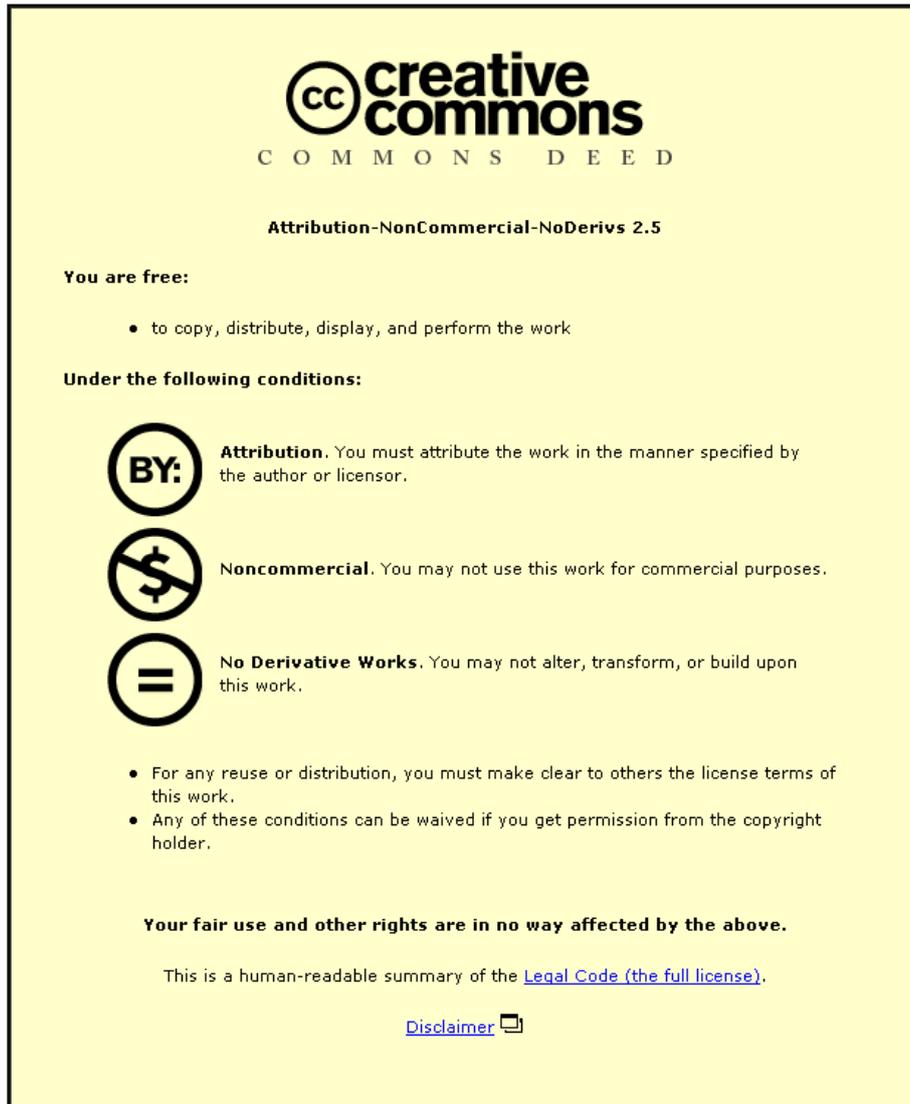


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**CONCEPTUALISING VALUE FOR CONSTRUCTION:
EXPERIENCE FROM SOCIAL HOUSING PROJECTS IN CHILE**

BY

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A DOCTORAL THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS
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"It's not that I'm so smart, it's just that I stay with problems longer."

~Albert Einstein

**Dedicated to my family and parents for all their unconditional
support, love and patience**

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More than three years ago, I decided to start this journey, whose outcome is illustrated through this final document. Now is the moment to thank everyone who supported me during this process. In this way, I would like to thank two institutions critical in this process: firstly my Chilean sponsor, the University of Santiago of Chile, and specially the Department of Civil Works; and secondly, the Department of Civil and Building Engineering of Loughborough University, which sponsored me with my tuition fees.

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Finally, I would like to thank my family, parents and friends for their unconditional support, love and patience. Life is never easy, and thousands of kilometres do not contribute to improve this situation. However, everything is possible with perseverance. Today, I can say that we have achieved this dream together.

ABSTRACT

Through the years, the concept of Value has been widely discussed covering diverse fields of knowledge, such as marketing, business management, strategy, engineering, design, and the like. Within the construction industry field, highly praised management approaches have been used to deliver Value such as Value Engineering, Value Management and Lean Thinking. As a result of the complex nature of this concept, different definitions, equations and models have been proposed to mainly deliver Value from a customer focused perspective. Therefore, the potential of the construction industry has been usually limited by the fulfilment of individual requirements. Thus, environmental and social issues have been generally managed from a bill payer perspective.

During the course of this research, Chilean experience in Social Housing Projects was investigated. Initial author observation, analysis of governmental policies and data collected from three case studies allowed to evidence an emergent phenomenon in developing countries such as Chile and in the construction sector experience in general. This phenomenon considers Value as an “*oscillating*” concept, which means Value delivered by a particular construction project continuously impacts society in a wide sense, and provides a legacy for future generations. In the same way, Value delivered for particular projects affects in turn those judgments concerning future projects and contribute with the permanent improvement of the construction sector’s performance (learning from experience). Consequently, the construction industry contributes to the development of society through the alleviation of environmental & society issues such as drug consumption, social risk, public safety and so forth.

Along the time, the decisions and activities of the construction industry have influenced more than a reduced set of customers. Therefore, there is no reasoning against the fact that the human species depends on many sorts of building and infrastructure projects to perform their activities and that the more developed a society or country is, the more such structures are needed. This is an absolute matter

of fact. Consequently, building projects as the outcome of build environment could be considered as the physical reflection of our current decisions. They represent major investments in the future delivery, where several human, natural, monetary and technological resources are devoted. Those projects provide a legacy to future generations based on what we have valued today, and how much we care about tomorrow and the stability of our ecosystem. Therefore, the concept of Value in the construction management field should be visualised from a wider perspective towards the consideration of universal environmental & social issues. The consideration of this phenomenon is even more important in developing countries, where opportunities still exist to create a well-balanced built environment that supports society.

In an attempt to conceptualise a wider view of Value in the construction industry, different approaches to manage Value were investigated. As a result, Lean Thinking arose as a potential philosophy to expand common customer focused Value perspectives. Additionally, different features and multidimensional attributes of the concept of Value were identified. To aid the visualisation of Value in the construction industry, a conceptual model was developed and named the “First and Last Value Model” – F&LVM. According to this model, the delivery of Value spans across two different contexts: *First context*, which refers to Value delivery to the society (*First Value*: Environmental & Social issues), and *Last context*, which deals with Value delivery at project level (*Last Value*: Production process). This model also considers the interaction between three Value domains: Production & Delivery capacity; Stakeholders’ perspective; and Social perspective. From this interaction, four central perspectives are included towards a wider visualisation of Value: Technological, economic, environmental and political. Moreover, this model considers Value as an objective, subjective, dynamic, context dependent, relative, and “*oscillating*” concept. Finally, the F&LVM was evaluated under the criteria of both researchers and practitioners from Lean Construction, whose potential contributes to a sustainable development. Evaluator’s feedback demonstrated that this model contributes to a wider conceptualisation of Value in the construction industry.

Keywords: Value, Social Housing Projects, Society, Lean Construction.

LIST OF ABBREVIATIONS

AEC	Architecture, Engineering and Construction
ARCOM	Association of Researchers for Construction Management
BS EN	British Standard European Norm
CASEN	Encuesta de Caracterización Socioeconómica – “Survey of socioeconomic profile”
CVM	Customer Value Management
DFC	Departamento de Fondo Concursable – "Department of Contestable Fund"
DOE	Departamento de Obras de Edificación – "Department of Edification Works"
EGIS	Entidades de Gestión Inmobiliaria Social – "Entity for social housing management "
EGLC	European Group for Lean Construction
FAST	Function Analysis System Technique
F&LVM	First and Last Value Model
FPS	Ficha de Protección Social – "Social Protection Record"
FSV	Fondo Solidario de la Vivienda – “Housing Solidary Fund”
IGLC	International group for Lean Construction
INE	Instituto Nacional de Estadísticas – “National Statistical Institute”
ISO	International Standards Organization
ITO	Inspector Técnico de Obras – " Works’ Technical Inspector"
KAISEN	Japanese term that means continuous improvement
LC	Lean Construction

LDM	Lean Design Management
LP	Lean Production
LPDS	Lean Project Delivery System
LT	Lean Thinking
MINVU	Ministerio de Vivienda y Urbanismo – “Chilean Housing and Town Planning Ministry”
NChHP	New Chilean Housing Policy
NGO	Non-governmental organization
OED	Oxford English Dictionary
ONEMI	Oficina Nacional de Emergencia del Ministerio del Interior – "National Emergency Office of Ministry of Interior"
OS	Outside Scope
PL	Perceived Limitation
QFD	Quality Function Deployment
R	Requirement (Building & Infrastructure Projects)
RIBA	Royal Institute of British Architects
SERVIU	Servicio de Vivienda y Urbanismo – "Service of Housing and Urban Matters"
SHP	Social Housing Projects
SIP	Social Insertion Plan
SP	Supply Chain
SMART	Simply Multi Attribute Rating Technique
TFV	Transformation, Flow & Value Generation
UGAT	Unidad de Gestión de Asistencia Técnica – "Management Unit of Technical Assistance"
UTpCH	Un Techo para Chile

VBM Value Based-Management

VALiD Value in Design

VE Value Engineering

VM Value Management

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CHAPTER ONE. INTRODUCTION

1.1 Introduction

Chapter 1 of this thesis describes the background and rationale behind this research. Thus, knowledge gap is underlined and research aim and objectives are stated. Additionally, a summary of the work done and a brief description of each chapter are included. Finally, the thesis' structure is presented as a diagram to facilitate the reader's exploration of this document.

1.2 Research Background

This section aims to provide a framework for understanding how the concept of Value has been mainly considered in the construction sector and how the exploration of Social Housing Projects (SHP) opens the opportunity to visualise Value from a wider perspective, which includes the alleviation of environmental and social issues.

Through the years, the concept of Value has been discussed within different academic fields such as marketing, business management, strategy, engineering, design, and the like. In the construction management field, different approaches define and address Value from individual perspectives causing a general misunderstanding (Koskela, 2000). Similarly, Emmitt et al. (2005) argued that the concept of Value has been used somewhat slackly in the construction management practice and literature.

From the beginning, when Value Engineering arose in the construction sector (1960's), the concept of Value has been mainly explored from its objective nature, which means Value as an intrinsic property of products or services. This idea comes from the Greek philosophy, and it has influenced for many years the understanding of Value of both engineers and economists (Shillito and De Marle, 1992). Even though the objective consideration of Value has been recognised as a misinterpretation of this concept, it still has a big impact on current applications. As a result of the objective view of Value, several measurable product attributes such as cost, time, quality and function have been balanced to meet particular customer requirements.

More recently, it has been underlined that the construction industry fails to consider the relationship between building projects, people and the built environment, which is the more subjective part of Value (Thomson et al. 2003,a; Thomson et al. 2003,b). Thus, isolated efforts have been undertaken to address the subjective part of this concept, as early as the building project stage. These initiatives have been mostly supported by the early interaction of different stakeholders representing individual, grouped and even social Value assessments. A perfect example for this is the UK construction sector, where an emergent “value agenda” has started to influence the outputs of this sector. In this way, the desire to invest in projects that benefit society, as well as cause economic success, has been incorporated in governmental policies to persuade investment strategies of the public organisations. Similarly, this idea has been translated to the private sector causing an ongoing economical and societal debate (Thomson and Austin, 2006).

Although emergent initiatives have proposed society as an intrinsic customer, the construction sector outputs (building & infrastructure projects) have been commonly limited to the achievement of individual requirements, and particular interests have predominated over social issues. Besides, the Supply Chain in general regards customer as “*the one who pays*”, thus environmental and social issues continue to be included provided they are important from the bill payer’s perspective – one would expect this to be particularly strong in the public sector construction. Thus, a general failure in recognising the impact and legacy of the construction sector outputs on society (and vice versa) beyond that required by planning legislation has been identified.

From the exploration of Chilean social housing policies and three case studies emerges an underrated phenomenon in developing countries and in the construction industry in general, which considers the return of Value from the construction industry to the entire society. In January 2007, the Chilean Government announced a New Chilean Housing Policy –NChHP– which was called “*Política Habitacional de Mejoramiento de la Calidad e Integración Social*” (Home Policy for Quality Improvement and Social Integration). This policy not only intends to reduce housing deficit and improve house

attributes, but also to consider peoples' dignity and, as such, the construction industry delivers Value to the Chilean society as a whole. Through the insertion of low income people in the society, Chilean experience poses an opportunity to understand Value as an “*oscillating*” concept. That means Value delivered by a particular construction project continuously impacts society in a wide sense and provides a legacy to future generations. Similarly, Value delivered by particular projects affects in turn judgments for future projects and contributes to the continuous improvement of the construction sector' performance (learning from experience). Therefore, the construction industry contributes with the development of society and the built environment through the alleviation of environmental and society issues such as drug consumption, educational levels, public safety, and the like.

1.3 Knowledge Gap

The decisions and activities of the construction industry influence more than a reduced set of customers with individual needs. Moreover, the human species depends on construction outputs to perform its activities, and the more developed a society or country is, the more such physical structures are needed. Thus, those projects form a built environment that can be considered the physical reflection of our current decisions. They represent major investments for the future, where numerous human, natural, monetary and technological resources are dedicated. Therefore, building & infrastructure projects as physical outputs of the construction sector influence the development of society and provide a legacy to future generations based on what we have valued today, and how much we care about tomorrow. According to King (1984), construction projects arise from social needs and provide a series of economic, social, religious and cultural functions. Thus, the outputs of this sector impact several universal issues (environmental & social) which are not necessarily considered as principal drivers by its immediate participants (eg. customer – end user).

Literature review revealed a common customer focused perspective of Value, which is considered the most divergent trend to previous statements. Accordingly, the concept

of Value has been mainly associated with the relationship between customer requirements (needs, goals, targets, etc.) and the delivery of products with specific attributes (quality, cost, function, etc.). Moreover, by the construction Supply Chain (SC), the notion of customer has been commonly understood as the party paying to meet particular requirements. This customer-focused perspective of Value is also linked to a common objective view of this concept. Thus, numerous product attributes have been considered relative to Value.

Therefore, there is a clear void in knowledge with respect to Value delivery from the construction industry and the impact of this sector over society and its legacy for future generations.

1.4 Research Rationale

The importance of creating a wider view of Value in construction is driven by the need for sustainable development and the particular role of the construction industry within society. As such, complementing the fulfilment of individual needs, the role of the construction industry should be expanded to support all those activities –public or private— that contribute to the development of society. Nowadays, most members of society have either little or no voice, or their role is not appropriately mirrored in the design and construction of new building projects. The same happens with the environment and future generations. Moreover, there is little joint effort to collect, understand, and use the knowledge on development evolution, which would be useful to influence the design and management of construction projects as a physical evidence of this sector, even where planning and regulation already exist.

Based on the research background, knowledge gap and previous statements, the rationale for this research stems from the need to better comprehend an emerging phenomenon, which considers the return of Value and legacy from the construction industry to the whole society. Thus, this research obtains its significance through a wider conceptualisation of Value represented by a prescriptive Value model – the First and Last Value model (F&LVM). This Value model shows the creation of Value from the interaction of three different domains: Production & delivery capacity of the

construction industry, stakeholder perspectives and social perspective. From this interaction, four perspectives of Value are included in the F&LVM. Those are technological, economic, environmental and political.

The visualisation of different Value domains including society encourages the consideration of environmental and social issues. This situation does not overlook the importance of money and other parameters such as quality, time and function used to deliver Value from a customer focused perspective. This idea proposes society is dependent on construction and it should predominate over particular interests if the construction industry potential is to be fulfilled.

1.5 Research Questions

Research questions are considered the starting point of any scientific research and they support the selection of the most suitable research design and methods (qualitative, quantitative, mixed and multi) (Corbin and Straus, 2008). In this way, research questions must be well defined to aid the identification of what should be measured and explored, considering important aspects such as reliability and validity of the research. According to Punch (1998), research questions should be clearly formulated, unambiguous, able to be answered through data collection, interrelated in case of multiple questions and interesting enough to rationalise efforts used when doing research.

According to Maxwell (1996), research questions in a qualitative study should not be fully formulated until total clarification of the design context is obtained, and these questions should be flexible to match the implications of different parts of the research design. Therefore, research questions could be considered dynamic from the very beginning of research processes because they are not stated in an absolute way.

In its broader sense, this research focused in showing a wider conceptualisation of Value in the construction industry, considering the role of society, different features and multidimensional attributes of this concept. Research aim was not completely established without early observation and initial literature review. Consequently,

research questions were not completely established after carrying out previous activities. Finally, two research questions were addressed:

1. How has Value been considered in the management of building projects?;
and
2. Could Value be conceptualised to emphasise the role of construction within society?

In order to answer research questions several rational decisions were made throughout the research process. In this way, the following paragraphs describe the research aim and objectives established.

1.6 Research Aim and Objectives

The aim of this research emerged from the need to underline and better comprehend an emerging phenomenon based on the return of Value from the construction industry to the society as a whole. Thus, this research established that a wider conceptualisation of Value, which considers stakeholder and global needs, and different features and multidimensional attributes of this concept, could enlarge the potential of this sector to address universal issues from early stage of projects. Therefore, the research aims at:

- Linking Value delivery from the construction industry with society and the built environment (building & infrastructure projects), and represent this situation through a conceptual model, which considers different features and multidimensional attributes of Value.

In order to answer research questions and achieve the aim established above, research activities were grouped into the following five objectives:

1. Building a general understanding of the concept of Value;
2. Investigating different perspectives of Value used in the construction industry and identifying their similarities and differences;

3. Identifying the potential of different perspectives to consider the return of Value from construction industry to the entire society;
4. Exploring the concept of Value from Chilean policies and three SHP used as case studies; and
5. Developing and evaluating a conceptual model to visualise Value from a wider perspective.

The following paragraphs describe the main activities performed in this research.

1.7 Summary of Work Done

During the course of this research, different activities were performed to achieve the research aim and objectives. Aimed at building an understanding of the Value concept, literature review firstly explored the evolution of this concept in general. Additionally, features and multidimensional attributes were investigated from the construction sector literature. As a result of the complex nature of Value, this concept has been addressed from different theories and management tools in the construction industry. Therefore, different approaches were investigated to understand how Value has been considered in current literature; these are Value Engineering, Value Management, Lean Thinking, Customer Value Management, Value Based Management and Value in Design (VALiD).

Literature review showed a common tendency to deliver Value from a customer focused perspective, where time, cost and quality are measurable parameters associated frequently to an objective view of Value. Thus, market and utility Value are concepts usually identified as central drivers of the construction sector performance. Accordingly, Value has been mainly considered from the interaction between the production & delivery capacity of the construction industry and stakeholders' perspectives of Value, mainly supported by an economic view. From the exploration of different Value approaches, Lean Thinking arose as a potential philosophy to expand the current visualisation of Value towards a wider consideration of environmental & social issues such as healthcare, social environments, civic pride, crime prevention, sustainability and the like. This philosophy deems Value to the customer as a

fundamental principle in the manufacturing sector and the consideration of Value in this way has been transferred into Lean Construction.

Simultaneously to the investigation of the concept of Value in the construction sector, Chilean experience on SHP was explored through the course of this research. In this way, early author observation and the investigation of the NChHP (principles, stakeholder's responsibilities and their activities along the life cycle of SHP) revealed an emerging phenomenon based on the return of Value from the construction industry to the entire society. In order to achieve a better understanding of this situation, literature review and documentary data analysis were triangulated using three case studies built in the Metropolitan Region of Santiago of Chile. According to the NChHP, stakeholders were identified and contacted to obtain their collaboration. In order to capture stakeholders' experience, two questionnaires were designed. The objective of these questionnaires was to gain an insight on the whole context where Value was considered on those projects. Thus, the first questionnaire was intended to look inside the particular experience (case studies) and general experience of different stakeholders working in SHP in Chile. In addition, the second questionnaire intended to look inside the activities carried out along the life cycle of the projects investigated (case studies).

In order to expand customer-focused Value delivery approaches towards the consideration of society and to highlight the potential of Lean Thinking, a prescriptive Value model was developed. Thus, the F&LVM aimed at visualising the relationship between Value delivery from the construction industry with society and the built environment. To evaluate the Value model proposed, three workshops were conducted, two as pilot evaluations at Loughborough University, and the final evaluation during the 12th meeting of the European Group for Lean Construction – EGLC¹ (Luxembourg – November, 2010). In addition, a fourth individual evaluation was conducted to collect opinions from Glenn Ballard (Lean Thinking researcher and

¹ EGLC The European Group for Lean Construction was founded in 2005 with a view to create a network of academicians, researchers and practitioners working within the area of Lean Construction in Europe. (www.eglc.eu/)

practitioner). From the evaluation process, qualitative data was collected and important trends were underlined and discussed through this thesis.

Finally, basing on the activities performed, the contribution to knowledge, limitation and new topics to be investigated were underlined.

1.8 Thesis Guide

The following paragraphs briefly describe each chapter and provide a thesis' diagram, which is included to show how each chapter relates to different activities carried out to answer research question and finally achieve research aim and objectives (Figure 1.1).

Chapter 1: Introduction.

This chapter provides an overview of the thesis and includes the main topics, such as background information, research aim and objectives, summary of research work done, etc. At the end, a thesis diagram structure is presented to facilitate reader's comprehension.

Chapter 2: The concept of Value and its Perspectives in the Construction Industry

This chapter is concerned mainly with exploring the nature of the concept of Value in a wide sense; consequently, the concepts 'values' and 'value system', as well the evolution of the concept of Value, its features and multidimensional attributes are dealt with. Secondly, this Chapter investigates Value from different perspectives used in construction sector, such as Value Engineering, Value Management, Lean Thinking, Customer Value Management, Value Based Management and VALiD. At the end, discussion and reflection of current perspectives of Value are included to underline common tendencies and the potential of current perspectives towards a wider visualisation of Value.

Chapter 3: The concept of Value from LC Perspective and its relationship with Society

This Chapter focuses on Lean Construction literature and aims at building a global understanding about the management of Value from this approach. Secondly, it explores the role of society in literature and current experience in the alleviation of

environmental and society issues. Lean Thinking regards Value to the customer as a fundamental principle for the manufacturing sector, thus transferring Value into Lean Construction.

Chapter 4: Chilean policy about social housing projects

This Chapter pays particular attention to the New Chilean Housing Policy of social housing projects (2007). Aimed at understanding current Chilean situation, this chapter fundamentally explores this issue. Thus, housing deficit, policy's principles and stakeholders groups are firstly identified. Then, stakeholder's responsibilities and activities performed through the life cycle of projects are also investigated. The New Chilean Housing Policy opens the opportunity to visualise the concept of Value from a wider perspective. This policy do not only promotes the reduction of the housing deficit, but also promotes the insertion of low-income people into society. Therefore, the construction industry contributes to the welfare of the entire population through the alleviation of social issues.

Chapter 5: Research Methodology

This chapter discusses the methodology followed during the research programme to achieve its aim and objectives in a strategic fashion. This chapter firstly explores key concepts such as research, research approaches, research methodology, research methods, etc. Secondly, research methods are established to ensure a proper connection with research objectives. Thirdly, aimed at choosing the most appropriate research methodology, factors used and activities performed are described. Additionally, a research process map is included to show how main activities performed through this research related to each other.

Chapter 6: Case Studies: Social Housing Projects in Chile

This Chapter complements the exploration of the New Chilean Housing Policy on SHP. Aimed at triangulating literature review about the concept of Value and the exploration of the Chilean policy, three social housing projects located in the Metropolitan Region of Santiago of Chile were used as case studies. In this way, questionnaires were designed to understand the role performed by different

stakeholders involved in these projects. Stakeholders' activities evidenced the return of Value from the construction industry to the entire society through the alleviation of social issues in the Chilean population. From this situation, Value was observed to be an "oscillating" concept. The visualisation of this emerging phenomenon provides the opportunity to conceptualise Value from a wider perspective and enhance the potential of the construction industry in the mitigation of global issues.

Chapter 7: Development of the First & Last Value Model

This Chapter describes the development of the First & Last Value Model (F&LVM). This prescriptive model aims at conceptualising a wider perspective of Value in the construction industry. Literature review, observation and data collection from SHP identified key elements to be incorporated within a global visualisation of Value. In the F&LVM, the delivery of Value spans across two different contexts: *First context* refers to Value delivery to the society (Environmental & Social issues), and *Last context* deals with Value delivery at project level (Production process). In addition, the interaction among three Value domains, features and multidimensional attributes of this concept are also included. Finally, SHP in Chile are discussed according to the F&LVM.

Chapter 8: Evaluation of the First & Last Value Model

This chapter consists of the evaluation process of the F&LVM. This activity aims at appraising the usability of this model to conceptualise a wider perspective of Value, and illustrated the main features and multidimensional attributes of this concept. This chapter also describes the method adopted for the evaluation process, data collected from evaluation feedback, final comments and discussion. To evaluate the F&LVM, interactive workshops were conducted, two as a pilot evaluation at Loughborough University and the final evaluation on occasion of the 12th meeting of the EGLC (Luxembourg -November, 2010). In addition, an individual evaluation was conducted to collect opinions from Glenn Ballard.

Chapter 9: Conclusions and Recommendations

This is the last chapter of this document and, accordingly, research objectives were explored to address research questions. Besides, contribution to knowledge in the

construction industry and academia is underlined. The expansion of the concept of Value proposed is an innovative alternative to be used in the construction industry. Finally, research publications, limitations and new research topics are included.

