young (1996) suggested a process to deal with project risks and includes: identify and evaluate potential risks, obtain agreement to action plans to contain the risks, take the actions and monitor the results, and promptly resolve any issues arising from risks that happen.

Project Management Institute (2004) suggested that the Project Risk Management processes include the risk management planning, risk identification, qualitative risk analysis, quantitative risk analysis, risk response planning, and risk monitoring and control throughout the project life cycle.

Kerzner (2006) noted that risk management strategy must be established early in a project and that risk must be continually addressed throughout the project life cycle. Risk management includes risk planning, assessment (identification and analysis), handling, and monitoring.

Loch, DeMeyer and Pich (2006) also suggested that project risk management consist of four conceptual steps: identify risks beforehand, classify and prioritize them according to probability and impact, manage them with a collection of preventive, mitigating, and contingent

actions that are triggered by risk occurrence, and embed these actions into a system of documentation and knowledge transfer to other projects.

All the aforementioned processes consist of common steps which include common procedures. Representative project risk management processes that best describe the common procedures included in each step can be considered those suggested by the Project Management Institute (2004):

- “Risk Management Planning - deciding how to approach, plan, and execute the risk management activities for a project.
- Risk Identification - determining which risks might affect the project and documenting their characteristics.
- Qualitative Risk Analysis - prioritizing risks for subsequent further analysis or action by assessing and combining their probability of occurrence and impact.
- Quantitative Risk Analysis - numerically analyzing the effect on overall project objectives of identified risks.
- Risk Response Planning - developing options and actions to enhance opportunities, and to reduce threats to project objectives,
- Risk Monitoring and Control - tracking identified risks, monitoring residual risks, identifying new risks, executing risk response plans, and evaluating their effectiveness throughout the project life cycle” (p. 237).

CHAPTER 4 – METHODOLOGIES AND PROCEDURES USED IN THE STUDY

4.1 Description of methodology

Methodology includes further research into the several stages of a project life cycle and the associated risks management of each stage. In general, academic and professional literatures provide the knowledge to decide which representative project life cycle, inter alia, is best suited a project, what are the risks associated with each phase of this project life cycle

and how all these are adapted to a specific project in respect of its requirements and specifications.

The Cyprus government web portal and other websites provide details about the exact regulations, specifications, European Directives and competent involved authorities which are necessary to be considered for the development of car recycle industry.

4.2 Definition of end-of-life vehicle (ELV)

End-of-life vehicles are motor vehicles that are categorised as waste. Their components and materials are also classed as waste. Waste is anything discarded, intended to be discarded or is required to be discarded. This includes material being sent for recycling or reuse. All provisions of the end-of-life vehicle legislation apply to cars and vans. However, only the de-pollution requirements apply to the following waste motor vehicles:

- three-wheeled motor vehicles
- coaches
- buses
- motor cycles
- goods vehicles.

Vintage vehicles do not fall within the scope of the legislation. Vintage vehicles include historic vehicles or vehicles of value to collectors or intended for museums, kept in a proper and environmentally sound manner, either ready for use or stripped into parts. The legislation also does not cover ships, trains or planes.

4.3 Legislative directive regarding the management of the ELV

The management of the ELV is enclosed in the more general directive of the waste management, but adopted legislative regulations that are regarded exclusively for the ELV. The main goals that emanate from the existing legislative guideline at a European level include:

- The maximum utilization of the materials that are included in the ELV by means of repossession, re-usage or re-cycling and finally their use for energy.
- The minimizing of the quantity of hazardous components that are contained in the new vehicles and therefore in the ELV.
- The minimizing of the materials that are contained in the ELV and cannot be utilized.
- The safe elaboration of the residue, in the event that it is not possible to be developed, to be led towards final disposal to the suitable areas.