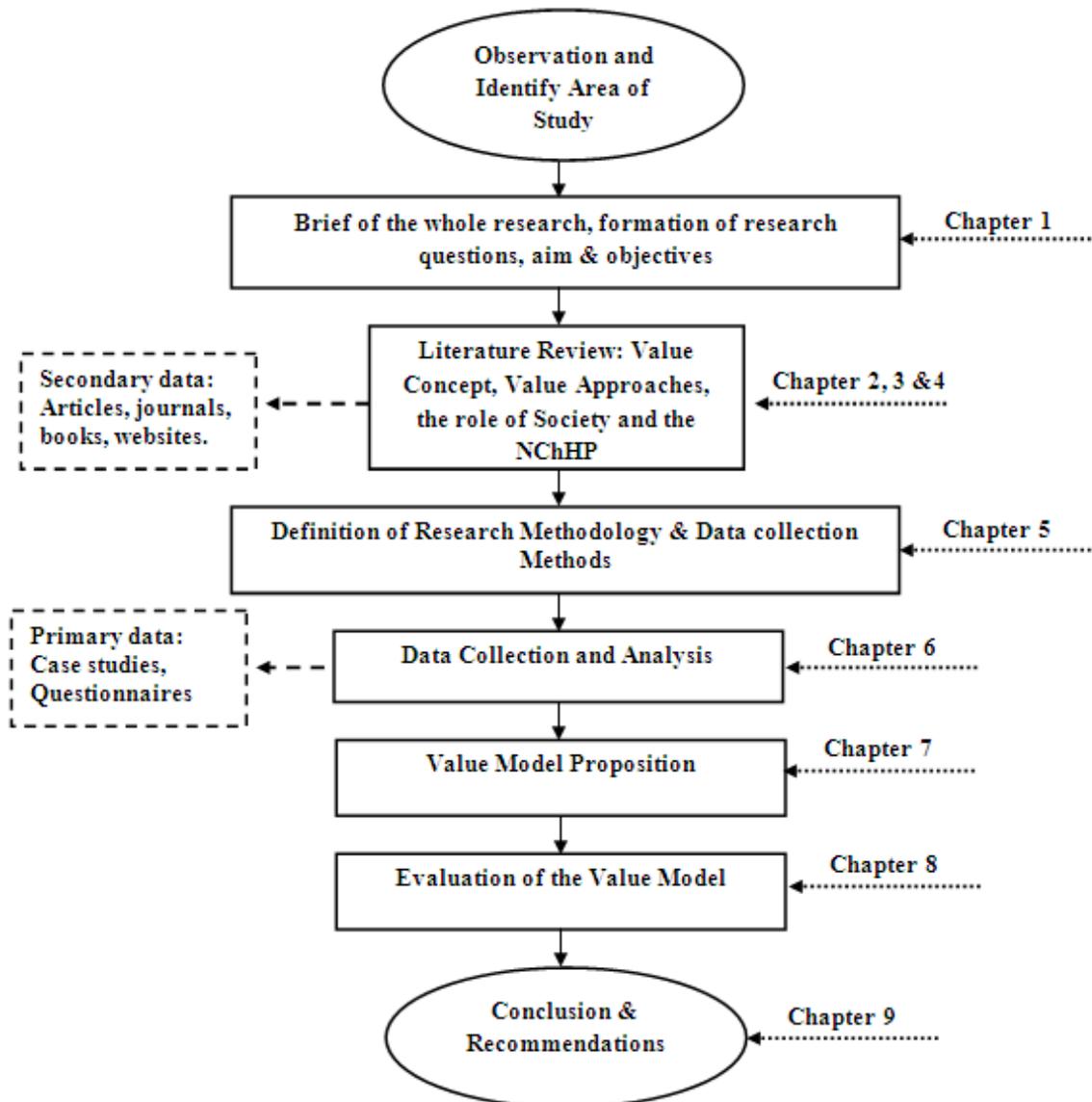


Figure 1.1. Thesis' diagram structure

CHAPTER TWO. THE CONCEPT OF VALUE AND ITS PERSPECTIVES IN THE CONSTRUCTION INDUSTRY

2.1 Introduction

Chapter 2 is dedicated to exploring the concept of Value in a wide sense. Thus, a general review of literature firstly explores the evolution of this concept. Secondly, the objective and subjective nature of Value are described and complemented with its other features and multidimensional attributes. Thirdly, Value is investigated from different approaches used in the construction sector: Value Engineering, Value Management, Lean Thinking, Customer Value Management, Value Based Management and Value in Design (VALiD). At the end, discussion and reflection of current perspectives of Value are included to underline differences and common tendencies. Literature did not reveal any overarching understanding of this concept for the construction industry in general. However, Lean Thinking arises as a potential theory to move towards a wider visualisation of Value in the construction industry.

2.2 The Evolution of the Concept of Value

Along the time, Value has been generally regarded as one of the most used and misrepresented concept of social science and particularly in management literature (Khalifa, 2004:646). Consequently, this concept has been broadly investigated by several fields of knowledge such as marketing, economics, philosophy, and the like. Other authors have also underlined this situation:

- *“Value generation has, from various viewpoints, been scientifically treated in the domains of quality, marketing, business management, strategy, design and microeconomics, at least. However, these pursuits have largely progressed in isolation from each other.”* (Koskela, 2000:84)

- *“Value creation has been a popular area in consumer and industrial marketing research and the interest is equally extensive in academia and industry.”*
(Heinonen, 2004:205)

As a result of the numerous and somewhat divergent fields of knowledge, and the isolation way that literature has dealt with this concept, Value could be considered a complex concept to be investigated. Therefore, several definitions vary according to different theoretical and individual approaches. With the purpose of facilitating the comprehension of the concept of Value, it is necessary to go back to the origin and evolution of this concept.

Arising in early Greek philosophy, (600 to 200 B.C.), Value has been understood as a property of goods or services. Although this understanding has been considered as a narrow point of view, the idea continues to be part of modern thinking. Thus, it has been argued that *“Engineers and economists alike see value in terms of the features that a product or service has”* (Shillito and De Marle, 1992:3). However, it is widely acknowledged that properties and features of products or services vary according to personal judgements, dissimilar contexts, specific circumstances, and so on.

Just as the Greek philosophy has contributed to the concept of Value, in the field of modern economics, Smith (1776) in the book *“The Wealth of Nations”* divided Value into *“value in use”* and *“value in exchange”*, which are concepts closely related to *“utility value”* and *“market value”*. In this way, Smith’s classification has been broadly discussed along with the concept of *“esteem value”*, which has been more recently introduced to complement Smith’s contribution. According to Kelly et al. (2004), the definition of these concepts arose from the relationship between (1) Value, function, cost, and worth or (2) Value, function, cost, and quality.

Following Smith’s classification of Value, Ricardo introduced those concepts into the economic theory of utility when he argued that *“The value of a commodity, or the quantity of any other commodity for which it will exchange, depends on the relative quantity of labour which is necessary for its production, and not on the greater or less compensation which is paid for that labour.”* (Ricardo, 1817:4).

Later, Marx (1886) argued that Value could be created only when labour is applied through the production process *"Theory of labour"*. This author also included the concepts of "value in use" and "value in exchange", and from this perspective the relationship between money and value became more evident. Thus, it is argued that *"The first chief function of money is to supply commodities with the material for the expression of their values, or to represent their values as magnitudes of the same denomination, qualitatively equal, and quantitatively comparable. It thus serves as a universal measure of value. And only by virtue of this function does gold, the equivalent commodity par excellence, become money."* (pg. 94). Therefore, the economic perspective of the concept of Value has commonly predominated, where the ratio cost/benefit has been broadly applied. However, despite the concept of Value has been mainly measured in monetary terms, it has been broadly admitted that Value is not necessarily achieved at the lowest cost (Ruskin, 1898).

Value has also been investigated from other diverse economic contexts; thus, according to the "Exchange theory" of Bagozzi (1975), marketing concept should be framed as exchanges, these are *"(1) restricted: two-party reciprocal relationship; (2) generalised: univocal and reciprocal relationship among at least three actors in exchange; and (3) complex: system of mutual relationships between at least three parties."* (pg. 32-3). Accordingly, the Value for which any exchange takes place includes direct, indirect or both kinds of Value, where the latter is frequently delivered through an indirect exchange.

In the 2000s, Bowman and Veronique developed the "Transaction theory". They argued that *"although value is created by labour in action, value capture is determined by power relationship between economic actors."* (pg. 5). Thus, modern management theories included the concept of "shareholder value" intending to increase common wealth through the use of responsible practices generating Value for every shareholder. Hence, "shareholder value" aims at *"maximizing the returns generated to those people who have an ownership stake in the business."* (Scott, 1989:5).

Business and marketing strategies have had the management of customer expectations as a core activity in the delivery of Value. In this way, it has been argued

that *“in the past, customers judged the value of a product or service on the basis of some combination of quality and price. Today’s customer, by contrast, has an expanded concept of value that included convenience of purchase, after-sale service, dependability, and so on.”* (Treacy and Wiersema, 1993:84). Thus, the world of business and commerce has been recognised as a dynamic place, where customers play *“an active role in creating and competing for value.”* (Prahalad and Ramaswamy, 2000:80).

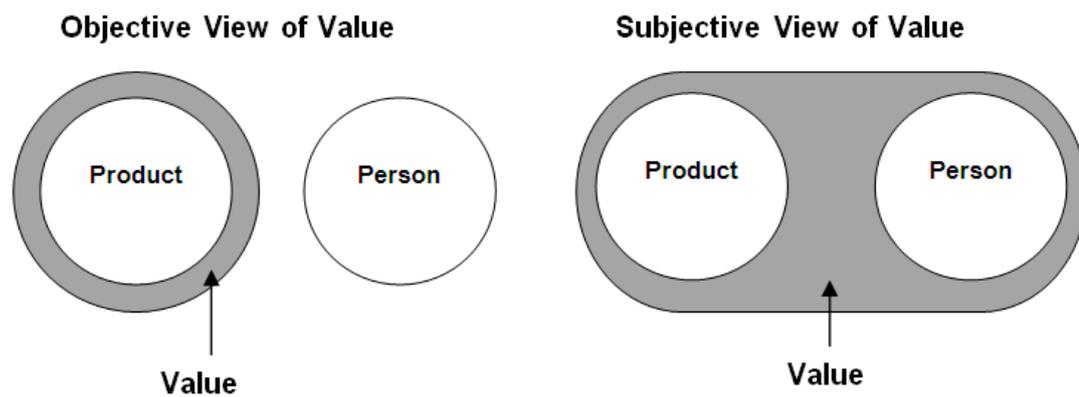
From a philosophical view, the concept of Value has been linked to different states of mind; consequently, human *“values”* evidence individual judgements from the interaction between the product and the person. Thus, human *“values”* have been understood as a base of a decision making process. According to Anderson (1993), *“to value something is to have a complex of positive attitudes toward it, governed by distinct standards for perception, emotion, deliberation, desire, and conduct.”* (pg.2). As a result, marketing strategies have introduced *“customer value”* as a management tool to attract and maintain customer attention (Woodruff and Gardial, 1996; Woodruff, 1997; Kotler, 2002). Moreover, the management of Value has included more subjective views; thus, Value has been addressed in terms of customer perception of benefits and sacrifices (Saliba and Fischer, 2000).

In the construction sector, the concept of Value has also been addressed from different approaches. To help future comprehension, the objective and subjective dimensions of Value are firstly differentiated through the following sections.

2.3 The Objective and Subjective Dimensions of Value

In order to better comprehend the concept of Value and its approaches in the construction sector, it is necessary to explore the objective and subjective dimensions of this concept. Firstly, the term Value from the term *“values”* should be clearly differentiated; such concepts have been commonly misunderstood, as if one were the plural form of the other. Therefore, the exploration of both concepts is a key activity to achieve a better understanding of current literature and practices in the construction industry.

As a distinction, the concept of Value could be both objective and subjective. Thus, when Value is related to the assessment of products (e.g. building and infrastructure projects), it can be subjective if *“remain internalized within an individual or an organisation or objective if they are expressed.”* (Thomson et al. 2003,a:337). Accordingly, Thomson and Austin (2006) illustrated the objective and subjective views of Value (Figure 2.1):



**Figure 2.1. Objective and Subjective views of Value
(Thomson and Austin, 2006)**

On the other hand, *“values”* as a heart of cultures and individuals (Hebel, 1998) are intrinsically subjective. They make evident human guidelines (ethical and ideological) which represent the *“value system”* of an individual, organization or even society. In order to provide a better understanding of *“values”*, they have been described as:

- *“Values are what we care about. As such, values should be the driving force for our decision making. They should be the basis for the time and effort we spend thinking about decisions.”* (Keeney, 1992:3)
- *“Values form the shared conceptions of what is most desirable in social life; in effect, values are the “glue” that binds people together into organizations.”* (Buchko, 2007:37)
- *“Values are conceptions of the desirable within every individual and society.”* (Bernard et al. 2006:79)

It is essential to mention that *“values”* have been commonly grouped into *“value systems”* (also called *“set of values”*). In the case of individuals, they hold a unique *“set*

of values”, which is evidenced when these *“are organized according the degree to which each acts as a guiding principle in his or her life.”* (Glew, 2009:675). The same situation is also noticed in groups and organizations, even communities and cultures. According to Amis and Hinings (2002), the way in which organisations are structured is a function of the *“values”* embodied within them.

Considering the global picture, *“value systems”* that arise from groups or organizations contribute with the formation of cultures and even create identity (Hebel, 1998). Therefore, *“value systems”* become evident personal, ethical and ideological judgments, for an individual, organization or even society. Thus, the subjective part of Value is linked to the *“value system”* of individuals, groups, organizations, etc.

In the construction industry, and closely related to design activities, the objectivity and subjectivity of Value has been previously explored by Thomson et al. (2003,a), Thomson et al. (2003,b), and Thomson et al. (2006). With the purpose of complementing previous ideas and facilitating comprehension through this document, the following paragraphs underline both features of this concept.

- **The objective dimension of Value**

The objective dimension of Value has been broadly investigated from diverse fields of knowledge. As it was previously underlined, this feature comes from Greek philosophy, where Value was regarded as a property of goods or services, a perspective which is still strongly associated to the concept of Value in the construction industry; thus it is argued that *“engineers and economists alike see value in terms of the features that a product or service has.”* (Shillito and De Marle, 1992:3). Therefore, problems are deemed as basically technical from their nature, and their existence is separated from human perception (Green, 1997).

From its objective view, Value has been broadly linked to measurable product attributes, where quality, function and money have played an important role in the management of Value in the construction industry. Hence, Value is understood as what *“an individual places on an object or outcome (e.g., the value one places on pay).”* (Meglino and Ravlin, 1998:353). Accordingly, Burt (1978) argued that

“Maximum value is....obtained from a required level of quality at least cost, the highest level of quality for a given cost, or from an optimum compromise between the two.”

(see Thomson et al. 2003,a:339). Additionally, Dell’Isola (1997) introduced in the construction sector the definition of Value as:

$$Value = \frac{Function + Quality}{Cost}$$

- **The subjective dimension of Value**

The subjective dimension of Value is one of the most complex features to be investigated, to which everyone is able to contribute with an individual view of this concept. Thus, different “value systems” are interrelated. According to Christoffersen (2003) *“The perception of value is individual and personal, and is therefore subjective. Indeed, agreement of an objective best value for a group will differ from the individuals’ perception of value.”* (see Emmitt et al. 2004:363). Thereby, the subjective dimension of Value reflects the desire to obtain or maintain an specific item or how much the owner(s)/customer(s) is/are willing to pay for subjective Value assessments such as prestige, appearance, aesthetic, judicial, religious or moral reasons, or any combination of these views (Neap and Celik, 1999).

With the purpose of representing the most subjective part of Value, different definitions and equations were identified in the literature:

- Based on Miles (1961), ‘esteem value’ is defined as *“ the price which is offered by the customer in excess of the use value for the properties or features of the product which make him want to own it...Often, it is the cumulative effect of styling, surface finish and get up, and sometimes the attractiveness of the packing.”* (Lal, 1990:181)
- Follower (1990) defines Value as:

$$Value = \frac{user's\ initial\ impresion + satisfaction\ in\ use}{first\ cost + follow\ on\ costs}$$

- Thomson et al. (2003,a) defines Value as:

$$Value = \frac{\textit{benefits (what you get)}}{\textit{sacrifices (what you put into)}}$$

In order to achieve a better comprehension of Value, different features and multidimensional attributes of Value were identified from literature. These are described though the following sections.

2.4 Features and Multidimensional Attributes of Value

In the constructbion sector, Wandahl (2005) underlines different features of Value, which also characterise human “*values*”. To build a wider understanding of the concept of Value, the following paragraphs complement the earlier overview.

2.4.1 Value as a Relative Concept

Value as a relative concept means that it is comparative to other product features. Consequently, based on the quotation of Fink’s speech (2002), Wandhal and Beijder (2003:4) underlined that:

- *“Goods do not have value each on their own. Goods only have value in comparison with other goods, e.g. there could not be good houses if there weren’t bad houses.”*; and
- *“To create value is not to create products, but products with certain characteristics and qualities.”*

Accordingly, in the field of Customer Value Management, Gale (1994) argued that Value is defined as *“quality (including all non-price attributes) relative to price and stated that quality, price and value were relative.”* Additionally, Daniels (2000) defined Value *“as the relationship of market-perceived price to market-perceived quality”* (see Thomson et al. 2003,a:338). Therefore, Value is intrinsically qualified according to other parameters, thus, it is not possible to evaluate ‘*good*’ quality, service, price, etc. if the concept ‘*bad*’ is not previously or simultaneously assimilated.

2.4.2 Value as a Context Dependent Concept

The concept of Value depends on the situation where judgements of products are expressed. Additionally, Thomson et al. (2003.a) argued that value assessments arise in diverse contexts, which are limited by their particular features. This idea is also underlined by Thyssen et al. (2008); they argued that an objective valuation of an item frequently depends on the context, e.g., what the environment can provide, group approval, and the like.

Wandahl (2005) exemplifies this situation using an ordinary stone, so, the Value associated to this stone varies according to the context in which it will be used. This author argued: *"If you need a stone for a road barrier, a big stone would have great value. On the other hand, if you need a stone to play ducks and drakes with, perhaps a small flat stone would be of value."* (pg. 65). Thus, Value varies according to different contexts, which are continuously changing throughout time. Consequently, one of the multidimensional attributes of this concept is identified.

2.4.3 Value as a Dynamic Concept

Closely related to the context dependency feature of this concept, the perception of Value also varies throughout time. Therefore, the impact of this dimension (time) in the management of Value should be considered along the life cycle of projects (e.g. briefing, design, onsite activities, occupancy, etc.).

The importance of consider this second multidimensional attribute of Value has also been documented by other authors, whose ideas are underlined below:

- *"Depending on the owner(s)/buyer(s)' value system, the subjective part of the value of a product can change, and accordingly, the value of the product will change."* (Neap and Celik 1999:184)
- *"...value is a matter of personal opinion, which can and does change over time."* (Bertelsen and Emmitt, 2005:74)
- *"Value is dynamic, it changes over time. Partly in relation to the building and its use and partly in relation to the building process."* (Wandahl, 2005:65)

Finally, to complement the preceding features and multidimensional attributes of Value, the measuring difficulties have also been underlined. In addition, the subjective dimensions of this concept increases the complexity involved in making a Value statement something explicit and easily quantifiable (Wandahl, 2005).

In order to better comprehend the management of Value, the following paragraphs will address the issue of how Value has been classified by different authors in the construction industry.

2.5 Classification of the Concept of Value

Over the years, the construction industry has regarded Value as a complex concept to be investigated. It is argued that:

- *“...‘value’ is one of those words with myriad connotations and often contradictory definitions within different department of industry.” (Oughton, 1969:3)*
- *“Construction industry members and clients find the discussion of “value” difficult as a common understanding of what it is and how it relates to design, construction and use of buildings...” (Thomson and Austin, 2003,b:3)*
- *“The concept of value is probably the most difficult to approach in the new way of managing construction projects.” (Bertelsen and Koskela, 2004:6)*
- *There is a “lack of a common language of value and the absence of methods of helping stakeholders express what they each consider value to be on a particular project” (Thomson and Austin, 2006:3)*

As an attempt to comprehend the concept of Value, Wandahl (2004:9) classified Value as illustrated in Figure 2.2. Accordingly, Value is differentiated between “*Product value*” linked to the “*management of value*” and “*Process values*” linked to the ‘*management by value*’. These concepts are defined as follows:

- *“Product value”*: It describes the technical and aesthetic project futures, price and use of the building, e.g., materials, colours, usability, flexibility, and the like. Consequently, “*Product value*” is closely linked to “*Utility Value*” and “*Market Value*”. Thus, “*Utility Value*” is related to the technical, aesthetic and use of the

building. Besides, “Market Value” represents the Value of utility, quality in money. Accordingly, this sort of Value is the central objective of the building projects; thus, it arise from an individual or grouped unfulfilled need, goal or expectation; and

- “Process values”: It describes components in the building process and cooperation among different parties, e.g., agreement discipline, communication, and the like. Therefore, “Process values” are connected with human behaviour and they evidence ethical/personal guidelines. Therefore, they are subjective.

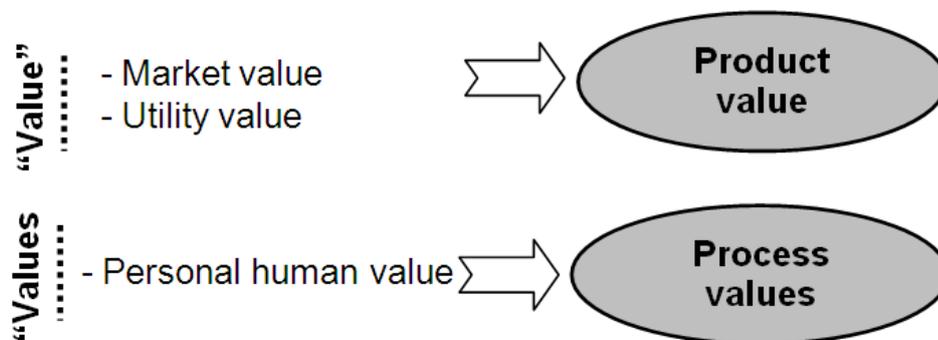


Figure 2.2. Product and Process value (Wandahl, 2004)

Additionally, “Utility value” (technical, aesthetic and use of the building) and “Market Value” (the value of utility, quality in money) have been complemented by a third type of Value called “Esteem value”, which is linked to the attractiveness and desirability of the building, which is the most subjective part of Value (Leinonen and Houvila, 2000).

On the other hand, Emmitt et al. (2005) propose another classification of Value:

- ‘External value’, which is the client/customer Value, the Value that the project should end up with and the delivery team focus on achieving; and
- ‘Internal Value’, by and between the participants of the delivery team.

“External value” is divided into “**Product value**” and “**Process value**” (the same names used by Wandahl (2004) – Using **bold** to differentiate). Both concepts are differentiated as follows:

- **“Product Value”** is linked to physical final product (building & infrastructure projects). Therefore, this sort of Value is linked to Vitruvian values (firmness, commodity and delight), combined with harmony with the surrounding, environmental issues and buildability. According to Gann et al. (2003) Function, Build Quality and Impact could be considered the modern interpretation of the Vitruvian values.
- **“Process value”** deals with the provision of the best customer experience (design and construction). Hence, this kind of Value comprises:
 - *‘Soft values’ such as work ethics, communication, conflict solving etc. between the client and the delivery team;*
 - *‘Hard values’ such as the delivery teams ability to keep agreed time limits, cost estimates, quality of the product and workers safety etc.; and*
 - *Values that come from the actual design and construction process. As an example of this kind of value, renovation works in a kindergarten could be used to teach children about safety, creativity etc. and thus generates process value that might not have been evident when the project started out. Learning from participating in the process is another value in this category.*

In order to better comprehend the management of Value in the construction industry, the following paragraphs explore different approaches identified in the literature.

2.6 Different Approaches to Manage Value in the Construction Industry

Management of Value in the construction industry is not a recent practice. Since the early 1960’s, the construction industry has distinguished the importance of this concept in order to achieve successful results through the fulfilment of customer requirements. It has been argued that *“the goal of any building project is to deliver value to the client organisation, and in order to do so the building project and its processes must be of value to all project participants.”* (Wandahl, 2005:21). Despite its significance, Value continues to be a complex concept for current construction

projects. Therefore, to better understand the management of Value, the following sections explore this concept from three different approaches, which are broadly regarded in the construction management literature; these are Value Engineering, Value Management, and Lean Thinking. Additionally, three different approaches are investigated to build a broader view of Value. These approaches are Value Based Management, Customer Value management, and Value in Design.

2.6.1 Value Engineering Approach

In the late 1940s, Value Engineering (VE) (called Value Analysis from the beginning) arose in US manufacturing sector, introduced by Lawrence D. Miles in General Electric Company. This approach aimed at creating products with fewer materials during the Second World War (Kelly et al. 2004; Younker, 2003). Accordingly, it was argued that the fundamental philosophy of VE is *“to eliminate the cost which did not contribute to the performance of the required function.”* (Green, 1991:1).

In 1963, Dell’Isola introduced VE practices in construction contracts with Navy Facilities Engineering Command. As a result, in 1972 VE techniques started to be included into public and private organizations firstly in the United States of America and later in some other countries such as Japan, India and South Africa. Thus, VE was defined as a:

- *“Disciplined procedure directed towards the achievement of necessary functions for minimum cost without detriment to quality, reliability, performance and delivery.”* (Crum, 1971:6)
- *“Creative, organized approach, whose objective is to optimize cost and/or performance of a facility or system. Through a system of investigation, unnecessary expenditures are avoided, resulting in improved value and economy.”* (Dell’isola, 1982:1)
- *“Proven management technique using a systematized approach to seek out the best functional balance between cost, reliability, and performance of a product or project.”* (Zimmerman and Hart, 1982:1)

Generally, VE intends to finding alternative products which provide the same function at the minimum cost. Thus, it has been argued *“Value, for definition purposes, is the fair equivalent in services or commodities that an owner/buyer receives in exchange for money.”* (Dell’isola, 1982:2). Consequently, VE has been mainly considered as a cost saving tool with an objective vision of Value. It is important to underline, that VE is applied in project stages such as later design and early construction processes. Consequently, this Value approach fails in the management of customer requirements from initial stages of projects, where more subjective aspects of Value can be addressees.

VE has commonly used Function Analysis as a management tool to define client requirements and the associated cost. Accordingly, Zimmerman and Hart (1982) argued that Function Analysis aids *“to identify what we really want to do and how much we really should have to pay for doing it.”* (pg. 39). Similarly, when VE practices are investigated, it is possible to identify that the concept of Value has mainly been associated with the same mathematical equation used in the Function Analysis. Thus, Value is defined as:

$$Value = \frac{Function}{Cost}$$

Once primary functions of products have been identified, secondary functions are explored using the Function Analysis System Technique (FAST). This technique expands the function analysis structure through a diagram, where “how” and “why” questions are incorporated; thus, design description is translated into verbs and nouns (Fang and Rogerson, 1992). In addition, this diagram is used to achieve agreed products functions between projects participants and the client.

On the other hand, the Job Plan is another standard methodology used in VE approach. This methodology aims at defining necessary tasks and achieving the most economical combination of function to complete this specific task. According to Green (1991:11), the Job Plan includes six basic phases:

1. **Information stage:** *Collection of relevant information, achievement of a common perception of value and the definition of scope of study;*
2. **Functional analysis stage:** *Analysis of function based on the existing design proposal. It is important to identify both primary and secondary functions. Many practitioners take this process by constructing a functional analysis diagram;*
3. **Speculation stage:** *Use of brainstorming techniques to identify alternative ways in which the identified functions can be achieved;*
4. **Evaluation stage:** *Testing the alternatives against agreed criteria and selecting those which offer the most promise;*
5. **Development stage:** *Detailed analysis and development of the chosen solutions; and*
6. **Presentation stage:** *The recommended solution is decided upon and the client is given a full presentation together with a written report.*

According to Green (1990), the use of the methodology offered by the Job Plan ensures that enough attention is paid to creative thinking. Thus, client benefits could be increased. It is important to underline, that VE assumes that the function of project's components has an objective characteristic. Therefore, this function remains constant along the time. Therefore, there are two intrinsic VE's features: (1) client requirements could be identified and well structured, and (2) clients are able to communicate their needs in a proper way. This situation ignores the complexity of client participants of building projects, where the understanding of their needs is regarded as a difficult task of current organisations (Wandahl, 2005).

2.6.2 Value Management Approach

In the second part of the eighties in Europe, it was widely accepted that VE practices work only when they are applied to solve design practices that are well structured and simply defined. As a result, in the early 1990's VE practices were adapted and the term Value Management (VM) arose in the construction industry (Neap and Celik, 1999:2).

Thus, this approach became a new alternative to address confusing objectives and dissimilar Value judgments from the client organization, situation which is even worse with the participation of several organizations with dissimilar individual interests (multifaceted projects) (Green, 1994). VM approach considers the interaction of diverse client “value systems”, and consequently it is based on social sciences.

Through literature review, different VM definitions have been identified. Thus, VM approach is defined as follows:

- *“...management of a process to obtain maximum value on a scale determined by the client.”* (Kelly and Male, 1993:3)
- *“a structured approach to defining what value means to a client in meeting a perceived need by establishing a clear consensus about the project objectives and how they can be achieved.”* (Connaughton and Green, 1996:7)

Therefore, VM practices are basically oriented to achieving satisfactory conceptual designs, which deliver value for money according to different stakeholder perspectives from the very early stages of projects (pre-brief, briefing and concept design) (Kelly et al. 2004). Consequently, VM enhances stakeholder benefits through the identification of needs and interests from diverse project participants. Thus, VM aids to understand the projects and the communication processes, increasing the quality of projects definition, innovation and reducing unnecessary costs (Connaughton and Green, 1996; Best and De Valance, 1999). From the described situation arises the main difference between VM and VE perspective. VM allows the interaction of projects stakeholders to produce a common and clear assessment of project’s objectives, whereas VE omitted the recognition and representation of client organization’s requirements. Consequently, VM is *“concerned with the ‘what’, rather than the ‘how’.”* (Green, 1996:3).

Accordingly to the British Standard in Value Management (BS EN 12973:2000), Value from this approach is defined as:

- *“...the equivalence of an item expressed in objective or subjective units of currency, effort, or exchange. Equally Value can be measured on a comparative*

scale that reflects the desire to obtain or retain an item/object.” (Kelly et al. 2004:152).

Accordingly, Value can be broken down into objective and subjective components, a situation which makes it different from the VE perspective, which deemed Value as an objective concept. In this case, objective components of Value include cost and price, while subjective components incorporate individual and group-made choices based mainly on cost and price parameters. According to Kelly (2007), Value is achieved when client satisfaction is higher than the resources invested in meeting this need. Thereby, the concept of Value relies on the relationship between the fulfillment of many differing needs and the resources used in doing so (The Institute of Value Management UK - www.ivm.org.uk).

Commonly, VM has been associated with the early stage of projects (briefings stage); however, as previously mentioned by Wandalh (2005), it has also been admitted that this management tool can be used in other stages of the building process. From this, VM started to be a combination of VM practices in the early stage of projects and VE in later stages. Despite this, today VM continues to be mainly associated with the early stage of projects.

In order to maximize the functional Value of a product, VM complements Function Analysis with other tools such as Simply Multi Attribute Rating Technique (SMART), which is explored below.

- **Simply Multi Attribute Rating Technique Value Management (SMART VM):**

In the 1990's, when VM was broadly discussed in the UK construction sector, Stuart Green and a group of researchers and practitioners introduced SMART as their own theory of VM. SMART VM approach combines the benefits of traditional VE with soft system thinking as required by VM (Green, 1992). Hence, the concept of a requisite decision model by Phillips (1994) played an important role. According to Green (1994), requisite models arise from a process of group agreement for establishing a common understanding of objectives and identify possible solutions. Thus, it is argued that the

theoretical framework of SMART VM is provided by the concept of group decision support, which is defined as “...any designed process that supports a group of people seeking individually to make sense of, and collectively act in a situation in which they have power.” (Green, 1992:17). SMART VM is applied using a series of two workshops during the concept and outline proposal stages of a construction project (based on RIBA² Outline Plan of Work stages A and C - 2007).

The first workshop (known as VM1) is conducted when a particular project is proposed as a solution of one particular need. This workshop has the objective of corroborating the need for the project and encouraging the agreement among design objectives (Green and Moss 1998). According to Green (1992), the first workshop includes five stages: (1) Information, (2) Structuring of objectives, (3) Speculation, (4) Evaluation, and (5) Development.

The second workshop (known as VM2) is conducted when clients made a decision based on a series of outline design solutions developed by the design team. This workshop aims at ensuring that client decision is made in a rational manner and the chosen solution fulfils all the defined objectives (Green and Moss, 1998). According to Green (1992), the VM2 includes seven stages: (1) Information, (2) Structuring of objectives, (3) Assignment of importance weights, (4) Evaluation, (5) Sensitivity analysis, (6) Cost/Value reconciliation and (7) Marginal value improvement.

Additionally, Green (1992) underlined the difference between VE and SMART VM approaches. This author argued that SMART VM was designed to deal with confused, dynamic and imprecise defined problems. Therefore, SMART VM’s approach is about establishing a common understanding about what the problem is. On the contrary, VE’s approach is more concerned with solving specific problems. SMART VM provides a framework where professional teams think and properly communicate their ideas. Thus, it ensures that the decision making processes are explicit and more rational. Therefore, in the long term the use of this approach could help to learn from the experience.

² RIBA: The Royal Institute of British Architects (www.architecture.com)

2.6.3 Lean Thinking Approach in the Construction industry

With the objective of elucidating the understanding of Lean Thinking (LT) in the construction sector, Koskela (2004) clarified the problem with the terms Lean Production (LP) and Lean Construction (LC) because few people associate those terms with practices arising from the Toyota production ideas (*"The machine that changed the world"* by Womack et al. 1990). It is important to mention that LT philosophy, as a Lean Production, emerged in Toyota in the 1950s as a consequence of the business challenges in Japan after the Second World War (Drew, McCallum and Roggenhofer, 2004:5).

As a result of the confusing situation described above, many practitioners regard LP and LC as the application of LT based on the book *"Lean Thinking"* by Womack and Jones (1996), where five basic principles were established: Specify value, identify the value stream, make value steps flow, customer pulls product, and pursue perfection. Thus, the concept of Value in the book *"Lean Thinking"* was defined as *"a capability provided to a customer at the right time and at an appropriate price, as defined in each case by the customer."* (Womack and Jones, 1996: 311). Thus, it has been identified that LT practices *"must start with a conscious attempt to precisely define value in terms of specific products with specific capabilities offered at specific price through a dialogue with specific customers"* (Womack and Jones, 2003:19). Consequently, from manufacturing sector experience Value has been mainly associated to materials, parts or products, etc.

As noted previously, literature review reveals the definition of Value as the first principle of LT in manufacturing sector; thus, it has been argued that LT *"starts with the customer and the definition of value."* (Melton, 2005:664). In this way, Koskela analyses the five principles of LT, and argues that *"value is here used to mean materials, part of product."* (Koskela, 2004:29) (Table 2.1). Additionally, this author established deficiencies in these principles related to conceptualization and maximization of Value. In this way, it is argued that:

- *"Unfortunately, the frequent use of "value" among the principles, also conceals the fact that very little is said on how to maximise value. Simply, the Authors*

are using imprecise and unsystematic terms, due to lack of explicit conceptualization”; “How can we specify value, if it is something happening between the customer and the product? We cannot.” (Koskela, 2004:29-30).

Table 2.1. Inferred meaning of Value from five Lean principles (Koskela, 2000)

Lean Principles	Inferred meaning of value
1. Precisely specify value by specific product.	1. Specify value = specify product
2. Identify value stream for each product.	2. Value stream = material (or information) flow
3. Make value flow without interruptions.	3. Value = parts, material
4. Let the customer pull value from the producer.	4. Value = product
5. Pursue perfection	

As LC has been influenced by LP experience, there is a common tendency to view construction as a transformation process, where Value delivery is associated with the fulfilment of customer requirements. In this way, Koskela (2000) distinguished three theoretical models to understand production: Transformation, Flow and Value generation (TFV). As a consequence, TFV arose as a theory of production, and a “*value generation model*” which included five principles: Requirement capture, requirement flow-down, comprehensiveness of requirements, capability of production subsystems, and measuring of Value. Accordingly, Shewhart (1931) played an important role in this initial value generation model, but his work lacked value generation arising from the internal mechanisms of suppliers. Koskela (2000) added a third subsystem (order-delivery) to the two previous subsystems proposed by Shewhart’s value model (product design and production).

Thus, the “*value generation model*” identifies two trajectories currently used by the construction industry: Quality-based method and marketing-originated Value-based method. From TFV theory of production, requirements are associated to the customer’s needs and/or wishes, which control production activities. Requirements

cover many different aspects to be fulfilled by the construction industry, and these aspects, such as price, quality, time, ethics, function etc. can be linked to the particular customer assessments of Value. Thus, LT in the construction sector aims at understanding customer requirements through collaborative processes. As a result, outside customers that pay for final products have been considered as important as inside customers or project participants who are involved in building processes (Tapping and Shuker, 2003). It is argued that *“one of the core ideas of Lean Construction is that the process of designing and producing a construction product should progress continuously and create value for both the customer and the delivery team.”* (Lennartsson et al. 2008:541).

Currently, LT in the construction sector has been adapted to early stages of projects. Thus, Lean Design as an ongoing investigation has changed previous practices, where managers commonly decided what the client wanted and, therefore, if clients were not satisfied; they managed variables in relation to product costs and characteristics.

2.6.4 Value Based-Management Approach

Value Based-Management (VBM) was introduced by Jim McTaggart in the book *“The value imperative: Managing for superior Shareholder Returns”* (1994). In this way, VBM is defined as:

- *“a combination of beliefs, principles and processes that effectively arm the company to succeed in its battle against competition from the outside and the institutional imperative from the inside. They form the basis of a systematic approach to achieving the company governing objective (i.e., maximising wealth and shareholder value over time).”* (Mactaggart et al. 1994:42).

Therefore, this management approach has been linked to the improvement of business performance and maximisation of shareholder value (Olsen, 2007). Additionally, it is argued that VBM *“allows managers from all levels of the company to understand how their activities are directly linked to economic cash flows and how these economic cash flows, in turn, determine the long-term value of the company. VBM artfully combines financial and strategic management techniques to create*

sustainable competitive advantage at all levels of the company. By aligning internal business processes, strategies, and corporate governance and investor communications, VBM provides a common discipline, a consistent culture, and a singular focus on value for all business activities." (Morin and Jarrell, 2001:viii). Consequently, VBM changes the common vision of Value of the industry, which considers that Value *"is created only when companies invest capital at returns that exceed the cost of capital."* (Timothy Koller, 1994: 87). Therefore, this author argued that VBM is focused on the way that companies use their values to address long-term strategies and daily operating decisions.

With the purpose of improving the construction sector performance, Wandahl and Bejder (2003) introduced the VBM approach into the IGLC³ forum. These authors argued *"VBM is thought as a more proactive management system compared with traditional systems... the main idea of VBM is to fulfil the product values determined by the construction client/end users, and this is done more proactively by using process values as means."* (pg. 12). As it was previously stated, Wandahl (2004) differentiated the terms Value and *"values"* as *"Product value"* and *"Process value"*, correspondingly. Thus, this classification introduces the concept of *"Management of value"* and *"Management by values"*.

From the perspective of the VBM approach, *"Management by values"* is an essential activity to achieve successful results and deliver products with specific attributes which meet customer needs (*"Management of Value"*). Thus, from this particular perspective, the management of human *"values"* is a key task of the construction industry to deliver effective and efficient projects.

2.6.5 Customer Value Management Approach

In the early 1990s, Customer Value Management (CVM) was introduced by Gale in the book *"Managing Customer Value"* (1994) aimed to address the subjective nature of

³IGLC: International group for Lean Construction formed in 1992 by Koskela. It meets annually and now incorporates academic and practitioners from 21 countries.

Value as a way to fulfil customer requirements. In simple words, CVM is a management tool to measure customer satisfaction. According to Daniels (2000), management practices focused on customer satisfaction arose in the early 1990's with the quality revolution; however, these changes did not translate into significant effects. Thus, CVM arose as a new marketing strategy to improve current results of customer satisfaction. Basically, it is argued that *"CVM is a kind of enhanced customer satisfaction measurement, but enhanced by the inclusion of price and value factors. CVM measures not just a customers' satisfaction with every aspect of a product or service, i.e. the measure of "quality", but measures this satisfaction relative to the price paid. This is a measure of perceived value."* (Daniels, 2000:67-8). Additionally, it is argued that CVM *"...involves coordinating products, prices, service, customer relationships, marketing communications, and quality assurance in a strategically coherent and cost-effective way. The aim is to provide a superior package in terms of what the customer really wants."* (www.cval.com).

It is important to mention that CVM has not just focused on understanding the perception of Value from the point of view of organisations and own customers, it also intends to understand the perception of Value from customers of other companies which offer similar products or services. Consequently, Daniels (2000) introduced three fundamental questions which should direct management strategies of companies aimed to improve their results (pg. 68):

1. *What are the key buying factors that customers value when they choose between us and our toughest competitors?;*
2. *How do customers rate our performance versus competitors on each key buying factors?; and*
3. *What is the relative importance of each of these components of customer value?*

Therefore, the concept of Value from CVM approach is closely related to marketing strategies and according to Evans (2002), *"Value can be easily defined simply as the*

ratio of perceived benefit to perceived cost." (pg. 134). Thus, CVM incorporates more subjective aspects of Value.

2.6.6 Value in Design Approach

In the UK construction sector, management of Value has currently been connected to the welfare of the entire population. Thus, the idea of investing in buildings which generate social benefits, as equal to successful economic results is highly encouraged. This recent initiative is known as the "*value agenda*" and is used locally as a strategy of public organisations. Additionally, in the private sector, this idea has generated an ongoing debate between social welfare and the fulfilment of particular stakeholder's requirements. Through the years, commercial success of building projects is mostly linked to the satisfaction of stakeholder's requirements. However, it is supposed that people want buildings and facilities able to represent their own set of values (Thomson and Austin, 2006). In this way, Value in Design (VALiD) arises as a flexible framework aimed to address the subjective nature of Value through the understanding and interaction of dissimilar set of values. Therefore, the participation of different stakeholders is included from the very early stage of construction projects. According to Thomson et al. (2006), from VALiD perspective, Value is defined as:

$$Value = \frac{Benefits - Sacrifices}{Resources}$$

In this equation, Value is defined as "*the relationship of stakeholder benefits sought, sacrifices accepted, and resources expended.*" (Thomson and Austin, 2006:1). Thus, VALiD includes the interaction of diverse Value perspectives from different project stakeholders. Hence, stakeholders are defined as "*the parties with an interest and influence on a building project outcomes, who stand to gain or loose as a result, to include both providers and customers.*" (Austin, 2005,a:1). Therefore, this approach aids to accomplish agreed project objectives and measure Value delivery performance. In order to manage the complex nature of Value, this framework considers the objective and subjective dimensions of this concept.

Previous authors also argued that the use of VALiD is most appropriate on projects which:

- (i) Are complex in terms of the built product and/or the diversity of stakeholders' needs and expectations.*
- (ii) Have an inexperienced client, who would benefit from using a structured approach to defining value and judging value in design.*
- (iii) Require a unique and bespoke solution, which is aligned with specific stakeholder needs and expectations.*
- (iv) Desire wide and inclusive stakeholder engagement.*

Additionally, VALiD framework includes three stages: *(1) Understand stakeholders' values and aids project teams to agree a common set of values, (2) Define Value to express stakeholder expectation for Value delivery, and (3) Asses Value proposition during design, the physical solution along the construction and the experience of the solution along the use.* Thus, it is ensured that stakeholder judgements are reflected in the project outcome. Finally, it is underlined that VALiD considers stakeholders' judgements based on *"product qualities — the physical and functional characteristics of the built product and the business it facilitates. Value delivery is focused on the knock-on effects of decision on long term operating costs and business performance."* (Austin, 2005,b).

2.7 Consideration of Value from Different Approaches

The concept of Value has been managed from isolated initiatives, where different definitions, equations and individual visions have contributed to the understanding of Value. As a result, there is not an overarching understanding of this concept in the construction industry. However, important similarities and differences are identified. To clarify this discussion, Table 2.2 summarises how the concept of Value is considered from different approaches described above.

Table 2.2. Consideration of Value from different approaches in the construction industry

Management of Value as		Approaches					
		VE	VM	LT	VBM	CVM	VALiD
Product Value	An objective concept	●	●	●	-	-	-
	A subjective concept	-	-	●	-	●	●
Human “values”		-	-	●	●	-	-
Relative concept		●	●	●	-	●	●
Context Dependent concept		●	●	●	●	●	●
Dynamic concept		-	-	●	-	-	●
Customer focussed concept		●	●	●	●	●	●

From this Table, it is possible to underline important tendencies:

- Management of product Value from an Objective view:** The objective part of Value arises when this concept is defined in term of physical products (outputs of the construction industry) and their attributes. Thus, Value has been commonly relative to quality and cost. Therefore, this view does not consider individual Value assessments arising from the interaction of products and different “value systems”. This situation is clearly observed from the perspective of VE, which assumes that Value is improved by reducing cost and retaining the product function. In addition, VM and LT are perspectives whose practices have been also associated to an objective view of Value because both approaches can be easily associated to the delivery of “Market Value” and “Utility Value”, where money plays an important role.
- Management of product Value from a Subjective view:** The subjective part of Value considers the interaction between the product and the person. Thus, the understanding of individual assessments is a key activity to deliver projects with agreed Value (e.g. product attributes and best customer experience). Similarly, CVM and VALiD consider customers perception to increase their satisfaction. In addition, from LT philosophy Value should be defined from final customer perspective. Thus, more subjective Value assessments are also considered. That does not mean that current Lean practices in the construction industry are broadly focused on the delivery of Value as a subjective concept.

- **Management of human “values”:** This construction sector’ objective deals with the consideration of human “values” as a means to improve business performance and increase shareholder value. VBM in the construction sector gives the opportunity to include the management of ‘soft values’ and ‘hard values’ as a way to deliver successful and efficient projects. Similarly, LT philosophy gives the opportunity to include the management of “values” to achieve successful results and meet individual customer requirements.
- **Consideration of Value features and multidimensional attributes:** VE, VM, LT, CVM and VALiD consider product Value relative to different attributes, commonly measured in terms of product quality, functionality and cost. In exception of LT and VALiD, other investigated perspectives (VE, VM and CVM) commonly fail when considering Value as a dynamic concept because they are linked to particular project stages (e.g. briefing and design).
- **Customer focused perspectives:** Previous approaches to manage Value have been mostly focused on the fulfilment of individual customer requirements. As a result, delivery of “Market Value” and “Utility Value” has usually guided the performance of the construction industry. This situation is also linked to the common understanding of customer by the supply chain as the “one who pays” for meeting individual needs.

It is important to underline that VALiD approach includes the interaction of diverse stakeholder judgements to deliver projects, and also considers the impact of their design to the built environment. However, social issues are not necessarily considered as main drivers of the construction industry. Therefore, successful result continues to be associated to long term operating cost and business performance (Austin, 2005, b).

2.8 Discussion of the Concept of Value and its Different Approaches

Literature review aids to understand how Value has been regarded in the construction sector. Thus, three different Value groups are summarised as follows:

1. Value of the construction sector outputs: This sort of Value is related to physical final product (buildings & infrastructure projects). Accordingly, it is linked to the management of product attributes and closely connected with “Utility Value” and “Market Value” (Wandahl, 2004).
2. “values” within the process to deliver the output: This classification is linked to the management of human “values” (Wandahl, 2004). According to Emmitt et al. (2005), these “values” compromise the management of “soft values” and “hard values” to provide the best customer experience through design and construction stage. Additionally, personal “values” are also included from different participants of the project; and
3. Tacit Value: According to Emmitt et al. (2005), this kind of Value comes from the design and construction process, and is closely related to learning from experience.

The exploration of different Value perspectives revealed that current practices have been mainly focused on the delivery of the first kind of Value (Value of the output). Therefore, there is a common tendency to deliver Value in terms of different product attributes such as cost, quality, function, etc. Thus, the impact of building and infrastructure projects over society has been commonly missed or relegated as second level strategies of the construction sector.

This situation contradicts the early observation of Chilean experience through social housing projects, where current policy has promoted the integration of low-income people into social networks. Thus, several social problems such as healthcare, crime reduction, employment increase, etc. could be assumed as an intrinsic consequence of current construction practices. From literature, the relationship between construction outputs, society and the built environment could be firstly linked to the third kind of Value identified (Tacit Value), and secondly linked to VALiD approach, which considers the relationship between the product and the built environment. However, this concept has been less explored, and possibly not considered at all by the current construction perspectives.

It is a fact that VE, VM and LT approaches have mainly focused on the fulfilment of individual customer requirements. The reliance of society on the output of the construction industry is the core reason to expand current concept of Value. Thus, LT arises as a potential philosophy to promote a wider conceptualisation of Value towards the consideration of global issues such as healthcare, social risk, civic pride, crime prevention, sustainability, and the like. LT elevates Value to the customer as a fundamental principle in the manufacturing sector, and such consideration of Value has been transferred into the construction industry. Accordingly, LT promotes the understanding of different Value perspectives from tangible (clients, end users, etc) and intangible (society and environment) customers. In the case of tangible customers, from LT approach Value is *“generated through a process of negotiation between customer ends and means. The first role of the designer is to make explicit to customers the consequences of their desires...”* (Ballard and Howell, 1998:5). Therefore, the management of construction projects is understood as a complex process of negotiation between ends (What, e.g. desires) and means (How, e.g. Markets as a means to determine product price, design as a means to reduce variation, etc) (Howell and Ballard, 1994). Therefore, LT promotes a continuous improvement across the process, where the “What?” and the “How?” are two critical questions to be addressed. Hence, continuous improvement is understood as an opportunity to consider multidimensional attributes of Value, meanwhile the “How?” question gives a chance to consider human “values” within the management of construction projects.

It is important to underline that VALiD framework provides the opportunity to consider social issues from the interaction between stakeholders and the building environment & produces (building and infrastructure projects). However, VALiD is understood as a systematic design tool, which does not necessarily imply a new way of thinking to reformulate current strategies of the construction sector.

2.9 Conclusion

Chapter 2 mainly identified numerous and sometimes confusing features and multidimensional attributes of Value. In addition, different theories or management

tools incorporated the management of Value from somehow narrow or overlapped perspectives. Therefore, the construction industry lacks an overarching understanding of this concept. In this chapter, three kinds of Value were identified: Value of the construction sector outputs (product & attributes – “Market value” & “Utility value”), “values” considered along the process to deliver the output (human “values” – “Hard value” & “Soft value”) and a third sort of “Tacit Value” (e.g. learning from experience). This classification gives the opportunity to visualise how Value has been considered in the construction sector.

The exploration of different Value approaches identified important tendencies in the construction industry such as the close relationship between Value and several measurable products’ attributes. Thus, project’s functionality, cost, quality, etc. have been balanced to deliver Value from a strongly customer focused perspective. Consequently, Value delivery activities have been broadly considered at project level, where money has played a key role. In Supply Chain, for example, Value is understood as what customers will pay for a product or service, that is, according to its economic consideration.

Finally, investigation of different Value approaches revealed that the impact and legacy of construction projects to society is commonly missed. With the purpose of considering environmental and social issues, LT arises as a potential philosophy to expand current visualisation of Value and promote the cure of universal issues. In this way, the following chapter will deeply investigate the concept of Value from LT perspective in the construction industry and the role of society in current experience.

CHAPTER THREE. THE CONCEPT OF VALUE FROM LC PERSPECTIVE AND ITS RELATIONSHIP WITH THE SOCIETY

3.1 Introduction

Lean Thinking elevates Value to the customer as a fundamental principle for the manufacturing sector and considering Value in this way has transferred into Lean Construction. Chapter 3 pays particular attention to current Lean Construction literature aimed to build a global understanding about the management of Value from this perspective, whose potential to move towards a wider consideration of environmental and social issues emerged from preceding chapter. Secondly, this Chapter explores the role of society in current literature about Lean Construction practices.

3.2 Value from Lean Construction Perspective

The Toyota experience allowed construction practices to be viewed from another perspective, observing and understanding the entire process across the Supply Chain (SC) reducing waste and therefore delivering Value more efficiently to customers. Lean Construction started with Koskela in 1992, who analysed the emerging practices of Japanese manufacturing sector. At the same time, but independently Howell and Ballard observed that only one half of the tasks planned were completed in a weekly plan according to planning activities. For the last reason, in 2000 Ballard launched the Last Planner™ System as a new method for production control (Bertelsen and Koskela, 2004). However, Last Planner system has been in development by Ballard since 1992 (Ballard, 2000). Based on the previous experience and its successful results, LT philosophy breaks the anonymity in the construction field and becomes a current but not massive practice. Currently, academic institutions, private and public entities are

contributing to apply this philosophy in order to improve construction sector performance.

In lean terms, construction has been considered as a production process and this philosophy has been adapted to the particularities of the construction sector. As it was mentioned in Chapter 2, Koskela (2000) explored three different views to see production in the management of construction projects. As a result, the TFV Theory (Transformation, Flow and Value generation) has largely impacted the understanding of Value from LC perspective. To understand Value from this perspective, the followings paragraphs investigated the “value generation model” from TFV by Koskela.

3.2.1 Value Generation View from TFV Model by Koskela

LC perspective of Value has been influenced by Lean production. Therefore, based on the difference between manufacturing and construction industry, Koskela (2000) distinguished three theoretical models to regard production in construction: Transformation, Flow and Value generation. As a consequence, TFV arose as a theory of production in the construction industry and its “value generation model” has influenced largely the understanding of Value.

Basing on the work of Levitt (1960) and Drucker (1989), who included customer involvement in a vision of production, Koskela (2000) underlined that customers can only determine the Value of products, and therefore the goal of production process activities is the fulfilment of customer’s needs. Thus, the understanding of customer requirements is a key activity to deliver Value. This idea was previously emphasised by Shewhart (1931) in the beginning of the quality movement. However, this model of value was considered a black box because it lacked value generation arising from the internal mechanisms of suppliers.

As a result, Koskela added a third subsystem, “order-delivery” to the two previous subsystems by Shewhart, these are “product design” and “production”. Thus, it is argued that *“In the design function, the wishes and requirements of the customer are translated into a product design and specifications.”* (Koskela, 2000:76). This new

model is different from the transformation model of production (where inputs were transformed into output) in four key ways:

- *Firstly, by definition, the value generation model considers all activities taking place inside the supplier, rather than just the physical production;*
- *Secondly, the model covers the customer, abstracted away in the transformation model;*
- *Thirdly, in this model, the input is made up by customer dependent information, or value, whereas in the transformation all inputs are considered, and the output consists of the products (or services); and*
- *Fourthly, this is not a hierarchical model: all activities are not similar.*

Therefore, the concept of value generation focuses on the control of transformation and flow rather than on other features of physical production. Thus, the new “value generation model” considers two key concepts: Requirement and Value. In this way, Requirement plays a controlling role in the production process, and Value can be defined and measured from different perspectives. Finally, Koskela proposed a “value generation model” (Figure 3.1) where five principles were incorporated:

1. Requirement capture:

Principle: Ensuring that all customer requirements, both explicit and latent, have been captured.

2. Requirement flow-down:

Principle: Ensuring that relevant customer requirements are available in all phases of production and that they are not lost when progressively transformed into design solutions, production plans and products.

3. Comprehensiveness of requirements:

Principle: Ensuring that customer requirements have a bearing on all deliverables for all roles of customer.