4.4 Communal legislative frame

The European Union (EU) wishes to prevent waste arising from end-of-life vehicles and to promote the collection, re-use and recycling of vehicle components, so as to protect the environment. Thus, E.U has moved forward to decree the legislation for the management of the ELV and more specifically, it has adopted the Directive 2000/53/EC (European Council), named ELV Directive. Furthermore, the management of the ELV is incorporated in the general legislation for solid waste, while the administrative establishment of the ELV is subject to the proceedings for environmental permission. Within this legislative are included, inter alia, statutes in regard to:

- The managing of solid waste
- The managing of hazardous waste
- The sanitary burial of waste
- The cremation of waste
- The evaluation of the environmental consequences of the actions and plans
- The complete prevention and control of the pollutants

4.5 The Directive 2000/53/EC of the European Union – The ELV directive

The purpose of the Directive 2000/53/EC is to determine the measures regarding the prevention of the venturousness of the ELV, the minimizing of the consequences to the

environment from the production and administration of the ELV, and the development of correct practices for their management with emphasis on the recovery, re-usage and re-cycling of the materials.

4.6 Cyprus legislative directive

Cyprus has been harmonized with the provisions of the relative aforementioned European Directives via the Law 157 (I) of 2003 on ELVs.

The management of the ELVs is ruled by the Act 157 (I)/2003 regarding the ELVs. This Act regulates the management of the ELVs, the operation of the facilities for the management of these vehicles and the obligations of the financial bodies relating to these vehicles. This Act was voted to coincide with the Directive 2000/53/EC and the Ruling 2002/525/EC for the amendment of Paragraph II of the Directive 2000/53/EC.

4.7 Competent authorities

The Cypriot Authorities that are involved directly and indirectly in the production and management of the ELV and also the authorities they have are the following:

a. Authorities that control and are responsible for the management of end of life vehicles.

- Electromechanical Department (Ministry of Transportation and Works):

Consists of the Regulatory Body, which is responsible for the formation and controlling of the implementation of the articles of the legislation of the 2003 Act regarding the ELVs.

- Advisory Committee of Waste Management:

This committee is advisory to the Environmental Department for the granting of the waste management license. Furthermore, it constitutes the regulatory advisory body for the determining of the Technical Prescription Guideline for the Waste Management, the keeping of which is taken into consideration, when issuing a license to a car recycle industry.

- Environmental Service (Ministry of Agriculture and Natural Resources):

Consists of the regulatory environmental body, which is involved in the controlling and following of the management of the ELVs. It is involved in the licensing, for management purposes, through the Advisory Committee of Waste Management, of which it presides. The license is administered by the Minister of Agriculture, Natural Resources and Environment, after consulting with the Advisory Committee of Waste Management. The opinion of this committee is requested and is taken into account, in regard to determining the number of areas of temporary placement and the elaboration facilities that are considered sufficient, for the purpose of the end of life vehicles, as per the Act of 2003. In the event that the Electromechanical Department ascertains that the actions that are carried out at a plant or area that is used for the recovery, recycling, availability, re-usage or the elaboration of a vehicle or part, may prove to endanger their health or the safety of the people or the environment, then the above mentioned department collaborates with the Environmental Department, so that the necessary deemed measures are taken for confronting and obliterating the risk.

- Importers, After-sales, Recyclers, Transporters (Financial Bodies):

The importers and after- sales as producers, together with the remainder of the financial bodies, make up the regulatory bodies that must take care of the creation of the suitable management systems for the ELVs, in accordance with the 2003 Act regarding the End of Life Vehicles.

b. Other Authorities that are involved in the life cycle of vehicles

- Department of City Planning and Housing (Ministry of Interior):

It is generally involved in all activities that relate to some form of development, within defined pre-assigned zones. It constitutes the body in charge for the issuance of the City Planning licenses. The providence for the various legislations of this department, are taken into consideration at the licensing of the management facilities of the ELVs.

- Municipal/Communal Boards (Local Authorities):

They express their views at the meeting of the Advisory Committee of Waste Management, they are however, not entitled to vote. They constitute the competent authorities responsible for the issuance of the Building license based on the setting conditions. They may not have responsibilities as to the management; however they constitute partners of the competent authorities for the implementation of the Act of 2003 regarding the End of Life Vehicles. In some cases it is possible to deviate from some of the providence that defines the city planning (i.e. In proportion to the quantity of the products stored in areas of the industrial zone).

- Scientific Technical Chamber of Commerce of Cyprus (S.T.C.C.):

This constitutes the legal advisor for the State, in technical matters. Therefore it has the power to play the role of an advisor and counselor regarding the management of the ELVs.