4. Capability of production subsystems:

Principle: Ensuring the capability of the production system to produce products as required. And,

5. Measuring of Value:

Principle: Ensuring by measurements that value is generated for the customer

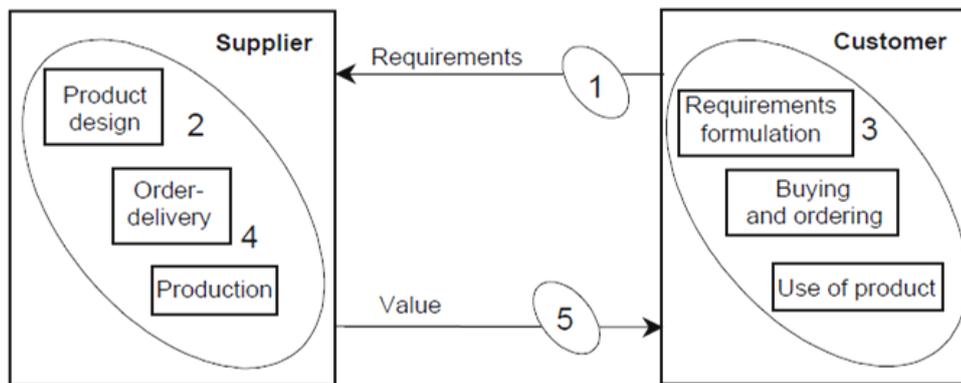


Figure 3.1. Value generation model (Koskela, 2000)

Koskela's "value generation model" expands production practices away from the transformation view. Thereby, Value also begins to be associated to all activities performed inside the Supply Chain to meet customer requirements. To finish, the TFV theory of production from Koskela is summarized in Table 3.1.

From the "value generation model" by Koskela, Value arises from the interaction of products, customers and suppliers. Therefore, the main principle of LT is the reduction of Value loss through the continuous improvement across the process (planning & control of activities) (Bertelsen and Koskela, 2002; Barshani et al. 2004). As a result, LT in the construction industry has been largely associated with activities oriented to reduce waste; this means activities that do not add Value for customer requirements, especially on-site activities through the production process (Forgues et al. 2008). According to Macomber and Howell (2004), a proper understanding of waste means is critical to understand Value. In order to better visualise Value from LC perspective and the impact of the "value generation model" by Koskela (2000), Table 3.2 underlines different Value interpretations from literature.

Table 3.1. Adapted from Integrated TFV view of production (Koskela, 2000)

	Value generation view
Conceptualization of production	As a process where value for the customer is created through fulfilment of his requirements
Main principles	Elimination of values loss (achieved value in relation to best possible value)
Methods and practices (examples)	Methods for requirements capture, Quality Function Deployment
Practical contribution	Taking care that customer requirements are met in the best possible manner
Suggested name for practical application of the view	Value management ⁴

Table 3.2. Value understanding from LC perspective

Reference	Value understanding
Ballard and Howell (1998)	<i>“Value is generated through a process of negotiation between customer ends and means.”</i> (pg. 5)
Lindfors (2000)	<i>“...products/services that increase profit, decrease time and cost, and improve quality for the company and generates profit/value for the customer”... “value is defined as “a quantity, which grows when customer satisfaction increases or expenses associated with a product decreases.”</i> (pg. 2)
Bertelsen and Koskela (2002)	In TFV theory of production (Koskela, 2000), when production is seen from a value generation point of view, <i>“value for the customer is created through fulfilment of his requirements.”</i> (pg. 2)
Björnfot and Stehn(2005)	<i>“As the materials are transformed into building products, the value of the products grows. When the product achieves its final place in the structure and is ready for end customer use, the product has obtained its maximum value.”</i> (pg. 298)
Pasquire et al. (2005)	When the first principle of LT is analyzed, it is argued that Value in construction <i>“is provided by what the building does.”</i> (pg. 483)

⁴ In this context Value management is about the management of Value and does not refer to BS EN 12973: Value Management

Emmitt et al. (2005)	<i>"Value is the end-goal of all construction projects and therefore the discussion and agreement of value parameters is fundamental to the achievement of improved productivity and client/user satisfaction." (pg. 57)</i>
Björnfot and Stehn (2006)	<i>"In Lean Thinking terms (Womack and Jones 2003), the construction process should be aimed at satisfying customer value (external value), while value for the involved project participants (internal value) should come from continuous improvements and waste reduction endeavors within the value streams. In order for construction to be able to satisfy external value for the customer (e.g., the client), value must be accurately defined." (pg. 268)</i>

Information included in Table 3.2 corroborates common Value features identified in Chapter 2. Thus, there is a common tendency to consider Value from a customer focused perspective. Accordingly, different product attributes have been managed to deliver Value from individual perspectives, which is the more subjective part of Value. In this way, waste reduction and quality improvement have been two key activities linked to Value.

3.2.2 The Relationship between Value and Reduction of Waste

As mentioned previously, from the perspective of LT, the concept of Value is usually associated to waste reduction. In this way, waste has been defined as:

- *"specifically any human activity which absorbs resources but creates no value" (Womack and Jones, 2003:15);*
- *"...anything that adds cost but not value" (Drew et al. 2004:15).*

Accordingly, Macomber and Howell (2004) argued that the proper understanding of waste is a prerequisite to understand Value. However, the relativity when defining waste has been a source of argument as waste is defined in function of Value. Therefore, it is argued that *"We can only know waste by knowing value first."* (Mossman, 2009:14). Thereby, from LC experience value generation has been defined as *"meeting client requirements while minimizing waste"* (Forgues et al. 2008: 435). Hence, it is important to know that waste reduction has been mainly associated with the production processes of on-site activities in the construction industry, but this

gives rise to an information deficit about waste reduction in the early stage of projects, where their impact is more significant to improve sector's performance (Formoso et al. 2002; Alves and Tsao 2007). Consequently, waste reduction has been linked to continuous improvement across the process *"A large amount of waste in the value chain is due to lack of coordination among these agents. The identification of the main flow and its leaders is very important, to understand the cooperation that is necessary for the lean transformation."* (Picchi, 2000:2).

According to LT, adding Value and reducing waste are two important activities to deliver products that meet clients' needs. Thus, the management of Value in Lean is considered *"an attempt to maximize value and eliminate waste reduction"* (Bae and Kim, 2007:314). An important feature of building projects is that their characteristics vary as customer perception changes. This reiterative process generates waste into processes from design to final occupancy (Björnfot and Stehn, 2007).

Finally, in spite of the close relationship between Value and waste, in the construction sector it has been recognized that Value is not a consequence of non-wasteful processes. Thus, Koskela argues *"A product with a wonderful value may be produced in a most wasteful process. On the other hand, a product with a clearly deficient value may be produced in a most waste-free-process."* (Koskela, 2004: 29). Therefore, there is not a direct interdependence between waste reduction and Value maximisation.

3.2.3 The Relationship between Value and Quality

As waste reduction, quality has been also closely linked to the concept of Value. Therefore, both concepts have been easily misunderstood, and current construction practices continue adding quality as a route to deliver Value. The problem emerges when quality is merely associated with product features and stakeholder perspectives are missed *"...Quality is delivered considering both the perception of value by the customer and other stakeholders, and defect reduction (e.g. Design for Manufacturing and constructability analysis)."* (Owen et al. 2006:62).

Back to the genesis of the quality movement, in the 1930s Shewhard linked Value with product characteristics, which should satisfy customer requirements. This vision was

criticised by Koskela (2000), who argued that it lacked the opportunity to deliver Value through all transformation processes. Later, in the 1980's, when the quality movement re-emerged, the imperfection of customer requirements materialized when recognising design specifications. Thus, the book *"Juran on Quality by design"* (Juran, 1992) became relevant. In the 2000's when Koskela investigated the quality movement from the production paradigm, Deming, Juran and Fiegenbaum arose as promoters of quality practices in Japan. Thereby, the concept of quality moved from product inspection to total quality control (also called total quality management). It is important to mention that, according to Shingo (1988), the term total considers: (1) expanding quality control from production to all departments, (2) expanding quality control from workers to management, and (3) expanding the notion of quality to cover all operations in the company. In the same way Deming, in the book *"Out of the crisis"* (1982-1986), introduced his theory of management based on fourteen principles to manage business effectively. Besides, the international organization for standardization has played a relevant role in quality movement (ISO 9000:2000 and ISO 9000:2008) (www.iso.org).

In the construction industry, the concept of quality has changed from inspection activities to the control and improvement of processes. Thus, LC has been also adapted and experience demonstrates that the concept of Value has been broadly considered relative to quality and other measurable product attributes. Thus, it has been argued that LC *"aims at the adoption of methodologies that allow for the attainment of favourable results in terms of generation of aggregated value to product, without implying cost increase or quality loss."* (Shimizu and Cardoso, 2002:2). Accordingly, there is a close relationship between Value maximisation and quality improvement. However, it is important to underline that no all products deliver Value through improved quality because more subjective aspects of Value could be considered as well.

3.2.4 The Relationship between Value and Price

Product price has also been understood as an attribute relative to Value; thus, there is a common tendency to measure Value in terms of money. This situation could be

associated to the origins of LT in the manufacturing sector when Value was defined as *“a capability provided to a customer at the right time and at an appropriate price, as defined in each case by the customer.”* (Womack and Jones, 1996: 311). It is assumed that Value is associated to products that fulfil specific customer requirements at the lowest price. Consequently, Value has been frequently linked to cost reduction activities. However, products that do not fulfil customer requirements do not have any Value even if their cost is the lowest. From this situation, more subjective aspects of Value are considered.

Commonly, the cost of products has been understood as the trade-off between sacrifices in exchange of their use, which could be differentiated between the cost to acquire and the cost to use. Additionally, for producers Value maximization and waste reduction generate the greatest project profit (difference between price and cost) (Ballard et al. 2001).

3.2.5 Value Relative to Waste, Quality and Price

For years, the concept of Value has commonly been understood as relative to other attributes of products. From LC literature, previous section underlined the close relationship between Value, waste, quality and price. Thus, waste is created when the activities of the production process do not contribute to the generation of Value from the perspective of customer. Therefore, if customers consider Value relative to quality or price, there is a close relationship between Value, waste, quality and price. However, it is important to clarify that Value cannot be only delivered through waste reduction alone. On the other hand, quality commonly arises by minimising of process variation and defects, both activities managed in terms of customer satisfaction.

Going back to Value features, Value can only be related to quality, price and waste reduction when valued from customer’s perspective. Hence, it is important to underline the following scenery:

“To refurbish Peter’s house, it is necessary to buy 300 bricks made of a specific and limited stone, not available in the market at the moment. Those bricks were made with the most wasteful process and their quality is not the same as of others fabricated

today. For Peter, however, those bricks are very valuable, even if their price is overestimated”.

In this particular context, from customer perspective, product Value does not relate to waste reduction, quality and price. Similarly, Erikshammar (2010) has also underlined this situation in LC literature.

Finally, in LC practices waste reduction, cost minimisation and quality improvement have been commonly addressed to deliver Value through the continuous improvement of construction site activities (planning & control). In addition, the importance of customers' involvement from the very early stages of projects has been also emphasised to achieve agreed product Value. In this way, the following sections explore how Value has been considered from LC perspective in early stage of projects.

3.3 The Concept of Value in the Early Stage of Projects

There are no differing arguments to refute that Value generation through the production process is broadly impacted by decisions and activities carried out in the early stage of construction projects. Similarly, the discussion of Value from early activities (briefing and early design) has been deemed as a central activity to fulfil customer requirements (Fabricio et al. 1999; Freire and Alarcon, 2000; Aquino and Melhado, 2002). It has been argued that most of the problems in building arise from a poor management of early decisions or inadequate activities in the design stage. In addition, the efficiency of production stages is also affected by those problems (Formoso et al. 1998). Despite the importance of early activities, several problems must be addressed such as several customers with conflicting needs, inadequate information, reduced budget, schedule pressure, iterative process, complexity and uncertainty, mismatch of values etc. (Ballard and Koskela, 1998; Tzortzopoulos and Formoso 1999; Emmitt et al. 2004). This situation makes it difficult to fulfil customer requirements, and consequently to deliver the best possible Value through the production process activities (construction stage).

From the TFV model of Koskela (2000), design is also considered as a value generation activity. Table 3.3 shows how design is understood as a Value adding process.

Table 3.3. Integrated TFV view of production
(Adapted from Koskela, 2000)

	Value generation concept
Conceptualization of design	As a process where value for the customer is created through fulfilment of his requirements
Main principles	Elimination of values loss (gap between achieved value and best possible value), rigorous requirement analysis, systematized management of flow-down of requirements of flow-down of requirements, optimization
Methods and practices (examples)	Quality Function Deployment, Value engineering, Taguchi methods
Practical contribution	Taking care that customer requirements are met in the best possible manner

From Koskela TFV model, design creates Value through the fulfilment of customer requirements by the supplier. Thus, customer requirements are captured and transformed along the production process. Therefore, there is a close relationship between Value delivery and functional features of products. It is argued *“In design, the customer requirements are translated into a design solution. In production, this design solution is realized. Thus the functional performance, the primary attribute of customer value, is determined in design, barring defective production. Thus the value aspect in design is much more significant, and by nature different in comparison to production.”* (Koskela, 2000:110-1).

Despite the fact that the early stages are very important, numerous limitations about the vision of design as a process to generate Value have been underlined. It is argued:

- *“In the value generation view, the emphasis is to achieve the best possible value from the customer point of view. It is not clear in the literature what are the requirements for achieving effective value generation in the design process.”* (Tzortzopoulos and Formoso, 1999:339).
- *“Value generation is less well understood. Roughly speaking it means figuring out what the client wants (after identifying who in fact is the customer). Efforts*

are underway to improve the quality of design brief and front end planning. But the process of value generation and the role of money in it, is still something of a mystery.” (Orrechia and Howell, 1999:254).

Preceding quotations support the ongoing LC efforts used to consider the concept of Value from early stage of projects. Thus, different management tools have been introduced to understand, plan and control the design stage. For example, concepts such as “Concurrent Engineering” have been introduced to expand current design practices, where sequential methods have predominated. Thus, it has been proposed to simultaneously consider multiple design criteria that express needs of different stakeholders (Ballard and Koskela, 1998).

At present, LC researchers have been working on the development of practical tools to improve customers’ involvement from the early stage of projects. As a result, design activities have been reformulated to deliver the best possible solutions avoiding future chaos along subsequent activities. Thus, different authors have contributed to the improvement of performance in construction sector by different means. They have, for example, used Quality Function Deployment (QFD) as a method to achieve customer satisfaction by developing quality in design. Others have employed design models, methods or processes aimed to delivering value, for example by planning and controlling the production process, the use of concurrent engineering concept, client involvement, flexibility, etc.

Aimed to better comprehend the management of Value within LC practices, the following paragraphs explores QFD, Target Costing and Lean Design Management.

3.3.1 Lean Construction’s Methods to Address Value Delivery

- **Quality Function Deployment (QFD)**

QFD was developed in Japan in 1966 by Yoji Akao, and it is defined as “*a method for developing a design quality aimed at satisfying the consumer and then translating the consumers’ demands into design targets and major quality assurance points to be used throughout the production stage.*” (Akao, 1990:3). Based on its potential to meet customer requirements, QFD is deemed as a management tool when design is

considered from the value generation view of TFV theory by Koskela. From LC experience, QFD is seen fundamentally as *“a tool that allows values (options) to be weighted in a decision matrix to find the solution that provides the best value in the view of the workshop actors.”* (Emmitt et al. 2004:7-8). Additionally, it is argued that this method is used to identify *“client’s expectations and ensuring that they are met in a profitable way (Huovila et al., 1997; Kamara et al., 1999) is one promising solution based in the value view.”* (see Koskela et al. 2002:10).

- **Target Costing**

Target costing was developed in Japan in the manufacturing sector. This Lean Management tool is used to understand how a company should work to add Value to the customers. It is used from an early stage of projects through design activities of new products and is also used in the value stream process to understand how customer value is increased. It is important to underline that Target costing is introduced in LC within the agenda of Lean Project Delivery in the book *“Building in value: Project delivery”* (Ballard et al. 2002) and its development is still in progress for LC practitioners. In this way, it is stated that Target costing is *“a methodology developed by manufacturers of consumer products to systematically improve product profitability, and is now being adapted for use in the delivery of construction projects. Target costing starts with setting a target cost, which is a very complex and difficult process in construction as compared to manufacturing.”* (Ballard, 2006:77). Thereby, it has been also argued that Target costing *“...is not only a tool for managing costs, but a strategic approach for development of new products, that aims to reduce costs, ensuring quality, reliability and other attributes that will add value to the customers.”* (Jacomit et al. 2008: 601). In this way, it is argued that *“Architects, engineers and constructors (AEC professionals) may be understood by some to have the job of providing the means requested by customers, who may or may not reveal their purpose of values. In this tradition, the AEC professional has no role in the specification of customer purpose and value.”* (Ballard, 2008:4).

- **Lean Design Management (LDM)**

When LT has been translated as a management process for design, activities have been targeted mainly towards improving the manufacturability of products. Thus, the early stages of a project have focused on coordination and flow of information, and on the development of designs capable of fulfilling technological, functional and operational requirements (Brookfield et al. 2004). In addition, the earlier phases of Lean Design should generate options to enhance client values and go beyond the mundane to create *“real value for client and building users alike”* (Emmitt et al. 2004:2). To avoid problems arising in the construction stage, LDM has also been linked to the improvement of communication and the decision making process. Thus, interactive workshops with participation of stakeholders become a central activity to create consensus in the differing Value judgements. These activities are regarded as an opportunity to reduce future uncertainty and minimise waste (Emmitt et al. 2004). The interaction of different stakeholders allows consideration of the notion of an expanded customer/client. Different bodies such as owners, constructors, subcontractors, end users, authorities, etc. contribute with different Value judgments from early stage of projects. However, it has been underlined that LC still lacks in the management of Value from early stage of projects. It is argued that *“In spite of its potential Lean Product Development (LPD) or ‘Lean Design’ has received little attention in the construction industry compared to research and application of Lean in site production. In addition focus seems to be skewed towards flow management and waste reduction as opposed to managing and enhancing client value (Jørgensen, 2006).”* (see Thyssen et al. 2008:507-8).

3.4 Customer Notion and Involvement in the Early Stage of Projects

The expansion of LT philosophy as a production theory to be applied in the construction industry initiates the TFM theory of production by Koskela (2000), where the fulfilment of customer requirement is strongly incorporated in the value generation view. Thereby, customer conception from the beginning has been mainly associated to someone (customer, client) who is able to communicate unfulfilled

needs, goals, expectations, requirements, targets, and the like. In addition, the supply chain commonly understands both customer and client notion as the “one who pays” for fulfilling particular requirements. Thus, the relationship between LT and the concept of Value in order to achieve customer satisfaction has been underlined by Melton (2005) *“Lean Thinking starts with the customer and the definition of value.”* (pg. 664).

In LC experience, an expanded customer perspective has been influenced by the work of Deming (1994). From this vision, LC delivers Value throughout construction process improvement considering each participant who contributes in the development of products as a potential customer. It is argued that *“if the NEXT customers were to be identified right from the start and appropriate measures put in place (potentially triggering payment), the chances of delivering a project on time, on budget and to the customers requirement will be greater.”* (Leong and Tilley 2008: 765-6). This vision underlines the LC potential to fulfil external customers as equal to internal customers; such idea is closely linked to the classification of internal and external values according to Emmitt et al. (2005). This situation has been also underlined through the following quotations:

- *“one of the core ideas of Lean Construction is that the process of designing and producing a construction product should progress continuously, from initial idea to finished product, creating value for both the customer and the delivery team.”* (Tyson et al. 2008:541).
- *“in Lean Thinking terms from the perspective of Womack and Jones (2003), the construction process should be aimed at satisfying customer value (external value), while value for the involved project participants (internal value) should come from continuous improvements and waste reduction endeavours within the value streams.”* (Björnfot and Sardén 2006:268).

Experience gathered to date demonstrated that customer involvement, adequate communication, collaboration, etc. are essential elements to achieve agreed Value parameters in the early stage of projects, and further contribute with fulfilment of customer requirements. It is argued that *“all actors must engage in dialogue to*

explore and then confirm a set of values that form the basis of the project, and the most effective way of doing this is through face-to-face meetings that recognise the value of group process (Luft, 1984). Communication is key to the discussion and implementation of values.” (Emmitt et al. 2004:4), this idea is linked to the ideas of Fonseca (2002), who has considered *“the quality of stakeholder participation in conversations as instrumental in creating value.”* and Scharmer (2001), who argued that *“reflective and generative dialogue are minimum conditions for knowledge emergence and in our case for effective value identification and value propositioning.”* (see Whelton and Ballard 2003:10). According to Emmitt et al. (2005), communication between client and the delivery team is included as a part of soft values within process value classification. The impact of ineffective design practices in final project results has been broadly recognised, thus LC researchers argued that most of these problems are linked to deficient communication and decision making in the early stage of projects (Emmitt et al. 2004).

3.4.1 Society as a Potential Customer from LT perspective

LC literature has underlined the need to consider a wider set of customers. It is stated that *“The client often represents a lot of different stakeholders (the users, the investor, the owner etc.), and furthermore when we build we affect our neighbour and the surroundings (city/landscape etc.). and they all have a different set of values and interests in the project.”* (Emmitt et al. 2005: 59). Therefore, stakeholders are regarded as the group formed by owner, user and the society. Additionally, those authors emphasized that society is mainly represented by governmental authorities. Table 3.4 included different quotations from LC researchers who underline the role of society in the construction industry.

Table 3.4. Society consideration from LC perspective

Reference	Quotations
Koskela (2000)	<i>“Taguchi proposed that any deviation from a target value in the product causes a loss, which is a quadratic function of the deviation, to the user and wider society (Taguchi 1993). Thus, by definition, wider society should be included as one customer.” (pg. 78)</i>
Bertelsen and Emmitt (2005)	<i>“Looking closer at the nature of the client, one may identify behind the façade an organisation, which during the project execution should represent the interests of three distinct client groups—the owners, the users and society. These three groups of interest each value different things at different time in the life of the building.” (pg.74)</i>
Gugnas and Oterhals (2006)	<i>“...Lean is about developing and customizing principles that are right to a specific organization (say, a shipyard) and diligently practicing them to achieve high performance that continues to add value to customers and society.” (pg. 322)</i>
Bae and Kim (2007)	<i>“Lean construction needs to identify sustainable values including economic, environmental and social value as critical factors in implementing sustainable construction.” (pg. 315)</i>

In order to comprehend the role of society in current practices, the following paragraphs explore LC experience in the alleviation of environmental & social issues.

3.5 The Role of Society in the Lean Construction Experience

From the TFV model of Koskela (2000), construction is considered as a production process activity where value generation is conceptualized as *“a process where value for the customer is created through fulfilment of his requirements.”* (Koskela, 2000:89). Despite the commonly shared customer-focused perspective, some authors have underlined the role of society in the development of new building and infrastructure projects. Thus, it is argued:

- *“Sometimes achieving value (economic, environmental, social, cultural and historic) is more important than reducing waste (Vrijhoef and Koskela, 2005)... Large and complex building project may contribute to waste in terms of*

production, but still produce value for the social and cultural environment (Vrijhoef and Koskela 2005)...” (see Höök, 2006:586)

- *“Measuring waste leads to fact that can be used when a company, and industry or the entire society decided how to render activities more effective.” (Forsberg and Saukkoriipi, 2007:71)*
- *“We believe sustainability issues should receive more attention from the IGLC community because of its growing importance and potential benefits to the AEC industry and society as a whole.” (Alves and Tsao, 2007:57)*
- *“Built facilities such as buildings, roads, and infrastructure are expected to last for a long time. Although they are primarily built products, they are demanded due to the need for servicing a particular need of the society.” (Koskela et al. 2008:61)*

At present, LC authors recognise the importance of society; thus, universal issues such as sustainable practices, work safety, people’s quality of life, etc. have been identified from literature. Nevertheless, there is only limited research about other important issues such as improved crime reduction, increased employment, integration of low-income people into society, etc. It is important to underline that the alleviation of social issues is not regarded as an intrinsic consequence of customer satisfaction. As a result, even common practices which consider a wider stakeholder universe do not necessarily elevate society’s welfare as a first level strategy of the construction sector. The following sections explore LC experience in the mitigation of global issues.

3.5.1 Lean Construction Contribution to Alleviate Environmental Issues

There is an ongoing concern about the construction sector’s responsibility over environmental issues such as carbon emissions, pollution, physical waste reduction, etc. concepts that have been largely discussed until now. Therefore, sustainable practices arose in the construction industry as a way to improve construction sector performance and to promote the responsible use of natural resources. In this way, LC authors argued that *“while traditional design and construction focus on cost,*

performance and quality objectives, sustainable design and construction add to these criteria minimization of resources depletion, minimization of environmental degradation, and creating a healthy built environment (Kibert 1994)." (see Huovila and Koskela, 1998:3). Thus, universal project constraints such as cost, time and quality are expanded to the consideration of social & environmental issues (Global context). This situation is illustrated in Figure 3.2 below.

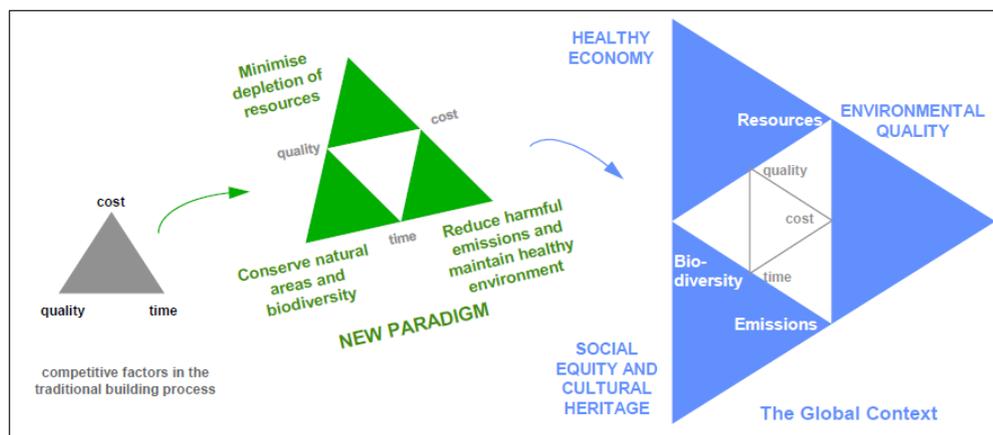


Figure 3.2. Challenges of sustainable construction in a global context (Huovila and Koskela, 1998)

Based on the TFCV theory of Koskela, environment is considered as a potential customer to be satisfied. In this way, Huovila and Koskela (1998) underlined that Lean principles can contribute to achieve sustainable goals by:

1. *"Eliminating (material) Waste: minimisation of resources depletion, minimisation of pollution; and*
2. *Adding Value to the customer: minimisation of resources depletion, minimisation of pollution, matching business and environmental excellence."*
(pg. 8)

Moreover, they underline customer's priorities from sustainable generation of value point of view:

- *"From owner's and user's points of view to emphasize: Conformity to business process; Location; Life cycle cost; Indoor conditions, because the decision to invest is based on these criteria;*

- From environment's point of view to concentrate on: Environmental burdens in operation; Service life and risks for deterioration; convertibility and flexibility, because they form the major burdens to the environment during the life span of the facility; and
- From constructor's point of view to look at: Safety; Comfort, Embodied environmental burdens in building elements, because they may have the strongest direct influence in construction costs in some cases." (pg. 8-9)

Green or sustainable projects contain even more particular issues than other conventional projects. Therefore, LC practices have been encouraged to adapt current production process to reduce waste and decrease project costs (Klotz et al. 2007; Degani and Cardoso, 2002). Towards the optimisation of the process, the interrelation between different Value visions is considered an essential activity to contribute to sustainable development. Therefore, in order to achieve agreed sustainable Value perspectives, Huovila and Koskela (1998) proposed a better distinction of different stakeholder priorities (Figure 3.3).

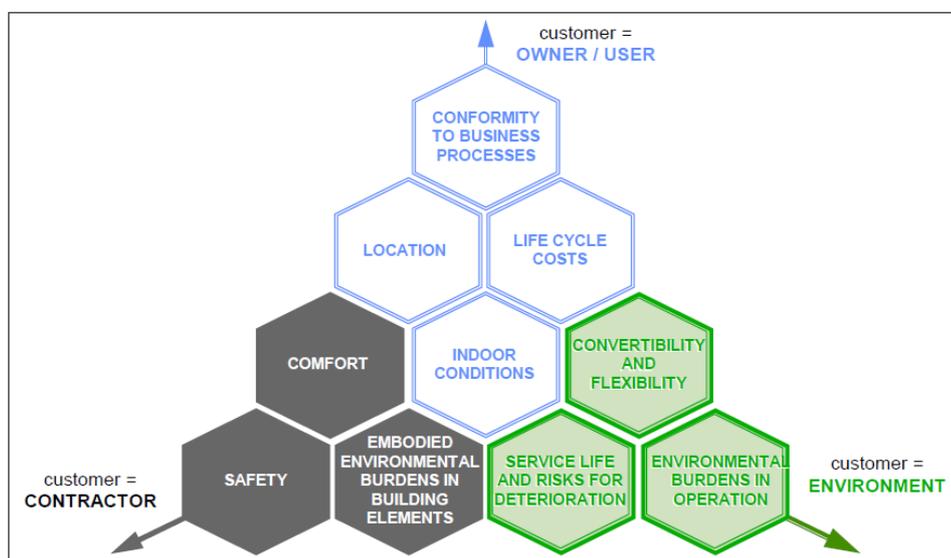


Figure 3.3. Customer priorities (Huovila and Koskela, 1998)

The potential of Lean to create sustainable projects has also been underlined by Bae and Kim (2007), who added social and environmental perspectives to the common economic view. They argued:

1. *“Economic perspective: possible upfront cost reduction, resource savings, operating cost reduction, and high performance capability;*
2. *Social perspective: workplace safety, occupant health, community wellbeing, loyalty among stakeholders, and external image improvement; and*
3. *Environmental perspective: reduced resource depletion, pollution prevention by eliminating waste, and resource preservation.”* (p.320)

Figure 3.4 shows the conceptual relationship between LT and Sustainability, where Lean Project Delivery System™ (LPDS)⁵ by Ballard is used to illustrate design and building processes.

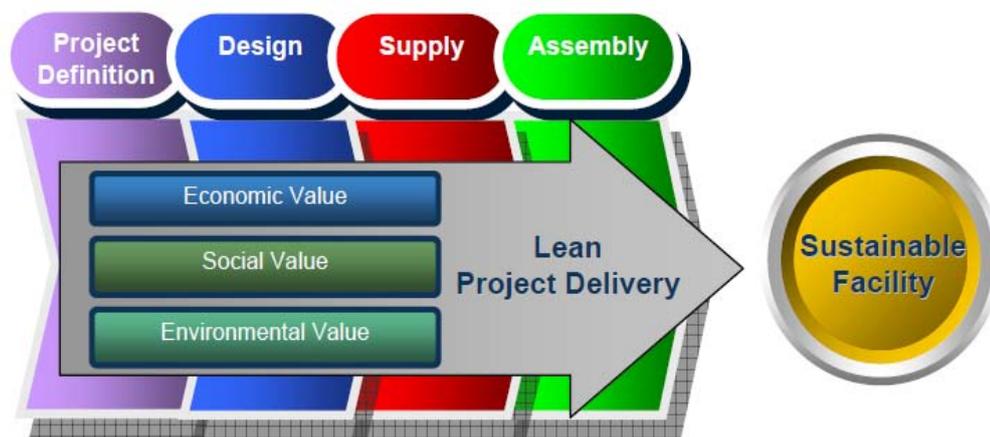


Figure 3.4. Conceptual relationship between Lean and Sustainability (Bae and Kim, 2007)

The potential of LT when approaching environmental issues has also been linked to the reduction of carbon emissions, through the reduction of physical waste in the construction process. It has been argued that *“Between 10 and 20% of all the raw materials delivered to a construction site end up in skips. This has a significant impact on CO₂ emissions as those skip loads also represent a waste of the embedded energy in the construction industry is aware of the issues of waste and sustainable development...”* (www.carbontrust.co.uk). Other initiatives have been promoted by consulting companies in developed countries such as Canada, KAIZEN Institute-Lean Advisers aiming at *“reducing waste (non-value), creating measurable improvements to*

⁵ LDPS: New and better way to design and build capital facilities. (www.leanconstruction.org)

the environment (carbon credits) and enhancing your service/product offering to delight your clients/customers.” (www.leanadvisors.com). So, Literature underlines that Lean practices can contribute to minimize waste and increase Value, through the consideration of customer and environmental needs. These requirements should be used to guide production process in the construction of future sustainable projects. (Lapinski et al. 2006).

3.5.2 Lean Construction Contribution to Alleviate Social Issues

The potential of LT to alleviate environmental issues has been complemented with other social issues such as the respect for labour force. This idea is stated as follows:

- *“Lean’ has an environmental objective (cut waste), an economic objective (meet customer's needs) and a social objective (respect the people who work for you).”*(www.projectbuild.org.uk)

Linked with the respect of labour force, employment safety is another empowered practiced. It is argued:

- *“In Lean terminology, poor safety is a form of waste...it is imperative to incorporate safety into process and production plans, in order to achieve projected goals of improved worker health, reduced costs, and increased value.”* (Nahmens and Ikuma, 2009:1)
- *“Lean advocated minimizing waste and continuously improving. Incidents that disrupt the flow of work or lead to injury are waste, so the relationship between lean and safety is clear.”* (Howell et al, 2002:2)

Lean literature identified the management of environmental and social issues as a way to deliver Value. Nowadays, sustainability, workers safety and other social issues mainly linked to the environment have been investigated. However, there exists common inertia to place customer requirements (who is paying for a product or service) over social issues. For example, it is argued that the first goal of Lean is delivering Value to the customer. Therefore, Lean could only contribute to sustainability if customers value sustainable practices (Bae and Kim, 2007).

3.6 Reflection on the Concept of Value and the Role of Society from LC Perspective

Over the years, LC has been largely associated with activities oriented to reduce waste; this means activities that do not add Value for customer requirements, especially on site activities through production process. Thus, main efforts have been endeavoured to improve construction process activities (The work) in order to deliver the best possible Value, from a strongly customer focused perspective. This common situation confirmed the information contained in Chapter 2, where Value from LC was broadly linked to “Utility Value” and “Market Value”. Thus, several product attributes such as price and quality have been managed in terms of Value.

Exploration of LC literature has demonstrated that this philosophy is not commonly applied to the management of Value from early stages of projects. Nowadays, having a holistic and integrated approach to the design and construction of buildings means that everything, or at least customer “*values*”, should be considered as early as possible, avoiding unnecessary and costly changes and re-work loops later. Currently, Lean Design is moving towards the management of Value from initial project stages. Thus, understanding of different stakeholders’ perspectives is regarded as an effective way to deliver products with agreed Value. Therefore, the narrow customer notion is moving towards consideration of environmental and social issues such as physical waste minimisation, reduction of carbon emissions, sustainability, health and safety, etc. However, the last situation is neither massively applied nor used as a first level strategy in the construction sector. It is a fact that environmental and social problems are mostly considered if they are prerequisite of customers or as a result of legislation or regulation. This means that larger issues and their impact on future generations are still not fully addressed.

At present, LC practices are limited by Value delivery strategies focused on the fulfilment of particular requirements and activities mainly performed in a Local context (production process – construction site). In order to expand Lean potential, the concept of Value should be visualised from a wider perspective, where social, economic and political constraints should be considered. The dependence of society

on buildings and infrastructure elevates the needs of society within customer requirement priorities and drives the need to expand common conceptualisation of Value from a Local to a wider context. This situation does not overlook the importance of money and other parameters such as quality, function, waste reduction, etc. used to deliver Value. This wider perspective suggests that society provides a wider set of “customers” whose needs are dependent on the built environment but have little or no voice in its design and construction. Based on the experience achieved to date, LC can utilise its potential to move towards an expansion of the common vision of Value, going far from current production process activities.

This situation is evident through social housing projects, where the needs of end users cover more than just a physical solution (the house and its attributes). Investment in the provision of housing should generate a return to society through improved health, reduced crime, increased employment, integration into society, sustainability etc. This is the reason why construction should consider the concept of Value in a wider context, focusing on fulfilling society as a whole and delivering a responsible legacy for future generations. Thus, governmental policies should include this expanded concept of Value from the early inception of all projects.

3.7 Conclusion

This Chapter has explored the concept of Value from LC perspective. Literature reviewed identifies two common situations:

1. LC efforts have been mainly endeavoured to deliver Value at project level, where waste reduction and planning & control of construction site activities have been key activities linked to Value; and
2. LC efforts have been mainly endeavoured to fulfil particular customer’s requirements. Thus, Value has been commonly related to “Utility Value” and “Market Value”.

However, LC’s potential goes far beyond simple waste reduction rather aiming at continuous improvement across the entire process. This situation provides the opportunity to understand and generate Value for the customer and even for society.

As emphasised earlier, there is an indisputable impact and return of legacy from the construction industry to society. This situation is completely different from the experience of the manufacturing sector, whose responsibility can be considered narrow in comparison to that of the construction industry. The products of the manufacturing sector have an impact over particular customers or over a limited group (e.g. car purchasing). However, the construction industry delivers building & infrastructure projects whose impact and legacy is hugely affecting current and future generations.

It is important to mention, that LC has also been applied to the Brazilian social housing sector. However, LC potential has mainly been used to deliver Value from a customer-focused perspective. Therefore, the impact of those projects over society has been relegated to second level strategies of the construction sector. Thereby, marketing strategies, management of customer requirements, planning & control of process, design of production systems, etc. have been included as Value adding activities (Schramm et al. 2004; Leite et al. 2005; Lima et al. 2008; Lima et al. 2009; Miron and Formoso, 2010). Consequently, even taking into account the economic and social impact of low-income projects over the society and the building environment, Brazilian efforts have been considered to increase final client's satisfaction. Thus, Value has been closely linked to the house and its attributes: quality, location, etc.

Finally, with the purpose of conceptualising the notion of Value from a wider perspective, the following Chapter explores the New Chilean Housing Policy (2007), which considers the insertion of low-income families into society as a central principle.

CHAPTER FOUR. CHILEAN POLICY ABOUT SOCIAL HOUSING PROJECTS

4.1 Introduction

Chapter 4 explores the New Chilean Housing Policy of social housing projects (2007). Focusing on understanding the Chilean situation, this chapter firstly explores current Chilean experience through this policy. Thus, housing deficit, policy's principles and stakeholders groups are firstly identified. Then, stakeholder's responsibilities and activities performed through the life cycle of projects are also investigated. The New Chilean Housing Policy opens the opportunity to visualise the concept of Value from a wider perspective. This policy not only promotes the reduction of the housing deficit, but also promotes the insertion of low-income people in society. Therefore, the construction industry contributes to the welfare of the entire population through the mitigation of social issues.

4.2 Chilean Situation on Social Housing Projects

The investigation of different approaches to manage Value in the construction industry has identified a common tendency to manage Value in terms of customer satisfaction. This situation is contradictory to the ideas promoted by the New Chilean Housing Policy, 2007 (NChHP), where the insertion of low-income people into society has been considered as a basic principle. Thus, Value is delivered to the entire society improving social problems such as crime, unemployment, segregation, etc. This insufficiently explored phenomenon is understood as an opportunity to visualise the concept of Value from a wider perspective considering the return of Value from the construction industry to the whole society.

Aimed at understanding Chilean situation more clearly, the following sections firstly describe the current housing deficit.

4.2.1 Chilean Housing Deficit

According to the Chilean Housing and Town Planning Ministry (MINVU), by March 2010 the total housing deficit in Chile corresponded to 1,175,838 houses; 544,363 of such figure –that is 46.3%- corresponded to new houses required, and 631,475 –that is 53.7%- were houses needing repair work or improvement. Suddenly, the earthquake of February 27th, 2010 changed the situation significantly, increasing the housing shortage in a 45.9% in relation to the figures exhibited at the end of 2009, which implies a set-back of more than five years.

Table 4.1 shows the evolution of the total housing deficit by December of each year and by March 2010.

Table 4.1. Estimated Evolution of the Total Housing Deficit in Chile
(Source: www.minvu.cl)

ESTIMATED EVOLUTION OF HOUSING DEFICIT (*) (Quantitative, qualitative and total, 2006-2010) (# of houses)					
Component	2006	2007	2008	2009	March 2010(*)
Quantitative deficit (new houses required)	412,349	388,374	364,241	354,014	544,363
Qualitative deficit (houses needing repairs and improvements)	594,904	570,339	531,077	451,782	631,475
Total requirements	1,007,253	958,713	895,318	805,796	1,175,838

(*) Data of 2010 corresponds to the estimated deficit for 2010 added to the number of requirements derived from the effects of the February 27th, 2010's earthquake' and tsunami, which were estimated basing on the following sources: Report of the National Emergency Office of Ministry of Interior (ONEMI), CASEN 2006, digital cartography of affected zones and MINVU's cadastres.

According to the National Statistical Institute (INE), the Chilean population is estimated to be 17,094,275 with a 40.3% of the total living in the Metropolitan Region of Santiago (data at June 30th, 2010) (www.ine.cl). Therefore, the total housing deficit

in Chile could be estimated in 6.9% approximately. According to the Chilean Housing and Urbanism Minister Mrs. Matte (March 11th, 2010 – April 19th 2011), the housing deficit in the Metropolitan Region of Santiago was 200,000 units (data at March, 31th, 2011) (www.latercera.com). Then, the housing deficit in the Metropolitan Region of Santiago could be estimated in 2.9% approximately.

4.2.2 The New Chilean Housing Policy

In January 2007, the Chilean Government announced the “Política Habitacional de Mejoramiento de la Calidad e Integración Social”— NChHP (Home policy for quality improvement and social integration). This new policy not only intends to reduce the number of people living in precarious conditions, but it is also concerned about those people’s dignity. According to the Chilean Housing and Town Planning Minister Mrs. Poblete (March 11th, 2006 – March 11th, 2010), it is argued:

- *“We said that we were going to build better quality houses and assured we were not interested in either solution, but in one which provided dignity and a sense of neighbourhood. This is an example: neighbours participated directly in the layout and construction. They didn’t receive a house... They decided where they wanted to live.”* (Poblete, 2007).

At present, the NChHP demonstrates that Chilean Governments have been working towards a situation in which quality and social insertion are key elements of its principles. In the 1990’s, housing deficit was considered one of the major social issues, and previous Chilean Governments were mainly focused on reducing the housing deficit. As a result, earlier policies dealt with the number of houses instead of other important attributes such as quality, location, etc. However, previous governmental objectives changed in the 2000’s when the housing deficit was not considered as the main problem anymore. Initially, the government offered different subsidies and loans at low interest rates causing a new problem when families that obtained a loan were unable to pay as a result of their low incomes. In addition, those families who were able to pay only received a sufficient budget to acquire bad quality houses and located

in an inadequate place, often far away from social networks (hospitals, schools, transportation, etc).

In 2001, the Chilean Government created the national plan “Fondo Solidario de la Vivienda” —FSV (“Housing Solidary Fund”), whose central purpose was to increase subsidy’ funds to allow the acquisition of land and to build new projects. However, the quality and standard of new houses became a critical issue impacting Government’s reputation until now.

As a result, the NChHP was announced under the Government of Michelle Bachelet (March 11th, 2006 – March 11th 2010). This new policy is focused on reducing the housing deficit of the poorest quintile of the Chilean population, and it also deals with the quality of houses and the insertion of people into social networks.

The NChHP provided an opportunity to improve on previous years when policies were mainly focused on reducing the deficit. At present, the Chilean Government is building projects located in places where families have access to public transportation, healthcare and education. Consequently, there is an important effect on the welfare of the entire population. This housing policy considers three principles:

1. Reduction of **Housing Deficit** - focusing on people who live in poverty conditions;
2. Guarantee of **Housing Quality** - improving standards and design and construction processes; and
3. Promotion of **Social Integration** - endeavouring solutions located in neighbourhoods and cities.

Housing deficit, housing quality and social integration are included in a project’s life cycle through the families’ involvement with relevant government entities and private companies. In addition, the Chilean Government provides financial assistance to low income families to achieve the house solution. Currently, new projects can apply for additional resources such as an Equipment Subsidy to improve neighbourhood’s environment (facilities such as parks, common areas, public squares, lighting, etc.) and

a Location Subsidy, which facilitates construction of new projects in places, integrated within society.

To integrate people into society, the NChHP includes a Social Insertion Plan (SIP), which stimulates families to participate actively in the decision-making activities related to their own projects. In this way, the Chilean government pays to external organisations to carry out activities before and after governmental approval Table 4.2.

Table 4.2. Activities of the SIP before and after project approval
(Source: www.minvu.cl)

Before submitting to revision:	After selection:
<ul style="list-style-type: none"> • Perform a diagnosis together with families; • Explain to families the program's characteristics; and • Certify the families' approval with the housing project agreed upon. 	<ul style="list-style-type: none"> • Develop follow-up activities so that families get involved in the project's execution; • Develop preliminary activities for the use, care and maintenance of their new house, as well as an expansion in the future; and • Develop activities to introduce and insert families within social networks: healthcare services, education, transportation, etc.

4.2.3 Current Processes in Chile According to the NChHP

Focusing on the optimization of public resources and the agility of previous processes (flow of resources and information), the Chilean Government has delegated responsibilities to private organisation. Thus, these organisations have been included in current processes from early stages of housing projects. Therefore, the Government is mainly focused on developing and supervising policies to improving results. As a result, different organisations such as private companies, Town Councils, NGOs,

charity foundations, etc. play a role consisting of people guidance through the technical and social aspects of building a house.

According to the NChHP, six groups of stakeholders are involved throughout life cycle of projects (Table 4.3). However, families do not interact formally with other stakeholders because the Chilean Government pays for representing families' requirements concerning other organisations. According to MINVU's "Fondo Solidario de Vivienda - Manual para dirigentes y familias" (Housing Support Fund - Handbook for leaders and families included in the NChHP), stakeholders are described as follows.

Table 4.3. Stakeholder description (Source: www.minvu.cl)

Stakeholder	Description
Families:	People described in the "Ficha de Protección Social" (FPS ⁶) who are participating in a construction project. They are organized by committees, which represents their requirements and expectations in front of EGIS.
EGIS:	Entity for social housing management – "Entidad de Gestión Inmobiliaria Social". Organisation whose principal task consists of directing people in technical and social aspects of building a house and also formally represent families requirement concerning other stakeholders.
SERVIU:	Governmental department responsible of housing programs and of revision of Social Housing Projects. It also pays for the EGIS's work and distributes subsidies for building new projects.
Town Council:	The local government collects the information about the families through the FPS, provides information on lands (cost and availability), and finally manages project's delivery.
Building company	Private organisation hired by the EGIS.
Architectural team	Private organisation hired by the EGIS.

⁶ FPS: Stands for Ficha de Protección Social – "Social Protection Record", a official form to be completed by social workers who visit the place where low income families live. According to the score obtained, families are classified by their vulnerability risk. The items considered for the score are: housing deficit, number of people living in the same house, living conditions, lack of drinking water and sewers, etc.

To understand the role of the previous organisations in current processes, Table 4.4 includes responsibilities associated to previous Stakeholder groups.

In addition, according to the NChHP four central stages were established along the life cycle of SHP in Chile. Table 4.5 includes main activities performed by each organisation. Moreover, Appendix 1 includes a detail of all activities carried out through the life cycle of SHP in Chile.

Table 4.4. Stakeholder’s responsibilities along the life cycle of projects (Source: www.minvu.cl)

FAMILIES	EGIS	SERVIU	Town Council	Architectural Team	Building Company
<ul style="list-style-type: none"> •Collect and transmit family requirements •Discover the significance of the new house for the family’s life •Create Committees and participate in their activities •Complete savings requirement •Participate in Committee’s activities •Participate in activities of the SIP •Participate in making a decision on acquisition of a land, and •Participate in creating social and technical requirements of the project. 	<ul style="list-style-type: none"> • Represent families concerning SERVIU • Support tasks of the committee or families • Advise families to find a land • Design the project or supervise its design by the architectural team • Obtain certificates for building projects • Hire building company services • Coordinate project execution and approve quality requirements • Collect documentation for obtaining money from the Government (subsidy) • Elaborate technical and social projects to submit these to SERVIU • Design and carry out activities related to the SIP • Manages delivery of projects, and • Carry out legal proceedings and formally register new houses 	<ul style="list-style-type: none"> • Provide orientation and advice during the whole life cycle of projects • Provide funds for paying technical and social assistance • Carry out or contract technical inspection during construction processes • Receive projects and information on documents • Create a technical committee to evaluate projects (Revision, qualification, and approval of selection), and • Distribute monetary Governmental assistance (subsidy) 	<ul style="list-style-type: none"> • Collect information about families at social risk (Carry out and update the FPS) • Confer legal status to committees • Provide information on land (Cost and availability) • Allow construction of the projects, and • Approve final hand over of projects 	<ul style="list-style-type: none"> • Design the project 	<ul style="list-style-type: none"> • Build up the project

Table 4.5. Stakeholder's responsibilities along the life cycle of projects
(Source: www.minvu.cl)

Design	Analysis and qualification	Execution	Occupancy
<ul style="list-style-type: none"> • Select EGIS • Agree relationship between the "Committee" and SERVIU • Define the construction site • Define the kind of housing project and site distribution • Fulfilling family saving requirement • Participate in SIP • Select building company, and • Submit designed projects to SERVIU 	<ul style="list-style-type: none"> • Inquire about project's evaluation • Apply for monetary assistance (subsidy) from the Government 	<ul style="list-style-type: none"> • Hiring the construction company • Supervising the construction project • Preparing families to become proprietors • Distribution of houses, and • Inauguration and removal from previous location 	<ul style="list-style-type: none"> • Expressing approval • Knowing and using post-sale service • Registering new address, and • Becoming involved with the social networks

4.3 Conclusion

The NChHP includes three key principles: (1) Reduction of housing deficit, (2) Improvement of housing quality and (3) Integration of low-income people into society. The first two principles of this policy highlight the opportunity of addressing Value from a project-focused perspective (e.g., Value associated with the delivery of the product and its associated attributes – A house). However, the third principle aids to visualise Value from a wider perspective, which considers the delivery of Value from the construction industry to the whole society (e.g. insertion of low-income people into society). Consequently, policy's principles, activities and responsibilities associated to different stakeholders follow two main tendencies, whose activities are detailed below:

1. The house and its attributes:

- Selection of building site;
- Definition of project budget;
- Definition of project features;
- Project's design;
- Post-sales services;
- Revision and qualification of project: technical, economical and legal; and
- Planning and control of construction site activities.

2. Insertion of families in social networks:

- Identification of social problems (e.g. delinquency, drug abuse, unemployment, etc.);
- Definition of Social Insertion Plan;
- Family professional training; and
- Insertion of people in social networks (schools, hospitals, transportation, police station, etc.).

Therefore, the construction industry through the delivery of building and infrastructure projects impacts society and delivers a legacy to future generations. In order to better understand this emerging phenomenon, the following Chapter explores research methodology and methods used to achieve research aim and objectives.

CHAPTER FIVE. RESEARCH METHODOLOGY

5.1 Introduction

Research methodology is understood as the base of scientific research and it consists of research philosophy and the research process. Usually, theoretical position is revealed through the research philosophy, which is mainly focused on the ontological and epistemological position of the study. Additionally, the practical categorization is established by the research process, which includes research design and research methods to collect and analyse data. Based on the particular research nature and features, this chapter firstly describes the theoretical and practical perspective of the implemented methodology aimed to answer research questions and achieve research aim and objectives. Secondly, specific research methods are described establishing the connection with the objectives established in this research. Accordingly, this Chapter explores key concepts such as research approaches, research process, research methodology, research methods, etc. Additionally, a research process map is included to show activities performed through this research.

5.2 Research Philosophy

In the consulted literature, there is broad and controversial information about philosophical research approaches, where different perspectives have been considered as contradictory “*dichotomous*” philosophies. Nevertheless, it is argued that all research design and approaches explicitly contain some ontological, epistemological and methodological position (Fitzgerald and Howcroft, 1998). In this way, several classifications have been proposed to identify two commonly polarised philosophical research perspectives, which have been described as a realist/relativist, hard/soft, positivist/interpretivist, quantitative/qualitative, etc.

The debate on research approaches has caused an ongoing and noticeable dispute between philosophical perspectives and the origin from where research is undertaken is still noticeable. With the purpose of clarifying, in the information sciences field

Fitzgerald and Howcroft (1998) proposed a summarized classification model, which shows two contrary or complementary views (Table 5.1). The classification suggested by these authors is based on the “Soft” and “Hard” research dichotomies and provides a global vision of the issues. To simplify the theoretical position of this research, “Soft” and “Hard” classifications are used as a framework moving from an ontological to an epistemological level.

It is important to mention that researchers in the construction management field as well as other research areas, have used both “Soft” and “Hard” research dichotomies positions from a complementary way; thereby, each perspective contributes to the research process in order to understand, infer and draw better conclusions. Thus, pluralistic and ecumenical approaches have been used as complementary perspectives (Loosemore et al 1996; Cormak, 1991).