- The Cyprus Commercial and Industrial Chamber of Commerce (C.C.I.C.):

The chamber of commerce is involved in the effort for the creation of an organization that will take over the management of first priority waste.

- Federation of Employers and Industrialists (F.E.I.):

As C.C.I.C., is involved in the effort for the creation of an organization which will undertake the management of first priority waste.

- The Association of Importers of Used Vehicles (A.I.U.V.):

An association under the umbrella of the C.C.I.C., which coordinates the actions of the importers of used vehicles.

- The Association of Importers of New Vehicles (A.I.N.V.):

An association under the umbrella of the F.E.I. which coordinates the actions of the importers of new vehicles.

- The Association of Recyclers (A.R.):

An association under the umbrella of the C.C.I.C. which coordinates the actions of the recyclers.

- Cyprus Statistical Service (Ministry of Finance):

The statistical service collects evidence every year from the Department of Motor Transportation and records information such as, the number of new road tax licenses, the number of licensed vehicles which are in circulation, the number of immobile vehicles etc.

- Department of Motor Transportation (Ministry of Transportation and Works):

The department of Motor Transportation is involved in the life cycle of the vehicles keeping, among others, the evidence that was mentioned previously and which the statistical service elaborates on. Furthermore, it maintains some evidence in regard to the number of vehicles that have been annulled. In the future it is expected that it will be involved on a small scale, in the management of the ELVs, based on the relative legislation, for the reason that the Department, during the erasing of a vehicle, will have to be demanded from the last owner, proof of the certificate of destruction.

- Customs (Ministry of Finance):

The customs record annually, the numbers of vehicles, by category that are imported and exported to and from Cyprus.

4.8 Selection of project life cycle model

During the research the appropriate and sufficient knowledge has been derived and the most suitable project life cycle model for the development of car recycle industries is selected. An integral analysis of this project life cycle follows as well as the associated risk management of each phase.

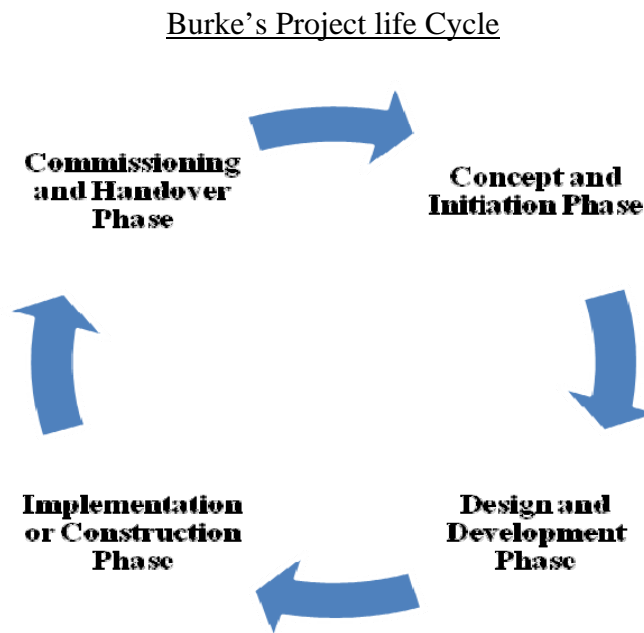


Figure 1: Project Life Cycle

According to Burke, there is a general agreement that most projects pass through a four phase life-cycle under the following headings:

1. **Concept and Initiation Phase:** The first phase starts the project by establishing a need or opportunity for the product, facility or service. The risks associated with each phase have to be considered from early in order to be better managed in the best interest of the project. If the project is based on competitive bidding, this phase would include the decision which has been made. The feasibility of proceeding with the project is investigated and on acceptance of the proposal moves to the next phase. In this stage function and performance requirements and specifications for the plant compliance with European Union and Cyprus competent authorities' regulations must be considered. Also, the potential entrepreneur shall take into account all the available subsidies provided for such project by the Government.

Risks that may affect the project during this phase are:

- 1st Risk: Feasibility studies do not include all the requirements and specifications set by the Environment Service, European Union Directive and Local Authorities.