Table 5.1. Summary of ‘Soft’ v/s ‘Hard’ Research Dichotomies (Fitzgerald and Howcroft, 1998)

SOFT	HARD
ONTOLOGICAL LEVEL	
<p>Relativist</p> <p>Belief that multiple realities exist as subjective construction of the mind. Socially-transmitted terms direct how reality is perceived and this will vary across different languages and cultures</p>	<p>Realist</p> <p>Belief that external world consists of pre-existing hard, tangible structures which exist independently of an individual’s cognition</p>
EPISTEMOLOGICAL LEVEL	
<p>Interpretivist</p> <p>No universal truth. Understand & interpret from researcher’s own frame or reference. Uncommitted neutrality impossible. Realist of context important</p>	<p>Positivist</p> <p>Belief that world conforms to fixed laws of causation. Complexity can be tackled by reductionism. Emphasis on objectivity, measurement and repeatability</p>
<p>Subjectivist</p> <p>Distinction between researcher and research situation is collapsed. Research findings emerge from the interaction between researcher and research situation, and values and beliefs of the researcher are central mediators</p>	<p>Objectivist</p> <p>Both possible and essential that the researcher remains detached from the research situation. Neutral observation of reality must take place in the absence of any contaminating values or bias on the part of the researcher</p>

<p><i>Emic/Insider/Subjective</i></p> <p>Origins in anthropology. Research orientation centred on native/insider’s view. With the latter viewed as an appropriate judge of adequacy of research</p>	<p><i>Etic/Outsider/Objective</i></p> <p>Origins in anthropology. Research orientation outside researcher who is seen as objective and the appropriate analysis of research</p>
<p>METHODOLOGICAL LEVEL</p>	
<p><i>Qualitative</i></p> <p>Determining what things exist rather than how many there are. Thick description. Less structure and more responsive to needs and nature of research situation</p>	<p><i>Quantitative</i></p> <p>Use of mathematical and statistical techniques to identify facts and causal relationships. Samples can be larger and more representative. Results can be generalised to larger populations within known limits of error</p>
<p><i>Exploratory</i></p> <p>Concerned with discovering patterns in research data and to explain/understand them. Lays basic descriptive foundation. May lead to generation of hypotheses</p>	<p><i>Confirmatory</i></p> <p>Concerned with hypothesis testing & theory verification. Tends to follow positivist, quantitative modes of research</p>
<p><i>Induction</i></p> <p>Begins with specific instances which are used to arrive at overall generalisations which can be expected on the balance of probability. New evidence may cause conclusions to be revised. Criticised by many philosophers of science, but plays an important role in theory/hypothesis conception</p>	<p><i>Deduction</i></p> <p>Uses general results to ascribe properties to specific instances. An argument is valid if it is impossible for the conclusions to be false if premises are true. Associated with theory verification/falsification & hypothesis testing</p>
<p><i>Field</i></p> <p>Emphasis on realism of context in natural situation, but precision in control of variables and behaviour measurement cannot be achieved</p>	<p><i>Laboratory</i></p> <p>Precise measurement and control of variables, but at expense of naturalness of situation, since real world intensity & variation may not be achievable</p>
<p><i>Idiographic</i></p> <p>Individual-centred perspective which uses naturalistic contexts & qualitative methods to recognise unique experience of the subject</p>	<p><i>Nomothetic</i></p> <p>Group-centred perspective using controlled environments & quantitative methods to establish general laws</p>
<p>AXIOLOGICAL LEVEL</p>	
<p><i>Relevance</i></p> <p>External validity of actual research question & its relevance to practice is emphasised rather than constraining the focus to that researchable by ‘rigorous’ methods</p>	<p><i>Rigour</i></p> <p>Research characterised by hypothetico-deductive testing according to the positivist paradigm with emphasis on internal validity through tight experimental control and quantitative techniques</p>

Accordingly, the theoretical position of this research is described as follows:

- **Ontological level**

According to Krauss (2005), ontology involves the philosophy of reality; therefore, it considers the particular view of human being and all aspects of life (Hirschheim, 1992). From an ontological conception, this research holds to the **relativist position** because it aims at exploring an emerging phenomenon based on the return of Value and legacy from the construction industry to the entire society. Therefore, a wider conceptualisation of Value represented by a prescriptive Value model could be used to promote the alleviation of environmental and social issues through the provision of constructed facilities.

- **Epistemological level**

Krauss (2005) argued that epistemology addresses to how we come to know reality. Specifically, it refers to our theory of knowledge, particularly to how we gain knowledge (Hirschheim, 1992). From an epistemological level, this research holds on a **interpretivist position** because the researcher holds understanding and interpretation of current Value approaches, observation of current Chilean situation and qualitative data collected from three case studies, which are used to propose a wider conceptualisation of Value in the construction management field.

In summary, research philosophy explored above aids to properly place this research in theoretical position. Additionally, research process will be discussed in the following sections. It is important to underline that practical attempts to achieve research aim and objectives are usually influenced by the researcher own experience.

5.3 Research Process

According to Cambridge and Oxford dictionaries, research is defined as a:

- *“detailed study of a subject, especially in order to discover (new) information or reach a (new) understanding.”* (www.dictionary.cambridge.org)
- *“Systematic investigation or inquiry aimed at contributing to knowledge of a theory, topic, etc., by careful consideration, observation, or study of a subject.”*

In later use also: original critical or scientific investigation carried out under the auspices of an academic or other institution.” (www.oed.com)

Additionally, Fellows and Liu (2008) argued that research is a learning process that can be understood as a contribution to the knowledge, which is about facts and conclusions (What) and scientific or critical components (How). There are different kinds of research and, consequently, different research approaches linked to them. However, most research approaches follow similar steps. To exemplify, Table 5.2 includes research process from two different authors. Accordingly, any sort of research should be undertaken following a systematic process, which intuitively guides a logical sequence of activities. Hence, research process evidences activities performed from the identification of a research problem to the delivery of physical results such as a report, thesis, papers, etc. (Punch, 1998; Sekaran, 2003).

Table 5.2. Research Process Steps (Kumar, 2005; and Melville & Goddard, 1996)

Research Process Steps	
By Kumar (2005)	By Melville & Goddard (1996)
Step 1: Formulating a research problem	(1) Become aware of a topic and problem
Step 2: Conceptualising a research design	(2) Convert the problem into a well-demarcated research problem
Step 3: Constructing an instrument for data collection	(3) Carry out the research (data collection or experimentation)
Step 4: Selecting a sample	(4) Analyse results
Step 5: Writing a research proposal	(5) Write up findings
Step 6: Collecting data	
Step 7: Processing data	
Step 8: Writing a research report	

Based on previous systematic steps, the forthcoming sections explore the research design.

5.3.1 Research Design

Research design is considered the most important component of the research process; it involves several logical decisions, which lead to improve the scientific rigor of any research (Sekaran, 2003). Thus, research design includes the interaction among

human decisions, theory and practice. Literature reveals different traditions for designing research (Punch 1998; Neuman, 2011), which can be mainly focused on:

- The use (applied and pure research);
- The purpose (exploratory, explanatory, descriptive and predictive);
- The data collection techniques (qualitative, quantitative, etc);
- The study of cases (within or across case study); and
- The time dimension (cross sectional and longitudinal).

The following sections explore the generic characteristic of research traditions identified above. Additionally, the suitability of these tradition in the designing of this research is discussed.

Based on the most important components of research, such as aim and objectives, process design can also be linked to the questions “how will this research be used?”. At this level, the research approach can be divided into pure and applied research. According to Fellows and Liu (2008), pure research is linked to the development of new theoretical perspectives, largely linked to academic purpose; meanwhile, applied research is linked to practitioner in the industry (Holt, 1998). However, there is also a huge contribution to research arisen from a mixture of both (theory and application).

This research aims at linking Value delivery from the construction industry with society and the built environment (building & infrastructure projects), and represent this situation through a conceptual model, which considers different features and multidimensional attributes of Value. Therefore, this research is placed primarily in the category of **pure research**, because it explores an emerging phenomenon in developing countries such as Chile and the construction industry in general, which considers the return of Value and legacy from this sector to society as a whole.

To complement previous ideas, a prescriptive Value model was developed to visualise the total universe of Value and the relationship between society, the construction industry, and the building environment. Consequently, Value model development and evaluation are placed in the category of **applied research** because since these research actions attempt to support research aims through the conceptualisation of a

wider perspective of Value represented in a prescriptive model. The model aims basically to encourage construction sector's practitioners to reflect on common Value approaches mainly focused on the fulfilment of customer requirements.

Based on its purpose, this research is developed from an **exploratory** approach because an emerging subject is explored and there still is information that should be included in order to achieve a more global understanding in the literature and practice. The investigation of different approaches to manage Value and the exploration of the Chilean experience on SHP are used to visualise the concept of Value from a wider perspective, which includes the alleviation of environmental and social issues. It is important to mention that this kind of research is considered less structured or organised. Thus, researchers can look for new insights, formulate new questions, and consider a phenomenon from other perspectives. Additionally, exploratory approaches could also be considered the first step of a more structured and extensive investigation (Neuman, 2011; Robson, 2002).

According to Neuman (2011), within and across case studies are also used as an alternative form to design research. Within case study aims to deeply investigate a particular phenomenon. Meanwhile, across case study aims to superficially collect information from a large number of cases. Therefore, in within case studies sample size is smaller than across case studies. Additionally, Neuman (2011) argued that research could be also differentiated between cross sectional and longitudinal groups. This classification depends on the time dimension of the research; thus, cross sectional research collects data in a specific time, while longitudinal research collects data through different times. This research includes three case studied to explore how the concept of Value has been considered. Thus, qualitative data was collected after housing occupation of low income families in Chile. Therefore, data from each project was collected in a precise time.

Considering the method used to undertake research, literature review identified four different research designs. These are quantitative, qualitative, mixed and multi method design (Bryman 1989, Fellows and Liu 2008). Quantitative research design is explanatory in nature and considered an excellent means to prove or disapprove

research hypothesis. This kind of research aims at establishing the relationship between independent and dependent variables in a sample. It is assumed that social phenomena can be quantified, measured and therefore statistically analysed (Fowler, 2008). In contrast, qualitative research design is exploratory in nature and used as a way to obtain insights and understanding of a particular phenomenon (Mason, 2002). On the other hand, mixed methods of research implement a strategy basin on more than one kind of research method. These methods could be a combination of qualitative and quantitative methods, a combination of quantitative methods, or a combination of qualitative methods (Creswell, 2003). Consequently, mixed methods of research work also with different sort of data and sometimes other researchers or research groups investigated different aspects of the same idea, phenomenon, etc. As a result, mixed methods of research are usually referred to a multi strategy research design (Bryman, 2001).

To generate strong evidence of the research findings, this research includes **methodological triangulation**. Therefore, multiple method strategy is used to collect and analyse data in order to achieve the research aim, objectives, and answer the research questions from different angles. Accordingly, to conceptualise the global picture of Value and generate a prescriptive model to represent this situation, qualitative data was collected from three main resources: literature review, data analysis and case studies. Aimed to achieve research aim and answer research questions, different individually connected objectives were established. Thus, qualitative data was collected and analyses qualitatively and quantitatively according to particular objectives and different stages of this research. In brief, this investigation adopts the following main activities: (1) Initial observation, (2) Literature review, (3) Case Study, (4) Data collection, (5) Value model development, and (6) Data analysis. It is important to underline that those activities were carried out as a concurrent process rather than as structured and sequential steps. Figure 5.1 shows the main activities performed through this research.

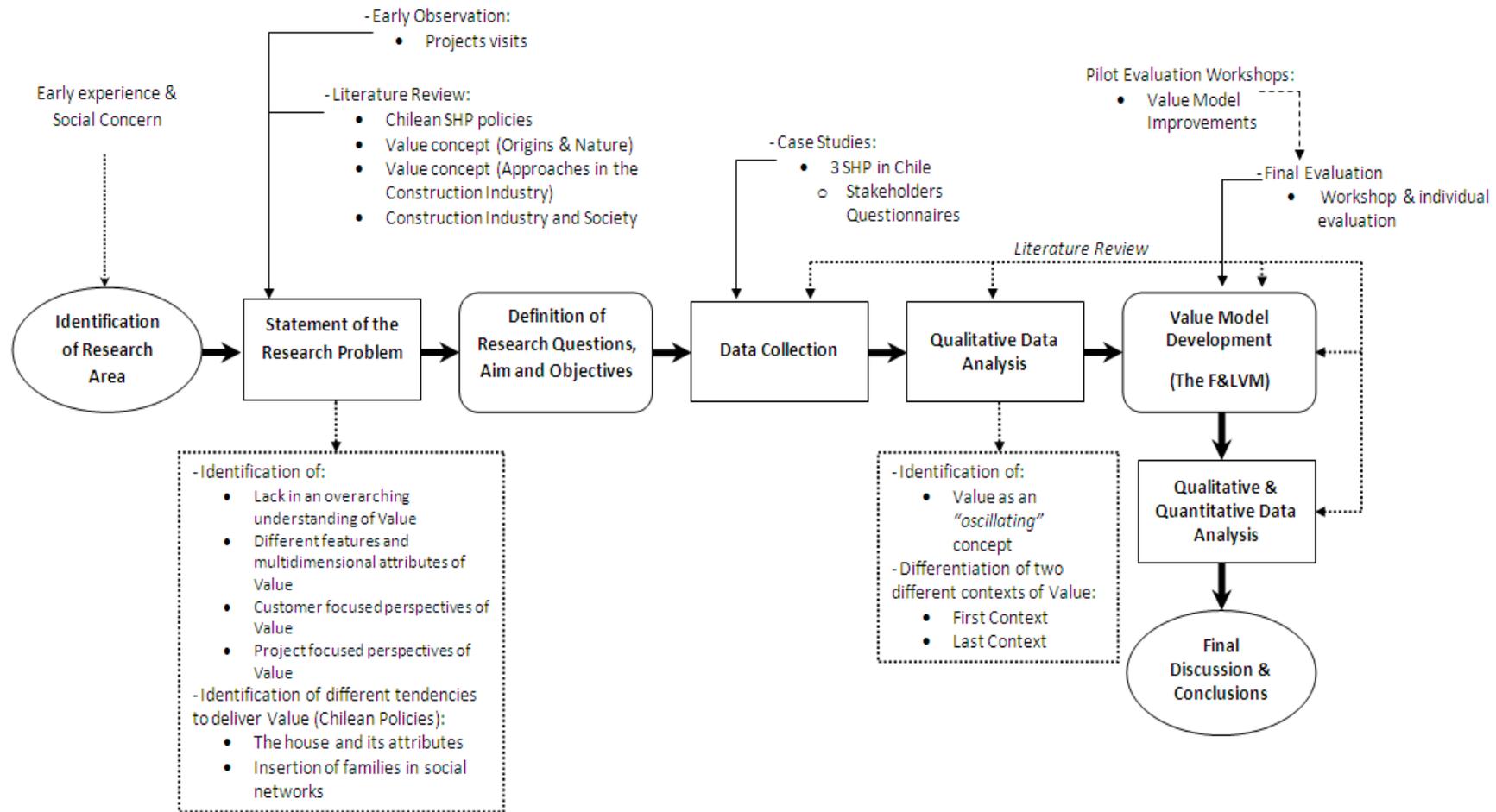


Figure 5.1. Research Methodology Diagram

5.4 Research Methods

Research methods consist of the practical aspects of scientific research, specifically the techniques used to collect and analyse data. It is important to underline that data is classified into two main groups: secondary and primary data. Generally, secondary data is collected by another individual and includes mainly analysis of documents. Meanwhile, primary data is collected by the researcher and includes activities such as observation, interviews and questionnaires (Kumar, 2005). Therefore, different resources provide information about the most suitable methods to collect and analyse data. It is important to underline that research methods could be regarded as techniques to collect evidence that can influence the process in which it is analysed (Remenyi et al. 1998).

5.4.1 Link between Research Objectives and Research Methods

To summarise decisions made in this research, Table 5.3 shows the relationship between the research methods and the objectives listed below:

1. Building a general understanding of the concept of Value;
2. Investigating different perspectives of Value used in the construction industry and identifying their similarities and differences;
3. Identifying the potential of different perspectives to consider the return of Value from construction industry to the entire society;
4. Exploring the concept of Value from Chilean policies and three SHP used as case studies; and
5. Developing and evaluating a conceptual model to visualise Value from a wider perspective.

Table 5.3. Relationship between research methods and research objectives

Research Methods		Research Objectives				
		1	2	3	4	5
Data Collection Methods	Observation				*	*
	Literature review	*	*	*	*	*
	Case study				*	*
	Documentary data				*	*
	Survey Questionnaire				*	*
	Focus Groups					*
Data Analysis	Quantitative (Measurement of Central tendency: Mean, Median and Standard Deviation)					*
	Qualitative (Coding & Classification)	*	*	*	*	*

5.4.2 Data Collection Methods of this Research

In order to achieve research aim and objectives, an explanation and justification of the specific methods are included through the following sections.

5.4.2.1 Observation

Observation is considered a critical requirement to propose improvements to existing practices, management perspectives or general knowledge. Thus, understanding the current situation and possible problems in full should be part of research activities from the beginning. Early research activities are commonly focused on review of literature; therefore, it becomes the starting point of initial understanding. On the other hand, observation is considered the easiest complement to a literature search (Holt, 1998). Other authors argue that good research practitioners include observation as the initial activity (Edwards and Talbot, 1996).

In this research, Chilean experience was explored using three SHP as a case study. These projects provided the opportunity to observe how Value from the construction

industry benefitted Chilean society as a whole. The researcher visited the project sites to observe housing locations and attributes, both aspects considered as central guidelines of the new Chilean policy. Moreover, these opportunities were followed by formal meetings with different stakeholders to obtain their future collaboration.

5.4.2.2 Literature review

Literature review can be understood as *“the compilation and assimilation of as much information as can be discovered with respect to a given topic”* (Holt, 1998: 53). Additionally, it is argued that *“literature review includes both the academic literature and official and unofficial documents (governmental policies, organizational procedural manuals, reports, news articles, etc.) that have interpreted the issue that is being studied.”* (Rudestam and Newton, 1992:80). In this research, activities were largely supported by theoretical review of current perspectives of Value in the construction sector and the investigation of the NChHP. Therefore, to understand the concept of Value, its several perspectives and Chilean policies more extensively, literature review was undertaken from the beginning of this research as an ongoing activity. In this way, different sources were explored, such as textbooks, newspapers, journals, conference proceedings, technical magazines, etc.

According to Kumar (2005), there are two initial steps in literature review: (1) Search for existing literature in your area of study and (2) Review literature selected. Following Kumar' guidelines, Loughborough University's library became the central source for this research: its online database offers numerous bibliographies on different research topics. Thus, several authors, perspectives and definitions of Value have been investigated in order to get a global picture and to understand how this concept has been currently used in different knowledge fields. In this way, the starting points for this research were key words such as Value, Value Management, Lean Thinking, Customer Value, etc.

In order to explore the current Chilean situation and to understand the processes and responsibilities of different organisations, official publications by the Chilean Ministry of Housing and Urban Development were investigated. In addition, the opinions of the

Chilean population on SHP were initially obtained from different social forums, such as newspapers and magazines. However, to increase reliability of this information other methods were considered in this investigation.

5.4.2.3 Documentary data

Documentary data is commonly ignored method by researchers, so the use of other methods such as surveys, interviews, observations, etc. have predominated (Robson, 2002). Nevertheless, depending on research aims and objectives, information from documentary data could be used alone or as a complement of other methods (Marchall and Rossman, 1995).

In this research, the official document "*Fondo Solidario de Vivienda-Manual para dirigentes y familias*" (www.minvu.cl) was used as a principal source of information from the Chilean government. This official manual allowed the identification of main stakeholder groups and their associated responsibilities, and different phases and activities along the life cycle of SHP in Chile. Information from documentary data analysis was used to differentiate Value delivery from a project focused and social perspective. In addition, qualitative data was also used to test the Value model proposed.

5.4.2.4 Case study

In general terms, the unit of analysis in a case study could be "*an individual, a community, an organization, a nation-state, an empire, or a civilization.*" (Orum et al. 1991:26). Therefore, case study is considered a very valuable source of information to understand the real situation of current construction practices and collecting evidence to illustrate more general findings. Thus, it is argued that a case study "*can permit the researcher to examine not only the complex of life in which people are implicated but also the impact on beliefs and decisions of the complex web of social interaction.*" (Feagin et al. 1991:8). As a result, case study gives the opportunity to deeply understand a particular subject, capturing complexities, relationships and processes (Robson, 2007). Additionally, it is argued that case studies provides the opportunity to

“reconstruct and analyze a case from a sociological perspective.” (Hamel and Dufour, 1993:1).

Case study includes different methods to collect data, which are used according to the nature of research and its objectives. Those methods could include interviews, questionnaires, observation, field study, etc. It is important to underline that case study methods have some detractors, who believe that quantitative methods are more appropriate to deliver serious results. Accordingly, it is argued *“Many social scientists still deeply believe that case studies are only appropriate for the descriptive phase, and that experiments are the only way of doing explanatory or causal inquiries.”* (Yin, 2003:3). On the contrary, it is also stated that case study has the ability to provide evidence of a real situation, allowing the study of practice and making contact with actual participants contributing with practical knowledge (Blakstad, 2001; Simon, 2009).

In this research, three SHP located in the Metropolitan region of Santiago, Chile were used as case studies to triangulate literature review and documentary data analysis. According to the NChHP, stakeholders were firstly identified, and secondly asked about activities performed to meet families' and social needs. In this way, different questionnaires were designed to collect qualitative data. This information was used to identify the context where Value was considered in current Chilean practices.

5.4.2.5 Survey questionnaire

In order to design functional questionnaires, it is necessary to be aware of some initial considerations which may help to draw up questions effectively. Consequently, Bryman (1989:40-1) proposed six key recommendations:

- 1. Questions should be clear and unambiguous.*
- 2. Wherever possible, simple language should be used; jargon or words which do not have an everyday usage should be avoided.*
- 3. Short questions are preferred.*

4. *'Double-barrelled' questions (in which the respondent is asked about two things in one question) should be avoided...*

5. *Questions should not contain negatives, as they can be readily misinterpreted...*

6. *Leading questions and presuming questions should be avoided...*

Besides, there are two types of questions to be used in a questionnaire: open-ended and closed questions. According to Kumar (2005):

- **Open-ended questions:** The possible responses are not given. In the case of a questionnaire, the respondent writes down the answers in his/her own words.
- **Closed questions:** The possible answers are set out in the questionnaire or schedule and the respondent or the investigator ticks the category that best describes the respondent's answer.

In this research, three questionnaires were designed to investigate general and particular (case studies) experience of stakeholders working in SHP in Chile. Questions were elaborated in a simple manner in order to facilitate respondents work. In the case that time was needed, answers were obtained via e-mail.

Research questionnaires are briefly described below. However, detailed information and sample description will be included in future sections.

- **Questionnaire 1:** This open-ended questions questionnaire aims at firstly investigating current problems in SHP in Chile. To address stakeholder answers based on their general experience, problems were asked as relative to the Chilean Government, families participating in SHP and Chilean society. In addition, this questionnaire aims to investigate stakeholders' general and particular experiences to identify end users and social need that they are trying to meet through housing provision.
- **Questionnaire 2:** This open-ended questionnaire aims to investigate stakeholders' activities performed through the life cycle of the three case studied included in this research.

- **Questionnaire 3:** This questionnaire is part of the evaluation process of the Value model proposed under Lean Construction perspective. It firstly includes a set of four closed questions aimed to explore the personal vision of the concept of Value from current researchers and practitioners. Secondly, this questionnaire includes a set of two open-ended questions: the first question focused on recognising the individual consideration of early stage of projects. Meanwhile, the second question helps to determine the individual understanding of the concept of Value. Finally, to observe possible modifications of initial answers after introducing and explaining the Value model, this questionnaire firstly includes the same set of four closed questions described above. Additionally, two sets of new closed questions were included to evaluate the model of Value proposed and identify barriers and advantages. In the case of pilot evaluations, respondents' opinions were collected to improve the Value model.

5.4.2.6 Focus groups

Focus groups are a form of group interview with participation of different people. Therefore, it is possible to generate interaction within the group, so that qualitative and quantitative information can be provided (numerical and measurable) (Brymann and Bell, 2003). For this reason, focus groups are frequently used for evaluation purposes.

In this research, focus groups were conducted to evaluate the model of Value; thus, interactive workshops were conducted in order to introduce and explain the F&LVM and receive feedback from participants through an evaluation questionnaire. The first two workshops were designed as a pilot evaluation consisting of researchers from Loughborough University working in areas such as concept of Value, Lean Thinking and design management. Thus, feedback received from preliminary evaluators allowed the development of the final workshop presentation and the questionnaire surveyed. The final workshop was run in Luxemburg during the second annual meeting of the European Group for Lean Construction-EGLC (November, 2010). In addition, an

individual evaluation was conducted to obtain Glenn Ballard's opinion (Lean Construction researcher and practitioner).

5.5 Sample Selection

Data sampling plays a crucial role in ensuring the credibility of the research achievements. Representative and non-biased samples must be considered to show valid and reliable research findings. As a result of the complexity to collect data from the whole population, reduced and representative population samples are used to characterize research findings and draw general conclusions (Tashakkori and Teddlie, 1998). Literature review evidenced two main sampling methods, which are related to probability and non-probability samplings. Probability sampling includes methods such as simple random, systematic random, stratified random, proportional, cluster random and multistage cluster samplings. Moreover, non-probability sampling includes methods such as purposive sampling, sampling for homogeneity or heterogeneity, stratified non-random sampling, snowball, sequential, convenience, and adaptive sampling (Robson, 2011; Neuman, 2011).

5.5.1 Case Study Sampling

Given the distance between Chile and the UK, it is difficult to collect data about Chilean experience in SHP as sometimes physical contact is required. In this research three case studies were investigated applying purposive sampling method, which is relevant when researchers are concerned with understanding a particular situation that is rich in information (Patton, 1990; Silverman, 2000). It is important to know that purposive sampling has some detractors because researchers already know some specific information or crucial feature of the sample (Vogt, 2005).

Initially, exploration of virtual media such as Internet was used to select the case study population. Accordingly, news about the NChHP allowed identification of three SHP located in the Metropolitan Region of Santiago of Chile. Those projects were built under the NChHP, which is the main feature already known by the researcher to select sampling population. In addition, those projects present important features such as

size, quality and location, which could be the reason why its outcome has been underlined by the media.

After identification of case studies, it was necessary to make contact with the organizations working on these projects. In this way, the main source used was e-mailing stakeholders working in those projects. As a result of this contact, travel opportunities to Chile allowed the creation of a useful research network to obtain stakeholders collaboration.

5.5.2 Survey Sampling

Firstly, the NChHP was used to identify the population surveyed in order to explore Chilean stakeholders' experience. Population surveyed included five organisations: SERVIU, EGIS, Town Council, architectural team and building company. It is important to know that snowball as a subcategory of purposive method was used to obtain data from different stakeholders working in SHP in Chile. This method is used when someone who meets some criteria is firstly identified and afterwards recommends another individual who meets similar criteria. In this research, the criterion respondents had to comply with was being part of any of the three case studies identified previously by the media.

The following activities were undertaken with the purpose of collecting data:

- An e-mail was elaborated, which included personal details and also University and PhD Programme information. This was used as a tool to introduce research purpose and to obtain collaboration from people involved in SHP in Chile;
- Questionnaires included clear instructions to be answered in a correct way and also a statement underlying reliability of this research: *"The present exercise is part of the research to obtain the Doctor of Philosophy Degree of Loughborough University. Please, be aware that all the information provided will be treated responsibly"*;

- Questions were elaborated in a simple manner in order to facilitate respondents work. They were also supported if clarification of any question was needed; and
- Time restrictions were omitted, so respondents could feel free to answer questions and request information to other participants of the same organization in order to complement their own ideas.

Secondly, aimed at evaluating the Value model proposed; population was identified using another subcategory of purposive sampling method. This subcategory is called expert sampling and is used when there is a sample of people with a demonstrable experience in a particular field. In this evaluation process, the F&LVM was examined under the perspective of Lean Construction's researchers and practitioners.

5.6 Value Model Development

Actions can be understood as doing something, performance, activity or the work of one factor over another in order to produce a change (Merriam-Webster Dictionary, 2000). In this research, after collection of data from literature, data analysis and case studies, a prescriptive Value model was designed to conceptualise Value from a wider perspective. The F&LVM was proposed as an innovative manner to solve the problems detected in literature review, such as common customer-focused perspectives of Value, lack in an overarching understanding of Value and lack in the relationship between building projects and society. A second action was performed to evaluate the potential of this model. Thus, neutrality was considered through the evaluation process, where the opinion of Lean Construction researchers and practitioners was collected through different workshops.

5.7 Data Analysis

Data analysis refers to the examination and interpretation of data collected. Thus, two kinds of data can be collected: qualitative data dealing with words and quantitative data dealing with numbers. According to Witte and Witte (2009), both groups are defined as follows:

- **Quantitative data** — When, among a set of observations, any single observation is a number that represents an amount or a number, then data is quantitative.
- **Qualitative data** — When, among a set of observations, any single observation is a word, or a sentence, or a description, or a code that represents a category, then data is qualitative.

Along this research, qualitative data was collected and analysed using qualitative and quantitative techniques. These activities are described in the following sections.

5.7.1 Analysis of Qualitative Data

Qualitative data can be obtained in diverse formats: notes, interview's transcriptions, texts, etc. In this research qualitative data was obtained from two main sources –documentary data analysis and questionnaires (aimed to firstly explore stakeholder's experience in SHP in Chile and secondly to evaluate the Value model developed and to obtain individual understanding of Value from current researcher and practitioners). Thus, the following activities were performed to analyse data qualitatively and quantitatively:

1. Data was firstly transcribed, separated and identified for referencing purposes by respondent's name. Secondly, a back-up copy of all original answers was kept;
2. According to Strauss and Corbin (1990), coding qualitative data is about discovering, naming and categorising phenomena, and developing categories related to their properties and dimensions. Therefore, when Chilean stakeholders' experience was investigated, the concepts of Last Value and First Value were used to identify Value delivery activities at project level and Value delivery to society;
3. Evaluation stage explored personal vision of the concept of Value. Thus, data was classified in three main groups: (1) Customer-focused perspective of Value, (2) Value as a function of other parameters, and (3) wider perspective

of Value. Additionally, the concepts of First and Last Value were also used to identify Value understanding from a project focused perspective and from a social or wider perspective;

4. Evaluation stage also identified barriers, advantages and final comments to improve the F&LVM in future research. Accordingly, data collected was considered with regard to the aim and objectives of the F&LVM and divided into two perspectives: (1) Perceived limitation (PL) of the F&LVM and (2) outside scope (OS) of current research;
5. To measure respondents' opinion about acceptability of the F&LVM, qualitative data was analysed quantitatively by means of a Likert scale of five items. The items went from not applicable to strongly agree (0 = Not applicable, 1 = Strongly Disagree, 2 = Somewhat Disagree, 3 = Neither Agree nor Disagree, 4= Somewhat Agree, and 5 = Strongly Agree). Even though there are other forms of evaluation, the Likert scale is used based on several benefits: it is commonly used (Bernard, 2000), easy to construct, allows the use of hidden attitudes and finally produces a highly reliable scale (Baker, 2003). In this research, measurement of a central tendency was used to obtain an overall assessment of the typical values for each variable. Thus, the most widely used measurements were calculated: Mean, Median and Standard Deviation. Each measurement of central tendency provided important information about the Value of each variable. Thus, results were used for the analysis and discussion of the Value model proposed. Additionally, evaluation process also explored individual consideration of early stage of projects. To discuss respondent's opinion, percentages were calculated to visualise predominant understanding.

5.8 Reliability and Validity

Reliability and validity ensure credibility of research findings (Neuman, 2011). Consequently, it is possible to find both terms even in a research definition. As mentioned above, when a research study is undertaken, it involves a framework of a

set of philosophies; adequate procedures, method and techniques that ensure validity and reliability; and unbiased and objective characteristics (Kumar, 2005:6). Therefore, it is interpreted that all research processes must provide information, results and future conclusions, where both terms are considered. Consequently, it is argued *“When a measure is devised, it should not be presumed to be appropriate and adequate; rather, it is necessary to establish that it meets the researcher’s aims and that it has adequate measurement properties. Discussions of such issues usually involve a consideration of whether the measure is reliable and valid.”* (Bryman, 1989: 41).

- **Reliability**

Reliability can be interpreted as *“the ability to replicate the original study using the same research instrument and to get the same results.”* (Orum et al. 1991:17). In addition, it is considered an essential element in data collection and, for this reason, all information collected must have a support and be unbiased: *“Data collection is reliable if gets essentially the same data when a measurement is repeated under the same condition”* (Robson, 2007:71).

- **Validity**

According to Cook and Campbell (1979) validity is considered the *“best available approximation to the truth or falsity of a given inference, proposition or conclusion.”*. Furthermore, it is argued that *“The most basic way of establishing validity is to gauge whether a measure has face validity. Quite simply, this means that it is necessary to examine whether there appears to be a correspondence between the measures, be it a single indicator or a multiple-indicator index, and the concept in question”* (Bryman, 1989:41). Therefore, validity is about credibility: of a description, a conclusion, an explanation, an interpretation or of another kind of piece of information. According to Hall and Hall (1996), validity shows that any sort of method such as test, questionnaire, etc. is actually measuring what we want to measure.

It is also important to mention that in a qualitative research, validity and reliability are grouped in a third concept —“credibility”— which, according to Mansourian (2007),

includes three aspects: Neutrality (objectivity); Truthfulness (validity); and Replicability (reliability).

In this research, to ensure reliability and validity of (1) election of research methods and (2) analysis of research findings, actions detailed below were performed. In addition, neutrality was managed through evaluation process of the Value model, so the opinion of researchers and practitioners was used to discuss the potential of the F&LVM.

5.8.1 Reliability and Validity of Research Methods

As mentioned previously, research methods were chosen according to the aim and objectives established in this investigation. Thus, to make the selection reliable and valid, the following actions were performed:

- Research aim, objectives, methodological approach and research methods are explicitly explained throughout this document;
- Justification of decision making (Denscombe, 1998);
- Reliability and validity of questionnaires surveyed is based on guaranteeing that these questionnaires fully represent the information which supports the subject studied (Baker, 1994); consulting opinion and pretesting the questionnaires with research supervisor as a specialist of the topic investigated and conducting a pilot evaluation before designed workshop; and finally encouraging respondents to answer questionnaires appropriately (Adams and Schvaneveldt, 1991). Accordingly, instructions were stated clearly;
- To evaluate the Value model, researchers and practitioners of the construction sector were consulted. Thus, subjective interpretations were contrasted with real facts and other sort of data sources (Yin, 1989; Maxwell, 1996);
- Documentary data analysis is obtained from a reliable source of information (Official Chilean manuals);
- Case studies were chosen according to their impact on media and their descriptions are included through this document; and

- Documentary data analysis was triangulated with qualitative data obtained through the exploration of SHP in Chile. Thus, different sources are used to collect information and research findings that make sense.

5.8.2 Reliability and Validity of Research Findings

According to Burns (2000) and Denscombe (1998), there are different ways to check reliability and validity of research findings. In this research, the following activities were carried out.

- Research methods were selected according to the aim and objectives proposed; the research results are included throughout this document;
- This research's results have been published in conferences and Journal papers; thus, the revision of author perspective was validated by researchers and practitioners of the construction sector;
- Discussion of research findings is included. It is based on particular results of this research and other sources of information. Besides, to support research arguments qualitative data was collected and analysed both qualitatively and quantitatively;
- Conclusions have underlined several aspects of this research and opened the opportunity for future investigation; and
- Research limitation has been underlined and justified properly.

5.9 Conclusion

The aim of this research emerged from the need to underline and better comprehend and emerging phenomenon based on the return of Value from the construction industry to society as a whole. Thus, the research established that a global conceptualisation of Value based on the return of Value from the construction industry to the entire society could enlarge the potential of this sector to better address universal issues from early stage of projects. In order to achieve the research aim and objectives, the methodology adopted through this research was firstly

devoted to investigate current perspectives of Value in the construction industry, to explore Chilean experience in SHP, and to develop a model of Value to visualise the global picture. This chapter described the research process and research approaches undertaken during this investigation, with the purpose of showing the pathway followed and the tools used to carry out the different activities in a proper manner.

This investigation is placed primarily in the category of pure research and selection of research methodology was based on two main factors: (1) a function of the defined objectives and (2) the nature of input data available. From a philosophical perspective, this research was basically held on a relativist position from an ontological conception. Besides, from an epistemological level this research holds on an interpretivist position.

From a methodological level, this research adopted an exploratory and inductive approach. The research design adopted comprises six main activities: (1) Initial observation, (2) Literature review, (3) Case Study, (4) Data collection, (5) Value model development, and (6) Data analysis. These activities were carried out as a concurrent process rather than with structured and sequential steps. To ensure that research methodology and research methods will achieve research aim and objectives, the relationship between research methods and objectives was established.

In order to increase the reliability and validity of research findings, data was collected using different methods according to specific objectives. The methods used throughout this research process were observation, literature review, case study, documentary data, survey questionnaire, and focus group. In addition, to illustrate the total universe of Value, a conceptual model was designed and evaluated under the criteria of Lean Construction researchers and practitioners. Qualitative data collected from interactive workshops was firstly transcribed, separated and identified for referencing purposes by respondents' names. Secondly, the data was analysed qualitatively and quantitatively.

The next Chapter explores three social housing projects located in the Metropolitan Region of Santiago, Chile chosen as case studies. Data collected from these projects is

used to triangulate literature review about the concept of Value and documentary analysis concerning the NChHP.

CHAPTER SIX. CASE STUDIES: SOCIAL HOUSING PROJECTS IN CHILE

6.1 Introduction

Chapter 6 complements the exploration of the New Chilean Housing Policy on SHP. In order to triangulate literature review about the concept of Value and the exploration of the Chilean policy, three social housing projects located in the Metropolitan Region of Santiago, Chile were used as case studies. Consequently, questionnaires were designed to understand the role performed by different stakeholders involved in these projects. Stakeholders' activities evidenced the return of Value from the construction industry to the entire society through the alleviation of social issues for the Chilean population. From this situation, Value was observed to be an *"oscillating"* concept. The visualisation of this emerging phenomenon provides the opportunity to conceptualise Value from a wider perspective and enhance the potential of the construction industry in the mitigation of global issues. As a developing country, Chile provides a fresh platform for designing a built environment that may deliver a measurable contribution to society.

6.2 Case Studies Description

Three SHP located in the Metropolitan Region of Santiago, Chile were selected as case studies to explore how Value has been considered and delivered by different stakeholders using the NChHP. Case studies description is included in Table 6.1.

Table 6.1. SHP in Chile: Case studies description

Project	Description	
Vista Hermosa (2007)	Location:	Town Council of “Lo Espejo”
	N° of Families:	30
	House design Features:	Area of 672 sq.ft, three bedrooms, living room, kitchen, bathroom and additional space that can be used as a laundry
	Investment (per house):	<ul style="list-style-type: none"> • State resources (14,643 USD, Dec 07) • Location subsidy (1,029 USD, Dec 07) • Equipment subsidy (475 USD, Dec 07) • Family savings (990 USD, Dec 07) • Extension subsidy (3,562 USD, Dec 07) • Donations (1,979 USD, Dec 07)
Condominio Antumalal (2008)	Location:	Town Council of “Renca”
	N° of Families:	170
	House design Features:	Area of 699 sq.ft, distributed into three floors, including front yard garden and backyard. This project also offers a community area used for frequent meetings and workshops
	Investment (per house):	<ul style="list-style-type: none"> • State resources (15,475 USD, May 08) • Location subsidy (7,946 USD, May 08) • Equipment subsidy (502 USD, May 08) • Extension subsidy (3,764 USD, May 08) • Family savings (836 USD, May 08)
Condominio San Francisco (2009)	Location:	Town Council of “Pudahuel”
	N° of Families:	132
	House design Features:	Area of 592 sq.ft, including three bedrooms, living room, kitchen, bathroom, loggia and balcony. The project also includes parking area, green areas and activity centre of 786 sq.ft.

	Investment (per house):	<ul style="list-style-type: none"> • State resources (25,837 USD, Sep 09) • Family savings (814 USD, Sep 09) • Donations (316,681 USD, Sep 09)
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6.3 Data collection: Questionnaires and Sample Description

According to the NChHP, five stakeholder groups were identified: EGIS, SERVIU, Town Council, architectural team and building company.

As mentioned in the Research Methodology section (Chapter 5), qualitative data was obtained from two open-ended questions questionnaires, which are described as follows:

- **Questionnaire 1:** Intended to explore general and particular (case studies) experience of different stakeholders actively working in SHP in Chile, this questionnaire includes two sets of questions. Figure 6.1 is used to clarify questionnaire's structure.

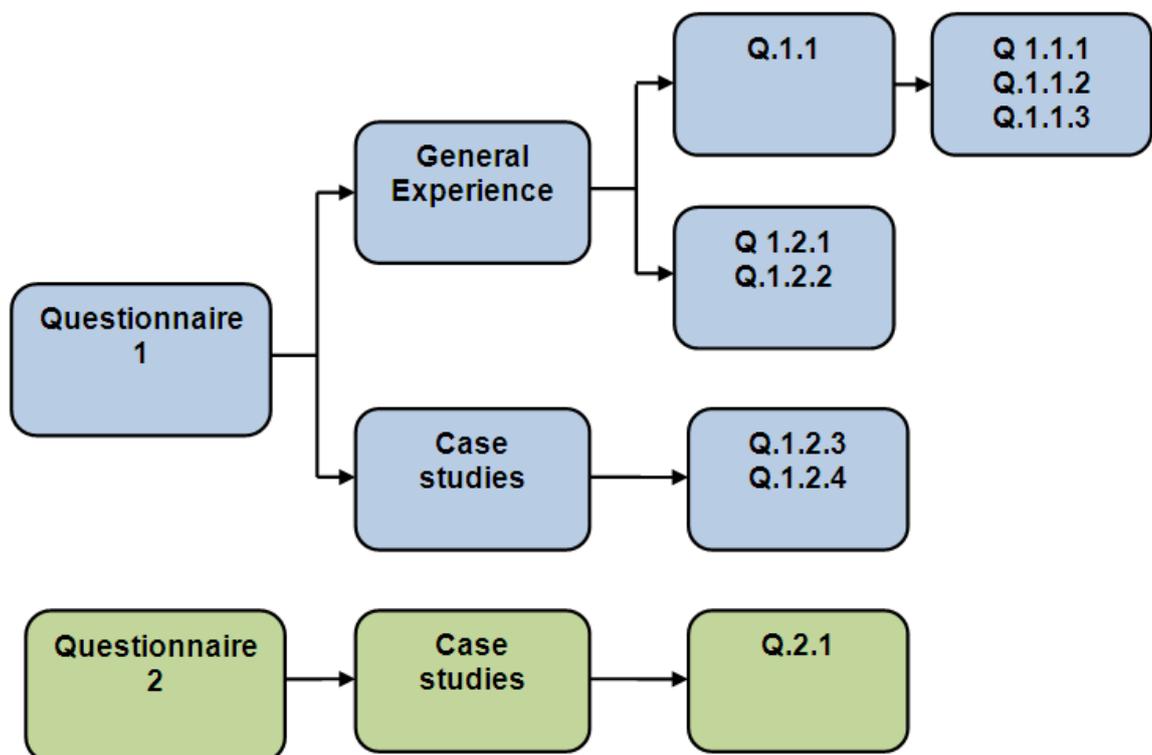


Figure 6.1. Data Collection - Questionnaires Structure

The first set of questions aimed to identify current problems detected by stakeholders working in SHP in Chile. The questions surveyed are:

- **Q.1.1 Which are the most important problems in Social Housing Projects in Chile?**
 - **Q.1.1.1 Relative to the Government**
 - **Q.1.1.2 Relative to Families**
 - **Q.1.1.3 Relative to the Society**

Table 6.2 includes Sample description for questions **Q.1.1** (Q.1.1.1, Q.1.1.2 and Q.1.1.3). In addition, full detail of responses from this set of question is included in Appendix 2.

Table 6.2. Sample description question Q.1.1 (Q.1.1.1, Q.1.1.2 and Q.1.1.3)

	Details
Stakeholder Organisations:	<ul style="list-style-type: none"> • SERVIU METROPOLITANO – Governmental body • Lo Espejo – Town Council • Renca – Town Council • Lo Barnechea – Town Council & EGIS • Simonetti – Building Company • SIESCON – Building Company • ORMUZ Ltda. – Building Company • JUNDEP – EGIS • EPS – EGIS & Architectural Company • ELEMENTAL – Architectural Company • Foundation “Un Techo Para Chile”
Respondents Profile:	<ul style="list-style-type: none"> • 6 Architects • 3 Project managers • 1 Building engineer • 1 Civil engineer • 1 Social worker

The second set of questions aimed to explore general and particular experience of different stakeholders working in SHP in Chile. Thus, the following questions were formulated:

- ***Social housing projects general experience:***
 - ***Q.1.2.1*** *In relation to families, which needs are you trying to meet?*
 - ***Q.1.2.2*** *In relation to Society, which needs are you trying to meet?*
- ***Social housing projects particular experience (three case studies):***
 - ***Q.1.2.3*** *In relation to families, which needs are you trying to meet?*
 - ***Q.1.2.4*** *In relation to the Society, which needs are you trying to meet?*

Table 6.3 includes Sample's description for questions **Q.1.2.1**, **Q.1.2.2**, **Q.1.2.3** and **Q.1.2.4**. In addition, full detail of responses from this set of question is included in Appendix 3.

Table 6.3. Sample description questions Q.1.2.1, Q.1.2.2, Q.1.2.3, Q.1.2.4 and Q.2.1.

Case Study	Stakeholder	Respondents Position
Vista Hermosa	• Ministry (Sub-Department of Housing Operations)	• Sub-director Assessor
	• EGIS: UTpCH	• Director of Definitive Housing Department
	• Town Council: Lo Espejo	• Manager of Housing Department
	• Building company: Simonetti	• Project manager
	• Architectural company: Elemental	• Project architect
Lo Boza	• Ministry (SERVIU - DFC)	• Project architect
	• EGIS: JUNDEP	• Project architect
	• Town Council: Renca	• Project architect
	• Building company: SIESCON	• Building engineer
	• Architectural company: ELEMENTAL	• Manager of Technical Department
San Francisco	• Ministry (SERVIU - DFC)	• Project architect
	• EGIS: EPS	• Project architect
	• Town Council: Pudahuel	• Welfare worker
	• Building company: ORMUZ	• Project manager
	• Architectural company: EPS	• Project architect

- **Questionnaire 2:** This questionnaire intended to identify activities performed through the life cycle of SHP in Chile (particular experience & case studies). To facilitate analysis of data collected, eight project stages were considered: New building requirement, feasibility, scheme design, detail design, construction, use, refurbish and demolition. These stages were adapted from RIBA Outline Plan of Work stages – 2007. Accordingly, stakeholders were asked:

- **Q.2.1** *Based on the job performed, provide detailed information on the activities carried out through the life cycle of projects.*

Sample's description included in Table 6.3 is the same used for question **Q.2.1**. In addition, detailed information for this question is included in Appendix 4.

6.4 Data Collected

The following sections analyse qualitative data collected using previous sources.

6.4.1 Current problem of SHP in Chile

Social perception of current results on SHP in Chile continues being broadly criticised. This situation was initially identified through the review of social forums such as newspapers and magazines⁷. Appendix 5 includes data collected from previous sources, whose central ideas are summarised as follows:

1. **Housing standards:** Project features are criticised in terms of inadequate housing standard such as size and quality.
2. **Role of Government:** To watch over welfare of the entire population is regarded as the main role of the Chilean Government. It is argued that public resources should be distributed to ensure a minimum living standard of the whole population. Therefore, the role of Chilean Government is criticised because there is not a close relationship between the Government and private organisations to ensure projects success. Additionally, Chilean policies are also criticised because low-income families have to fulfil initial saving requirements. In this way, it is argued that Governments do not provide the necessary monetary resources.

⁷ *It is important to mention that data collected from newspapers and magazines gives only a snapshot of opinion and is not an authoritative source of data. Additionally, Chilean press is a private source, therefore, its view may be biased by the editor's opinion and usually does not reflect a popular or fashionable view even if it is "incorrect". In order to make this information reliable, qualitative data was collected from different stakeholders currently working in SHP in Chile (questions **Q.1.1**: Q.1.1.1, Q.1.1.2 and Q.1.1.3).*

3. **Role of private organisations:** At present, the Chilean Government is focusing on the optimization of human and funding resources to expedite current processes and achieve sustainable projects as per technical and economic parameters. Consequently, responsibilities have been delegated and private organizations have been included into current processes. However, the role of private organisations is criticised because they consider profitability more important than social responsibility.

To complement the opinion of the population expressed in social forums, qualitative data was collected from questions **Q.1.1** (Q.1.1.1, Q.1.1.2 and Q.1.1.3) previously described. Table 6.4 summarises the opinion of different stakeholders working in SHP in Chile.

Table 6.4. Current Problems of SHP in Chile - Stakeholder's Opinion

Government	Families	Society
<ul style="list-style-type: none"> • Lack and high cost of urban lands; • Delay in payments; • Reduced budgets; • Restrictive rules from design perspective; • Policies focused on better neighbourhood instead of better houses; • Confusing technical requirements (Regulations); • Lack of support for families after house provision (Useless SIP); • Long process to deliver final solution; • Delegation of responsibilities to private companies. 	<ul style="list-style-type: none"> • Insufficient income to opt for a subsidy; • Social problems: drug consumption, alcoholism, delinquency, unemployment, overcrowding, etc.; • Lack of compromise; • Passive role through project development; • No awareness about future payments associated to the house (supply services: water, electricity, etc.); • Socialisation with other neighbours after house occupation. 	<ul style="list-style-type: none"> • Rejection of SHP in the surroundings (Segregation); • Stigmatisation of low income people; • Underestimation of project solutions; • No initiatives to integrate people and create better neighbourhoods.

Data from Table 6.4 corroborates the opinion of the Chilean population and adds other problems underlined as follows:

1. **Delegation of responsibilities:** This problem is closely related to points 2) and 3) identified from the opinion of Chilean population through social forums, where the role of private organisations was criticised. It is argued that delegation of governmental responsibilities could relegate social welfare over individual interests (profitability).
2. **Ineffective social insertion of families:** This problem was also identified from the opinion of Chilean population through social forums (points 2) and 3)). The role of Government and private organisations with regards to providing continuous support to the families after house occupation. Therefore, stakeholders miss the opportunity to avoid a permanent social risk of low-income families.
3. **Lack of family's participation:** As a result of the urgent necessity to meet basic needs (house solution and supply services), the delay of formal processes decreases families' motivation. Therefore, a lack of active participation of end users along the life cycle of projects is criticised.
4. **Segregation and stigmatisation of families:** The deficit of available and affordable land close to cities has been broadly emphasised. Therefore, low-income families continue to be segregated to places isolated from social networks. Thus, opportunities to overcome the abject poverty are reduced producing a constant permanence of social issues. This situation causes a lack of support from the Chilean population to accept the construction of SHP located close to neighbourhoods with better standards.

6.4.2 Fulfilment of End Users and Social Needs

According to the NChHP, three main governmental objectives were identified: Reduction of housing deficit, guaranty of housing quality and integration of families into society. When stakeholders were asked about the needs of families (end users) and society that they are trying to meet (Questions: **Q.1.2.1, Q.1.2.2, Q.1.2.3, and**

Q.1.2.4), qualitative data corroborated previous tendencies identified from the exploration of the NChHP (Chapter 4):

1. **The house and its attributes:** Provision of definitive housing solution is regarded as the main need of low-income families. Thus, the improvement of housing standards is closely linked to the fulfilment of this physical requirement. Accordingly, technical aspects such as materials, size, etc. are managed in terms of available resources. Additionally, other functional aspects such as green areas and common spaces have been also integrated.
2. **Insertion of families in social networks:** Several social issues were distinguished by different stakeholders such as drug consumption, poverty, unemployment, stigmatization, residential and urban segregation, etc., whose negative impacts affect the quality of life of the whole population. Hence, insertion of low-income families into society is underlined as a critical need to be fulfilled. Thus, projects located close to social networks provide the opportunity to integrate people inside urban areas avoiding a continuous poverty cycle and making the town an equity resource.

6.4.3 Activities Performed through the Life Cycle of Projects

When stakeholders were asked about their activities performed through the life cycle of projects (Question: **Q.2.1**), the following main activities were identified:

- **New building requirement:**
 - Coordinate activities;
 - Determine demand;
 - Perform participative workshops (e.g. housing design, neighbourhood, equipment, etc.);
 - Address families' expectations; and
 - Assess land site alternatives.
- **Feasibility:**
 - Evaluate project costs and feasibility aspects (Technical & legal studies);
 - Determine the exact number of families to be included in the project;

- Define housing size, model & urban sketches; and
- Determine economic feasibility (Design).
- **Scheme Design:**
 - Workshops (Housing Design, neighbourhood, equipment);
 - Management of families' expectations;
 - Elaboration of models to scale and 3D models (Design based on the use of the house); and
 - Elaboration of specialities projects (sanitation, paving & electricity).
- **Detail Design:**
 - Adjustment of Budget-Design;
 - Approval of final design;
 - Certification of final solution (Technical & legal requirements);
 - Elaboration of housing plan (technical drawings); and
 - Procurement of edification permissions.
- **Construction:**
 - Planning and controlling of construction site activities;
 - Defining type of construction contract (e.g. lump sum, unit price contract, etc.)
 - Organisation of working meeting with different stakeholders;
 - Managing families' expectations (e.g. organise project site visits);
 - Technical inspections; and
 - Legal housing approval.
- **Use:**
 - Workshops (use, maintenance and future extensions).
- **Refurbish:**
 - No involvement.
- **Demolish:**
 - Not in related with those projects.

Stakeholders' activities corroborate the main tendencies previously identified and related to (1) the house and its attributes and (2) insertion of low income families into

society. Therefore, data collected from the exploration of three case studied supports the visualisation of two contexts of Value:

1. **Value delivery focuses on the physical product:** Activities linked to deliver the house and improve its attributes (“Market Value” & “Utility Value”), and
2. **Value delivery to society:** Activities oriented to insert low-income people into society and its intrinsic consequences such as less social vulnerability and risk.

Table 6.5 summarised main actions linked to deliver Value from the previous contexts:

Table 6.5. Two different contexts to deliver Value from SHP in Chile (case studies)

Value delivery (Physical Product)	Value delivery to Chilean Society
<ul style="list-style-type: none"> • Improvement of house attributes: Quality, materials, space, function, etc. ; • Management of project features in terms of the available resources (project design); • Planning & control of construction site activities; • Involvement of end user from early stage of projects (e.g. interpretation of families’ housing expectations). 	<ul style="list-style-type: none"> • Definition of Social Insertion Plan (SIP); • Detection of social problems such as delinquency, drugs abuse, unemployment, etc.; • Family professional training; • Insertion of families in social networks (schools, hospitals, transportation, police station, etc.). • Improvement of public safety; • Improvement of social environment (aesthetic), etc.

6.5 Discussion of Value Delivery from Chilean Experience (Case studies)

Chilean experience on SHP provides the opportunity to visualise Value from a wider perspective. The first two principles (reduction of housing deficit and improved project quality) included in the NChHP are closely related to Value approaches focused on

product delivery and improvement of its attributes. However, the third principle considers Value delivery from a wider perspective including the impact and legacy from the construction industry to the Chilean society. Therefore, two contexts to deliver Value were identified from the exploration of three case studies built in the Metropolitan Region of Santiago of Chile. Thus, *First context* refers to Value delivery to the society (Environmental & Social issues), and *Last context* deals with Value delivery at project level (Production process – the work).

Consequently, *First context* provides the opportunity to visualise an emerging phenomenon in developing countries such as Chile and in the construction sector in general. The consideration of Value delivery to society expands common practices mainly focused on the fulfilment of particular customer requirements. From this phenomenon, Value is understood as an “*oscillating*” concept (Figure 6.2). That means:

- Value delivered from a particular construction project continuously impacts society in a wide sense and provides a legacy to future generations.
- Value delivered from a particular project affects in turn the judgments for future projects and contributes to the continuous improvement of the construction sector’s performance (learning from experience).

Therefore, the construction industry through the provision of building and infrastructure projects contributes to the development of society and the built environment. Hence, this sector continuously supports to alleviation of environmental and societal issues, whose impact affects the whole population.