2nd Risk: Environmental studies do not consider all the requirements and specification in order to be valid.

3rd Risk: Local Authorities delay the approval of the Plant design and the construction license.

2. Design and Development Phase: The second phase uses the guidelines set by the feasibility study to design the product (architectural, mechanical, electrical, structural, and plant designs), outline the build-method and develop detailed schedules and plans for making or implementing the product. The land and long lead items may be bought in this phase. Also this phase will include the development of the total bid package (i.e., time, schedule, cost, and performance).

Risks that may affect the project during this phase are:

1st Risk: Plant designers have not considered the applied regulations, legal limitation and Environment Service regulations and specifications.

2nd Risk: Incomplete documentation of bid package.

3rd Risk: Miscommunication and lack of cooperation among the designers, engineers and the contractor.

3. Implementation or Construction Phase: In this phase the contracts for the construction of the plant and the mechanical equipment supplies are let and the project implements as per the baseline plan developed in the previous phase.

Risks that may affect the project during this phase are:

1st Risk: Unsuitable equipment or defective equipment or delay of the supply or inappropriate site of equipment.

2nd Risk: Accident during the construction.

3rd Risk: Adverse Weather Conditions.

4th Risk: Construction is not performed in accordance with the applicable regulations

and specifications.

5th Risk: Contractor can not update the construction procedures when a significant change has occurred in the project scope.

6th Risk: Equipment supplier is not responding to the mechanical equipment supply needs.

4. Commissioning and Handover Phase: The fourth phase confirms the project has been implemented or built to the design and terminates the project. Then the plant must be inspected by the competent authority in order to approved and licensed. After the plant is being licensed and working properly documentation of the expenses must be deposited to Ministry of Finance in order to subsidize.

Risks that may affect the project during this phase are:

1st Risk: Environment Service delays the final inspection and approval of the Plant.

2nd Risk: Bad documentation of the expenses cause bad estimation and smaller amount of subsidize by the government.

CHAPTER 5 – RESULTS

5.1 Recommended representative project life cycle for the development of car recycle industry.

The most suitable project life cycle model has been selected and analyzed during sub-phase 4.8. Its basic format used in order to establish the representative project life cycle appropriate for the development of car recycle industry.

The established representative project life cycle contains all the development's relevant parameters (regulations, requirements, specifications, etc) distributed to the appropriate phase of the life cycle. This procedure generates the guidebook that provides the guidelines toward to the development of car recycle industry.

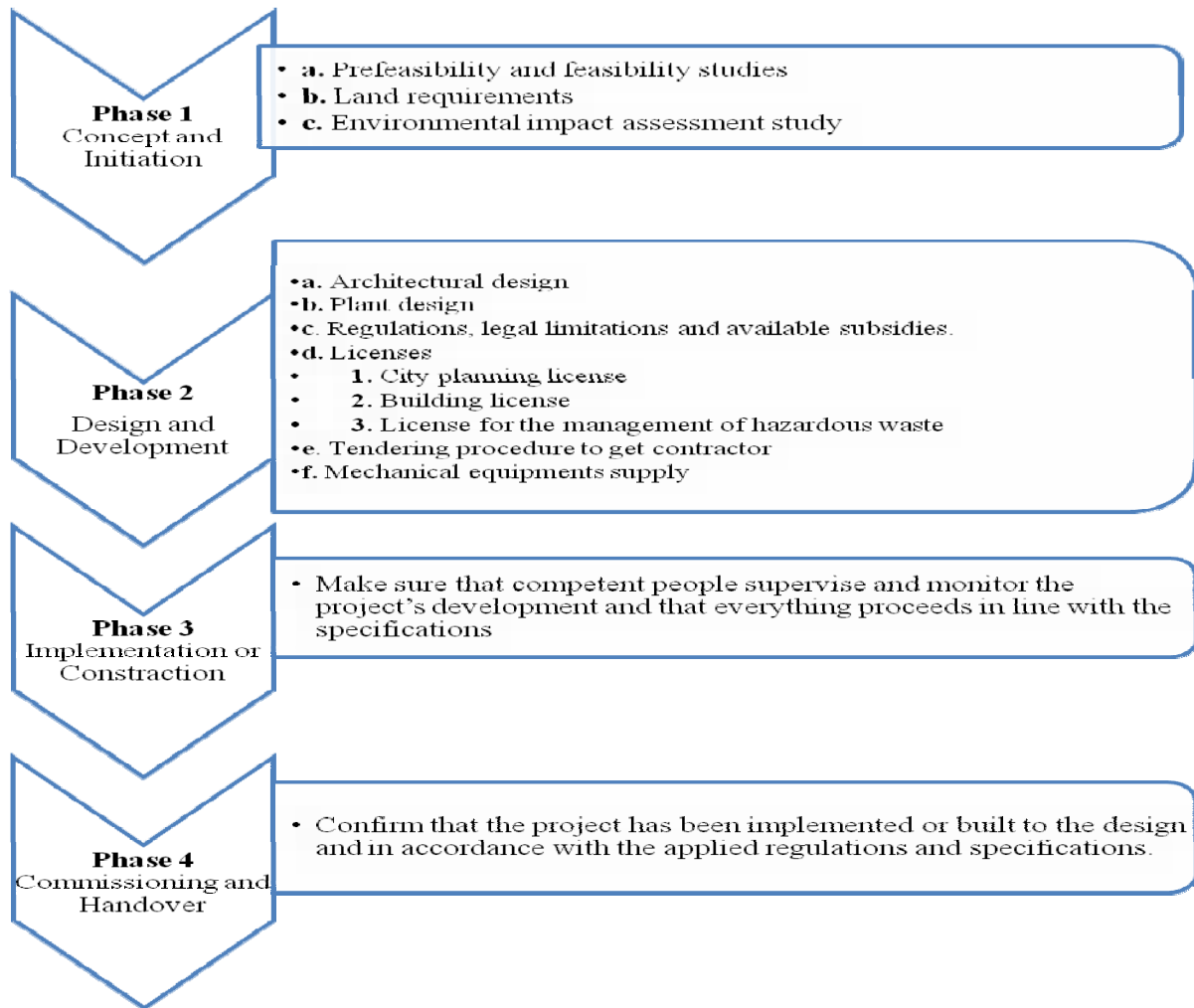


Figure 2: Representative Project Life Cycle

1. Concept and Initiation Phase

Cyprus, as a new member of European Union Community, it is required to comply with EU directives and regulations. According to European ELV Directive all cars that come to the end of their life must be recycled because they are considerable source of environment pollution.

Project management principles utilization will provide the basic framework to the establishment of a practical and complete guidebook which will contain all the stages which are necessary to the development of a car recycle plant, the applicable regulations and European ELV Directive, and the associated risks management of each stage. This guidebook

will provide the basic knowledge and guidelines needed for the car recycle plant development.

a. Prefeasibility and feasibility studies

Key considerations of this phase are prefeasibility and feasibility studies. The purpose of these studies are to examine if the plant could be serving more services than just recycling, i.e. having a spare part store on the side where customers can be procured with second hand parts. In addition, this idea was accompanied with other issues like developing a garage where vehicles prior the dismantling can be inspected and checked if it is more profitable to be resold or dismantled. After the final decision of the Plant operational framework, the whole project goes through a feasibility study, that is, the economic and financial assessment of the project to check whether the project is feasible, viable and prosperous. The already known economic and financial methods shall be used to ensure if the project is feasible or not.

b. Land requirements

Another significant aspect of this phase is the land requirements. In brief:

Land capacity conformity with architectural drawings: here several questions should be asked in order to ensure that the proposed land facilitates the architectural drawings and vice versa. The land plot design should be able to accommodate all the relevant machinery, equipment, buildings etc, in a tactical manner to safeguard the rational operation of the project. Each machinery/ equipment is suited at a specific location to facilitate dismantling and recycling time. Entrance and exit are at a specific location to ensure easy access from and to the plant. Is the land large enough to accommodate all the machinery/ equipment/ buildings? Is the land large enough to allow an adequate number of vehicles to park and wait for dismantling? Is the land large enough to allow large spare part and vehicle inventories? The place should be near the highly occupant regions (but inside the heavy industrial zone) to avoid high transportation costs: if the land is far away from the scraped vehicles source then essential transportation

costs should be taken into account for the feasibility study. The land should be adequately far from rural areas in order to avoid noise disturbance: environmental considerations are always of high concern. The scheme of the Land should be able to facilitate the way the Plant is to be installed: this text is related with the beginning of this task.

c. Environmental impact assessment study

Environmental impact assessment study is one of the most critical issues for such a project. An environmental impact assessment study shall be carried out in order to see the community's willing to accept of the project and potential entrepreneur's willingness to pay for such a service. If both situations are positive, then an evaluation with and without the project (not before and after) regarding the appreciation of the social welfare in line with the environmental protection shall be found. All the parameters of the project shall be taken into account, i.e. noise production, gas emittance, etc. Old vehicles that are not environmentally friendly and emit high carbon dioxide shall be scraped thus increasing the statistical value of life arising from the betterment of the environment. This will lead to fewer deaths; more productivity, higher GDP and finally the whole social welfare will be better off.

2. Design and Development Phase

The second phase uses the guidelines set by the feasibility study to design the plant (architectural, mechanical, electrical, structural, and plant designs), outline the build-method and develop detailed schedules and plans for making or implementing the plant. The land and long lead items may be bought in this phase. Since the project is going to develop via a tendering procedure to get contractor, this phase will include also the development of the total bid package (i.e., time, schedule, cost, and performance).

a. Architectural design

Architectural design should be done in line with the project's concept of operation. The

Architectural design should be tailored to the project's philosophy. All the available mechanical/ electrical and structural considerations relevant to this kind of projects should be taken into account.

b. Plant design

The plant design should be orientated in such a way to facilitate all those issues described in the paragraph 'land requirements' (page. 27, para. 3). The layout of the plant should facilitate the dismantling and recycling time, the pathways needed to undertake a specific job should be taken into consideration for safety and timing issues.

c. Regulations, legal limitations and available subsidies.

Several regulations set by European Union and Cyprus Government must be considered and also the licenses needed to start the development and finally to operate have to be derived.

- Currently applied national regulations: Regulations do change dramatically since the environmental issues are very important. Check whether is more feasible to finish the project before or after a forthcoming amendment of a regulation.
- Legal Limitations: Several legislations restrict the project's operations. These should be taken into account and integrated into the project's deliberation. Many times projects have to comply and constructed in line with legislations/ restrictions.
- Available Subsidies: The project shall take into account all the available subsidies provided for such project by the Government. These subsidies will be included into the economic and financial analysis of the project aforementioned.

d. Licenses

d.1 City planning license

First license is derived from Department of City Planning and Housing (Ministry of Interior). It is generally involved in all activities that relate to some form of development,

within defined pre-assigned zones. It constitutes the body in charge for the issuance of the city planning license. The providence for the various legislations of this department, and the Environmental Study are taken into consideration at the licensing of the car recycle plant, responsible for the management of the vehicles at their end of life cycle.

d.2 Building license

When the first license is obtained, Municipal/Communal Boards (Local Authorities) express their views at the meeting of the Advisory Committee of Waste Management. They constitute the competent authorities responsible for the issuance of the Building license based on the setting conditions. They may not have responsibilities as to the management; however they constitute partners of the competent authorities for the implementation of the Act of 2003 regarding the Vehicles at the End of Life Cycle.

d.3 License for the management of hazardous waste

This license is unsettled until the project is finished and the recycle plant operates properly. Then Environmental service inspects the plant if everything was done according to the law and within the environmental considerations and licensed the recycle plant.

e. Tendering procedure to get contractor

The next stage of this phase is the tendering procedure to get a contractor and a mechanical equipment supplier. As all the requirements and specifications are set and made available via proper documentation then the bidding procedure take place. The winning contractor will be the one that will provide the best services at the minimum cost.

f. Mechanical equipments supply

The selection of the appropriate equipment is essential. The equipment should meet all the specifications needed for such operations and environmentally friendly, i.e., consumes less energy. Price, specifications, maintenance, spare parts, service, capacity, efficiency etc are parameters to look for during the selection. The winning supplier shall sign a contract that

will include all those safeguarding issues for servicing, maintenance, warranty, delivery time, installation, training etc. The price of the equipment is one of the most critical parameters to be checked when deciding. It is wiser to examine foreign markets alone and check whether you can buy cheaper and faster. Decide whether to buy second hand machinery taking into consideration the cost, reliability etc.

3. Implementation or Construction Phase

Monitoring, coordinating and supervising the construction progress. Make sure that competent people supervise and monitor the project's development and that everything proceeds in line with the specifications. Make sure this is emphasized in the contract to be signed.

4. Commissioning and Handover Phase

This phase confirms that the project has been implemented or built to the design and in accordance with the applied regulations and specifications. Then the plant must be inspected from the Environmental Service in order to approved and finally licensed to manage hazardous wastes which include, inter alia, the management of the car at the end of their life cycle.

At this point, Environmental Service (Ministry of Agriculture and Natural Resources) plays the most critical role. This service is the one which will inspect, monitor and approve the project's development. The Environmental Service will take into account all the available parameters and decide whether everything was done according to the law and within the environmental considerations. It is involved in the licensing, for the management of hazardous waste, through the Advisory Committee of Waste Management, of which it presides. The license is administered by the Minister of Agriculture, Natural Resources and Environment, after consulting with the Advisory Committee of Waste Management.

After the plant is being licensed and worked properly documentation of the expenses must be deposited to the Ministry of Finance in order to subsidize.

5.2 Summary proceeding

Once the idea of a development of car recycle industry is born the very first thing to do is to communicate with the competent authorities to get the appropriate licenses needed to start the construction. First you make an application to the Department of City Planning and Housing (Ministry of Interior) in order to get the city planning license. Architectural and plant designs as well as environmental impact assessment study required to be deposited with the application so the Department of City Planning and Housing will be in a position to study the project development.

Since the application is examined and all matters relevant for such a development are taken into consideration Department of City Planning and Housing asked from the other competent authorities, Municipal/Communal Boards (local authorities) and Environmental service, to express their views in point of the recycle plant development at the meeting of the Advisory Committee of Waste Management. If the Municipal/Communal Boards (local authorities) agree and support the development of such an industry in its region issues the building license and the development starting to implement.

Finally, when the project is finished and the recycle plant operates properly, Environmental service inspects the plant if everything was done by the law and within the environmental considerations and issues the operation license called 'License for the management of hazardous waste'.

CHAPTER 6 – DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

6.1 Discussion

Cyprus, as a new member of European Union Community, is required to comply with EU directives and regulations. It is well known that EU regulations are very strict concerning matters of environmental and public health. According to European ELV Directive all cars

that come to the end of their life must be recycled because they are considerable source of environment pollution.

The application of these directives and regulations aim at increasing the statistical value of life arising from the betterment of the environment. This will lead to fewer deaths; more productivity, higher Gross Domestic Product (G.D.P.), and finally the whole social welfare will be better off.

All material covered in this master thesis provide a complete and practical guidebook for all those who are interested to develop car recycle industries in Cyprus. This guidebook reveals all the stages which are necessary to the development of a car recycle plant, the associated risks management of each stage, and the applicable regulations and European ELV Directive.

The recommended representative project life cycle which is the guide for the development of car recycle industries provides the basic knowledge and guidelines needed. First phase of this life cycle is 'concept and initiation'. Basic components of this phase are: Prefeasibility and feasibility studies: The purposes of these studies are to examine if the plant could be serving more services than just recycling and check whether the project is feasible, viable and prosperous.

Land requirements: Matters in respect to land capacity conformity with architectural drawings, size, machinery accommodation, region where the land located.

Environmental impact assessment study: This study shall be carried out in order to see the community's willingness to accept the project and potential entrepreneur's willingness to pay for such a service. If both situations are positive, then an evaluation with and without the project (not before and after) regarding the appreciation of the social welfare in line with the environmental protection shall be found.

Second phase 'Design and Development' refers to matters regarding architectural, mechanical, electrical, structural, and plant designs, applicable regulations, legal limitations, and available subsidies, required licenses needed to start the development, the procedure to get a contractor and finally the mechanical equipment supplied which is necessary for the operation of the recycle plant.

Third phase 'Implementation or construction' deals with the construction of the recycle plant and suggest supervising and monitoring (customer to the contractor) the project's development and that everything proceeds in line with the specifications.

Fourth phase 'Commissioning and Handover' is the final one where the project must be inspected if it has been built to the design and in accordance with the applied regulations and specifications in order to be licensed by the Environmental service.

6.2 Conclusions

All the aforementioned findings are significant since all together and in sequential order establish the guidebook that will guide all the interested toward to the development of car recycle industries avoiding waste of time and energy. This guidebook is extremely useful due to the absence of a similar representative in the market of Cyprus.

Many potential entrepreneurs expected to use this guidebook. This will have a great impact in the market of Cyprus from an economic point of view, since the industrial sector has expanded and the recycled products are exported as raw materials to other countries. Environmental and public health will also benefit from such developments as cars at the end of their life are considerable source of pollution. Moreover, this guidebook will contribute to the compliance of Cyprus Republic with the European ELV Directive and regulations since the development of such industries set a step toward to this direction.

6.3 Recommendations

Special attention must be taken to the currently applied national regulations. Regulations do change dramatically since the environmental issues are very important. Check whether it is more feasible to finish the project before or after a forthcoming amendment of a regulation. Also legal limitations must be considered since several legislations restrict the project's operations. These should be taken into account and integrated into the project's deliberation. In many times projects have to be complied and constructed in line with legislations/restrictions.

Another important aspect, financial nature, is the available subsidies. The project shall take into account all the available subsidies provided for such project by the Government. These subsidies will be included into the economic and financial analysis of the project.

6.3.1 Risks management

Also special attention must be shown to risks which are associated with each phase and how could be managed. Most important risks that are related with the project life cycle phases and recommended response actions are:

1. Concept and Initiation Phase

1st Risk: Feasibility studies do not include all the requirements and specifications set by the Environment Service, European Union Directive and Local Authorities.

Response action: Feasibility studies must test all the alternatives and constitute an early form of project planning based on time and materials or best effort.

2nd Risk: Environmental studies do not consider all the requirements and specification in order to be valid.

Response action: Requires more assurance and commitments from the Geotechnical exploration specialist.

3rd Risk: Local Authorities delay the approval of the Plant design and the construction license.

Response action: Plan the deposal of the designs earlier to the Local Authorities.

2. Design and Development Phase

1st Risk: Plant designers have not considered the applied regulations, legal limitation and Environment Service regulations and specifications.

Response action: Requires more assures and commitments and responsibilities from designers.

2nd Risk: Miscommunication and lack of cooperation among the designers, engineers and the contractor.

Response action: Play the role of coordinator among these parties.

3rd Risk: Incomplete documentation of bid package.

Response action: Always be informed about details relevant to the bid package.

3. Implementation or Construction Phase

1st Risk: Accident during the construction.

Response action: Required more assurance and commitments, from the contractor, that any accident during the construction is not going to affect the schedule of the project.

2nd Risk: Adverse Weather Conditions.

Response action: Provide for an extension to the schedule.

3rd Risk: Construction is not performed in accordance with the applicable regulations and specifications.

Response action: Requires more assurance and commitments from the contractor.

4th Risk: Contractor cannot update the construction procedures when a significant change has occurred in the project scope.

Response action: Requires the contractor to have an alternative course of action and be ready to handle critical situations.

5th Risk: Equipment supplier is not responding to the mechanical equipment supply needs.

Response action: Select the appropriate supplier and asks for assures and commitments

6th Risk: Unsuitable equipment or defective equipment or delay of the supply or inappropriate site of equipment.

Response action: Proper equipment selection, more assures and commitments from the supplier are required.

4. Commissioning and Handover Phase

1st Risk: Environment Service delays the final inspection and approval of the Plant.

Response action: Tight communication with Environment Service, tactically Inform about the project progress in order to operate the inspection as soon as the project is completed.

2nd Risk: Bad documentation of the expenses cause bad estimation and smaller amount of subsidize by the government.

Response action: Requires strictly billing instructions from the organization and bigger liability from accountants.

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