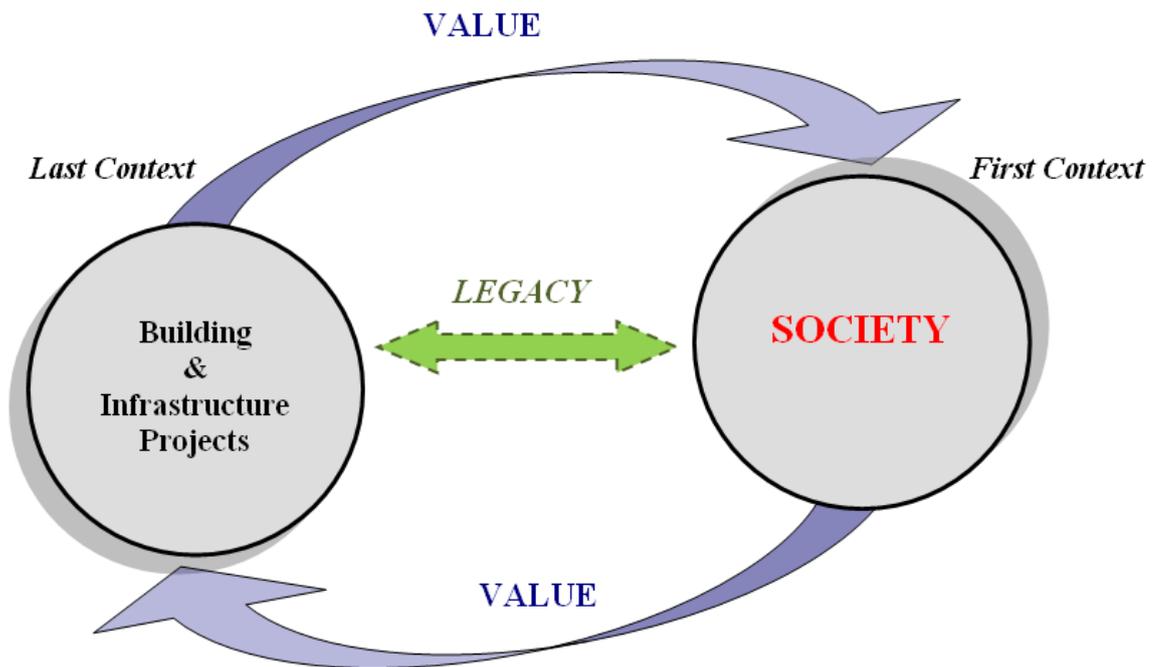


Figure 6.2. Value as an “oscillating” concept

6.6 Conclusion

This Chapter explored Chilean situation through the investigation of three SHP located in the Metropolitan Region of Santiago, Chile. Current experience allowed visualising a wider perspective of Value considering the impact and legacy from the construction industry to the whole society. Focusing on the optimization of human and funding resources and the agility of the process, the Chilean Government has delegated responsibilities and now includes private companies in the process. Accordingly, public and private organisations are working under the NChHP of 2007 in order to meet housing requirements and to build cities and neighbourhoods that would improve quality of life of low-income families and the Chilean population in general.

Therefore, activities and responsibilities associated to different stakeholders are firstly oriented towards the delivery of products and improvement of their attributes, and secondly the alleviation of social issues such as delinquency, drug abuse, unemployment, etc. This situation corroborates main Governmental actions previously identified from the exploration of the NChHP. Therefore, two different

contexts were identified: *First context* refers to Value delivery to the society (Environmental & Social issues), and *Last context* deals with Value delivery at project level (Production process – the work). Additionally, *First context* supports the visualisation of an emerging phenomenon, which understood Value as an “*oscillating*” concept.

Additionally, the literature review about the concept of Value and management perspectives identified four common tendencies to be considered in order to achieve a wider conceptualisation of Value. These are: (1) a lack of an overarching understanding; (2) customer focused perspectives; (3) Value understood as an objective concept; and (4) Value delivered at project level. Moreover, several features and multidimensional attributes of the concept of Value were recognised. To promote a wider conceptualisation of Value in the construction industry, the following Chapter describes the development of a conceptual model of Value considering the phenomenon observed from SHP in Chile and the features and multidimensional attributes of this concept.

CHAPTER SEVEN. DEVELOPMENT OF THE FIRST & LAST VALUE MODEL

7.1 Introduction

Chapter 7 discussed the development of the First & Last Value Model (F&LVM). Literature review, analysis of Chilean policies and data collected from three SHP in Chile identified six key elements to be considered towards a wider conceptualisation of Value in the construction industry. These are:

1. A lack of an overarching understanding of Value;
2. Customer-focused Value perspectives;
3. Value mainly understood as an objective concept;
4. Value commonly delivered at project level;
5. Several features and multidimensional attributes of Value, and
6. Return of Value from the construction industry to society and provision of legacy from this sector to future generations.

Accordingly, the delivery of Value spans across two different contexts: *First context* refers to Value delivery to the society (Environmental & Social issues), and *Last context* deals with Value delivery at project level (Production process – the work). Additionally, the interaction among three Value domains to be considered: Production & Delivery capacity of the construction industry; Stakeholders' perspective; and Social perspective. From the interaction of those domains, Value is delivered from four main perspectives: Technological, Economic, Environmental and Political.

Finally, the F&LVM includes different features and multidimensional attributes of Value; a concept which is objective, subjective, dynamic, context dependent, relative, and “*oscillating*”.

7.2 Towards an Expansion of the Common Perspective of Value

Value has been regarded as a difficult concept to be investigated in the construction industry. Its several features, definitions, equations and models mean this concept is complex and difficult to be conceptualised in the management of construction projects. Research activities described in previous chapters identified six key elements to be considered towards a wider conceptualisation of Value. Those key points are described as follows:

1. **Lack of an Overarching Understanding of Value:**

The concept of Value has been widely discussed in many academic fields including applied and social sciences. As a result of the subjective nature of this concept and its several features, different approaches have been proposed to manage Value in the construction sector.

2. **Customer-focused Perspective of Value:**

The concept of Value has been associated mainly to the relationship between customer requirements (needs, goals, targets, etc.) and product attributes (cost, quality, function, etc.). As a result, in the construction Supply Chain, the notion of customer has been deemed understood as the party paying to fulfil individual requirements.

3. **Value mainly understood as an objective concept:**

Different approaches to manage Value usually consider this concept from an objective view. Thus, numerous measurable product attributes such as cost and quality have been balanced to deliver Value without considering the interaction between the product and the person.

4. **Value delivery in a limited context (project level):**

As a result of a common customer-focused perspective and the predominant understanding of Value as an objective concept, this concept has been mainly conveyed within a limited context (at project level). Therefore, Value has been broadly

linked to “Market value” and “Utility value”. Thus, both concepts have been addressed through the planning and control of production process activities.

5. **Different Features and Multidimensional Attributes of Value:**

Literature review acknowledged different features and multidimensional attributes of Value, a concept that is objective, subjective, relative, context dependent, and dynamic.

6. **Return of Value from the Construction Industry to Society:**

Exploration of Chilean experience on SHP provides the opportunity to visualise Value from a wider perspective, which considers the return of Value and legacy from the construction industry to the whole society. This emerging phenomenon supports the notion of Value as an “*oscillating*” concept.

7.2.1 **Construction Industry’s Impact and Legacy for Society**

Building and infrastructure projects as physical outcome of the construction industry can be considered the reflection of our society. It is argued that construction project features “*are governed not simply by physical factors (climate, materials or topography) but by a society’s ideas, its forms of economic and social organisation, its distribution of resources and authority, its activities, and the beliefs and values which prevail at any one period of time.*” (King, 1984:1). Therefore, the construction industry should be sensitive to its impact on and legacy for society and future generations. In conjunction, governments should enact ruling policies encouraging ethical practices that benefit the whole population.

The understanding of Value as an “*oscillating*” concept provides the opportunity to expand current Value management practices towards the consideration of environmental and social issues. To emphasise the need for a wider conceptualisation of Value, the following sections explore the relationship between the construction sector, economy and environment.

- **The Construction Industry and economy:**

The construction industry contributes largely to the development of economies at micro and macro levels. It is argued that all governments aim at achieving economic goals, which are considered macroeconomic objectives. According to Myers (2008) *"There seems to be some political and economic consensus about the five dominant macroeconomics objectives: price stability, full employment, a sustained rate of economic growth, a positive trade balance with overseas partners and effective protection of the environment."* (pg. 203). In addition, according to Matijevic (2008) the construction industry contributes to four main topics: it stimulates employment, and economic growth; it contributes to general progress; and it has a stabilizing effect on the domestic economy. Regarding the public sector, governments distribute resources considering the positive effect of the construction industry to reactivate national economies. Consequently, other effects such as improving standard of living the whole population and investing in new technologies are also considered. Therefore, it is argued:

- *"...the construction sector has become a key consumer for many other industries in the economy. When final demand for construction output declines the impact is felt in many other dependent sectors."* (Briscoe, 1993: 8-9).
- *"Construction has to support a world of continuing population growth and economic development."* (Horvath, 1999:1).
- *"Construction output is an integral part of national output. It is possible that expansion of construction activity is preceded by an increase in economic output."* (Tse and Ganesan, 1997:371).

Previous quotations emphasised the need for a wider conceptualisation of Value. The construction sector not only fulfils particular customer requirements, but also generates a huge impact on the economy, and therefore it impacts has an influence on the whole society. Consequently, through public investments governments generate a continuous flow of money and Value delivery. For example, concerning social housing projects, taxes are originated in two main ways: firstly, contractors pay taxes when products are finished, and secondly, these projects provide the

opportunity to insert people into society, so future citizens will pay taxes and invest in the acquisition of goods and services.

- **The Construction industry and environment:**

The construction industry consumes a huge quantity of natural and limited resources. Because of its irresponsible and somehow unethical practices, this sector continuously struggles with a bad reputation. It is argued that the construction industry *“has a poor public image in comparison with other industries. The sector is often perceived as being dirty, dangerous and dull, with adversarial relationships at all levels and great environmental insensitivity.”* (Santos and Powell, 2001:166). In order to improve this sector’s reputation, modern agenda has been promoting the use of sustainable practices related to the welfare of future generations. Thus, according to Quinn and Dalton (2009) business organisations have been encouraged to be responsible of their operations, which affect societies and the natural environment.

According to the UK Government, the goal of sustainability is to *“enable all people throughout the world to satisfy their basic needs and enjoy a better quality of life, without compromising the quality of life of future generations.”* (www.defra.gov.uk). Even though the necessity for sustainable development has been largely regarded by different sectors, it is argued that society has not been part of a common goal (Fokkema et al, 2005). The incorporation of sustainable practices into the construction sector underlines the need for a wider conceptualisation of Value. According to Abidin and Pasquire (2005) Value consists of the relationship between the satisfaction of different needs and the resources used in doing so. Therefore, considering the impact of the construction sector’s legacy over society, those needs should be part of sustainable common and social objectives.

7.3 Development of the F&LVM

The dependence of society on the construction industry’s outputs and legacy constitute a core reason to expand current conceptualisation of Value. As outputs of the construction sector, building and infrastructure projects represent how global issues are considered from the interaction of different domains of Value. Although

topics such as sustainability, health and safety, reduction of carbon emission, etc. have been discussed widely, there is an important group of universal issues such as social insertion, unemployment, scholar levels, citizenship awareness, avoiding marginalization, socialisation, etc. which have not been broadly considered as deliverable by the construction industry.

The F&LVM aims at conceptualising Value from a wider perspective, considering the relationship among Value delivery from the construction industry, society and the built environment (building & infrastructure projects). Additionally, this model contributes to the visualisation of different features and multidimensional attributes of Value identified from literature. This wider conceptualisation of Value could generate a continuous movement from an economical perspective “value for money” to a social perspective, where the welfare of the entire population influences common customer focused strategies of the construction sector.

The F&LVM considers:

- **Two contexts:**
 - *First Context:* Value delivery to the society -Environmental & Social issues; and
 - *Last Context:* Value delivery at project level – Production process.
- **Three Value Domains:**
 - Production & Delivery capacity;
 - Stakeholders’ perspectives; and
 - Social perspectives.
- **Four perspectives of Value:**
 - Technological;
 - Economics;
 - Environmental; and
 - Political.
- **Main features and multidimensional attributes of Value:**
 - Objectivity;

- Subjectivity;
- Relativity;
- Context dependency;
- Dynamism; and
- Oscillation

7.3.1 First Context and Last Context in the F&LVM

Exploration of Chilean experience on SHP (policy and case studies) aids to identify two different contexts of Value to be considered towards a wider conceptualisation of this concept in the construction industry. As indicated in Chapter 6, those contexts are differentiated as *First Context* and *Last Context*. They are described as follows:

- **First Context and First Value Delivery:**

This context considers the delivery of Value and legacy from the construction industry to the whole society (This kind of Value is distinguished as *First Value*). In a broader context, *First Value* proposes an expansion of common customer focused perspectives to cover wider aspects – buildings and infrastructure as social assets, and development as a contribution to alleviate both environmental and social issues (e.g. climate change, sustainability, pollution, housing deficit, crime reduction, increasing of educational levels, social network insertion, socialisation, etc.). Here, the widest sense of societal benefits includes sustaining the environment and economy for human survival and development. Therefore, *First Value* is intangible and represented through:

- Societal goals;
- High level strategies of the construction industry; and
- Political initiatives focused on the impact and legacy of the construction sector outputs over society.

- **Last Context and Last Value Delivery:**

This context relates to the delivery of Value at project level, which is Value created through production process activities (This sort of Value is differentiated as *Last*

Value). The name *Last Value* comes from the Last Planner™ System, as a system to control production and create predictable and reliable workflow in construction processes activities. Thus, Value is created through transformation activities or what needs to be done (the work – construction site activities). Additionally, *Last Value* is created mainly from the delivery of the projects and its attributes as a means to fulfil customer requirements.

Literature review identified that the construction sector's practices have been focused mainly on this narrower context. Therefore, *Last Value* is tangible, measurable and represented as:

- Common targets of the construction sector;
- Value delivered from customer focused perspective (usually materialised as a 'Market Value' and 'Utility Value');
- Value created by the interaction of producer/suppliers; and
- Value delivered through planning and control of construction process activities.

According to Pasquire and Salvatierra-Garrido (2011), the concepts proposed *First Value* and *Last Value*, are not discrete but they rather exist at either end of a scale. Not every output of the construction industry (building & infrastructure project) needs to fulfil the aspirations of *First Value* – indeed only a few will, but all projects must fulfil the ends defined under *Last Value*. The intention of this new classification is to enable the underlying performance of the construction sector to move towards a more considered contribution to society by conceptualising the 'wide picture' of the social system. Therefore, *First Value* and *Last Value* intend to (re)connect society with the construction process and evidence a return of Value to society as a result. These concepts regard Value as an "oscillating" concept.

To clarify the proposed situation Table 7.1 shows how current design practices could move towards a more inclusive social perspective (e.g. to the left on Table 7.1). Continuous improvement is a fundamental principle of the construction industry, so *First Value* is intended to constitute an aspiration rather than a tangible set of criteria; in the sense that perfection should be recognised as a common goal of current

activities. This scale of *First to Last Value* provides contexts to the existing thinking on Value found in literature:

Table 7.1. Visualisation of First & Last Value compared to current design Value (Pasquire and Salvatierra-Garrido, 2011)

Author/s	Design Value Classification	Scale for illustration – not measuring quality or quantity															
		<div style="display: flex; justify-content: space-between; align-items: center;"> <i>First Value</i> <i>Last Value</i> </div>															
Gann et al (2003) Vitruvian values represented by Design Quality Indicators	Function													X	X	X	
	Build Quality														X	X	
	Impact													X	X	X	X
Emmitt et al. (2005) Vitruvian values encompassed within product value	External Value																
	i. Product:														X	X	X
	ii. Process:																
	Hard Soft Values												X	X	X	X	X
	Internal Value																X
Ballard (2008) Ends, means & constraints	Lean Project Delivery System													X	X	X	X

Key:

This aspect already demonstrates the potential to deliver *First Value*.

X Degree to which Value fulfilment goes beyond meeting bill payer requirement.

7.3.2 Domains of Value in the F&LVM

The F&LVM includes the interaction of three Value domains that are described as follows:

1. **Production and Delivery capacity:** This domain represents the activities performed by the construction industry aimed to deliver products that fulfil individual customer's requirements. Thus, both control and planning of

production process activities are managed in terms of the capability of producers and suppliers.

2. **Stakeholders' perspectives:** This domain represents the particular vision of Value from different stakeholders with the purpose of achieving economic success of construction projects. Therefore, individual requirements are addressed in terms of money and particular interests prevailing over social issues.

Generally, *Last Value* has been conceived by interaction among the Value domains described above: Production & Delivery Capacity of the construction industry and Stakeholders' perspectives. Interaction of these Value domains should promote the use of ethical and responsible management of human, monetary and natural resources. It is important to mention that regulation policies already exist and particular interests are commonly restricted by governmental legislations.

3. **Social perspectives:** This domain represents the social perspectives of Value, where environmental and social issues are considered as part of the Value creation process. Therefore, it is closely connected to *First Value* delivery. Thus, governments and public organisations are held responsible for the enactment and control of policies aimed to the welfare of the whole population. Like this, the role of services and ruling bodies is fundamental to promote and ensure the welfare of the entire population.

In the F&LVM, Value is widely conceptualised from the interaction of the domains described above. This interaction is illustrated in Figure 7.1.

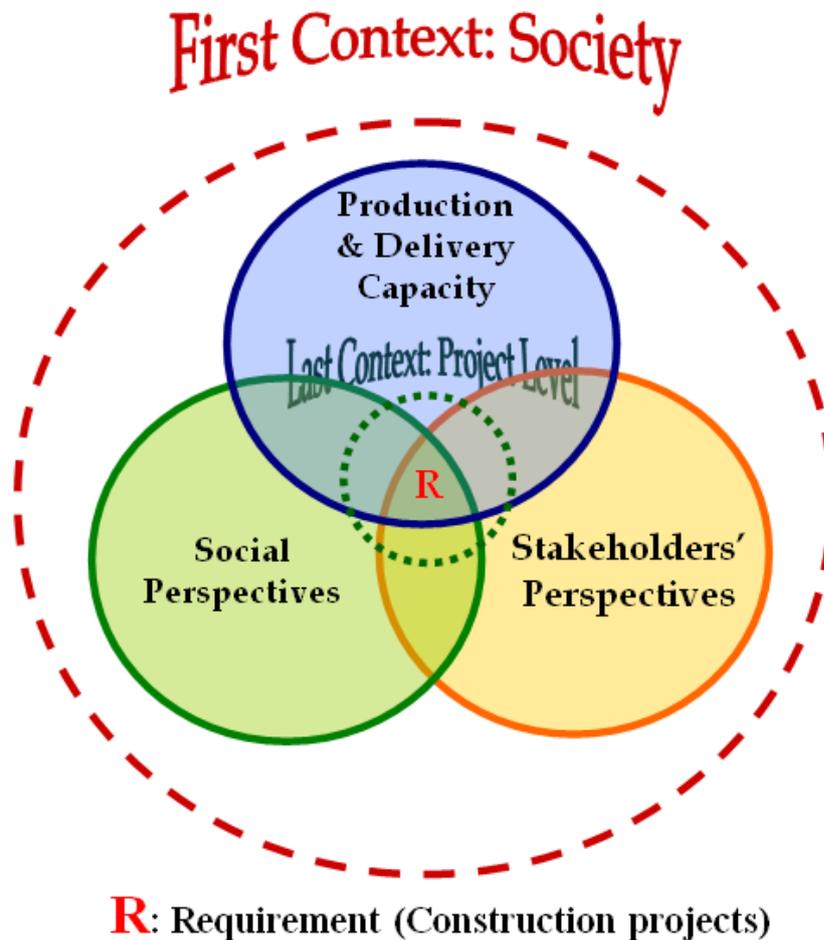


Figure 7.1. First & Last context in the F&LVM

7.3.3 Four Perspectives of Value in the F&LVM

Research activities identified different Value perspectives, which in the F&LVM are defined as follows:

- **Technology:**

In order to create products or services, the production and delivery capacity of the construction industry should use available resources to fulfil individual and social needs. Therefore, the technological perspective of Value delivery includes key concepts such as innovation, productivity, flexibility, expertise, skills, ability, knowledge, customization, enhancement, etc.

In general terms, technical perspective of Value is linked to the answer of two essential questions:

- Are we able to deliver a product or service?; and
- What can we do to differentiate our product or service?

- **Economics:**

In the F&LVM Stakeholders' universe comprises all parties representing the economic view of Value (e.g. private clients/customer, constructor, subcontractors, designers, consultants, etc). Consequently, this perspective is linked to the trade-off among money, objective products attributes (e.g. quality, waste reduction, etc.) and more subjective Value assessments such as prestige, image, aesthetics, etc. Hence, the economic perspective of Value depends on what desires or objectives need to be fulfilled. Thus, the economic agenda can be usually associated to the return of capital, profitability, cost reduction, etc.

This Value perspective is linked to the following questions:

- What do customers want?; and
- Which price are customers able to pay?

- **Environment:**

The construction industry has demonstrated an increasing concern regarding environment and the impact of practices over the planet (biodiversity). Thus, modern concepts such as sustainability (responsible use of limited resources), social responsibility (environment, local communities, working conditions, and ethical practices), and the Triple Bottom Line (People, Planet and Prosperity), etc. have been associated to ethical and responsible practices in the construction industry. These concepts are crucial for the construction sector's performance as here the use of limited natural resources is significant in comparison to other industries. Thus, this perspective of Value is linked to the question:

- How do our activities & products impact our planet (biodiversity)?

Therefore, environmental agenda considers topics such as pollution, carbon emissions, physical waste, land use, community health, etc.

- **Politics:**

Governments distribute public resources according to critical objectives they want to achieve, such as domestic economic growth and quality of life improvement for the whole population. Similarly, the role of services, planners, and legal & ruling organisations is essential to promote the delivery of construction projects, which meet particular and social needs. As a result, other governmental benefits could be linked to political perspectives such as continuance of the government (pleased voters), international recognition, etc.

From a political perspective, delivery of Value is associated to governmental goals. Therefore, this perspective of Value is linked to the question:

- How could public resources be distributed in order to fulfil social needs?

Finally, from the interaction of all previous elements, Figure 7.2 shows the F&LVM as follows:

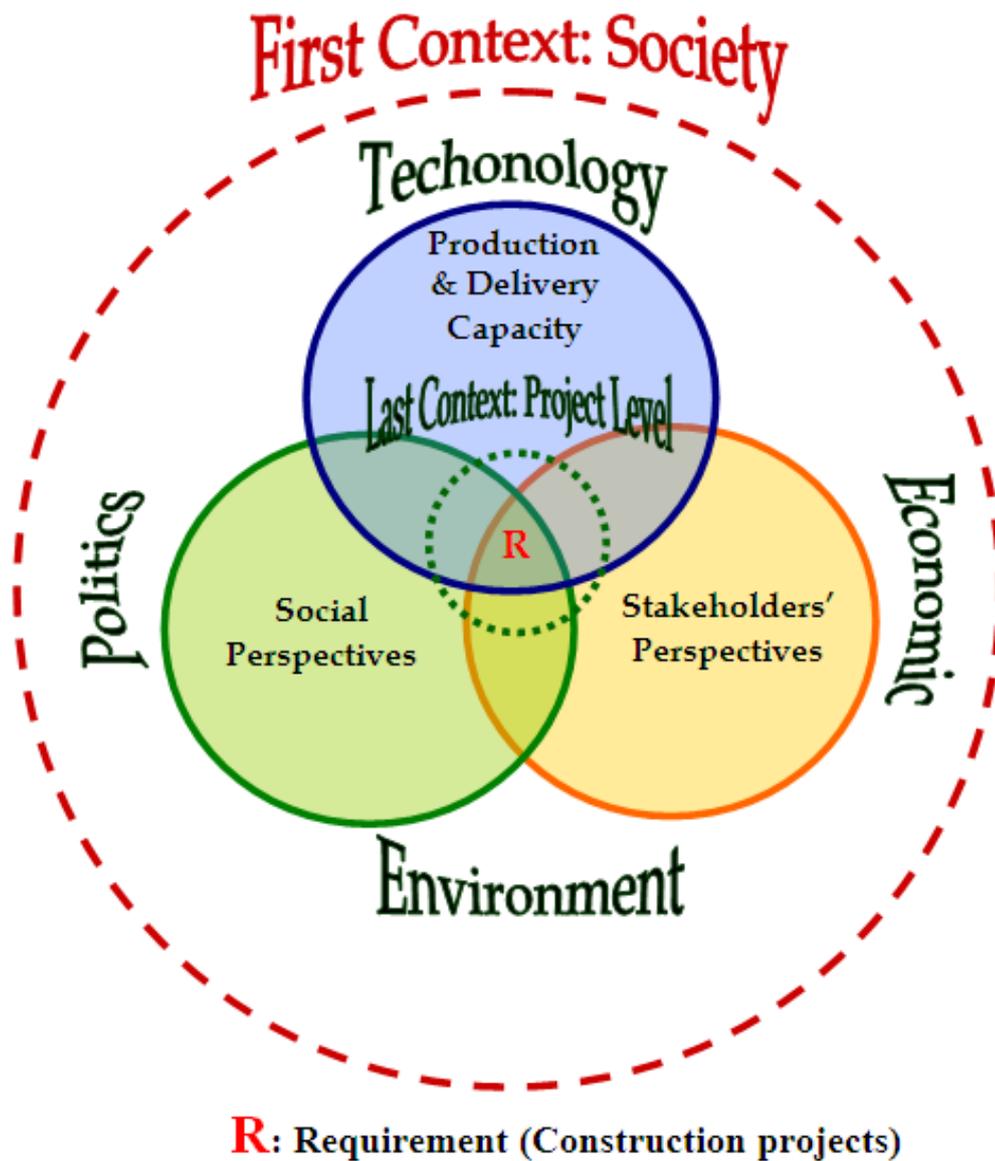


Figure 7.2. The First and Last Value Model - F&LVM

7.3.4 Different Features and Multidimensional Attributes of Value in the F&LVM

Literature review identified different features and multidimensional attributes of Value, a concept that is objective, subjective, relative, context-dependent and dynamic. Additionally, Value in this research is also regarded as an “oscillating” concept.

To aid the visualisation of previous Value features, the following paragraphs describe how Value should be considered using the F&LV:

1. **The objective and subjective part of Value:** In the construction sector Value has been commonly addressed in term of products attributes. As previously mentioned, this sort of Value arises from the interaction of two domains: The production and delivery capacity of the construction industry and diverse stakeholders' perspectives. Thus, individual Value assessment should be identified and addressed from early stages of projects, where opportunities to achieve agreed perspectives are increased. From the F&LVM, the interaction of previous domains includes two main Value perspectives: Technology and Economic.
2. **The relative feature of Value:** Building & infrastructure projects are created from the interaction of two Value domains: The production & delivery capacity of the construction industry and stakeholders' perspectives. Those projects are linked to several attributes, which are managed to deliver Value and fulfil individual requirements. Therefore, Value in the F&LVM should be considered as a relative to different individual assessments, which must be addressed from early stages to achieve agreed Value among different project stakeholders.
3. **The context dependent and dynamic feature of Value:** When product assessments arise from the interaction of products and people, temporal factors are also associated. Hence, social, economical and political circumstances influence the continuous variation of Value judgements along the life cycle of projects. Therefore, Value becomes a relative, context dependent and dynamic concept. Figure 7.3 illustrates how Value judgements vary across the time.

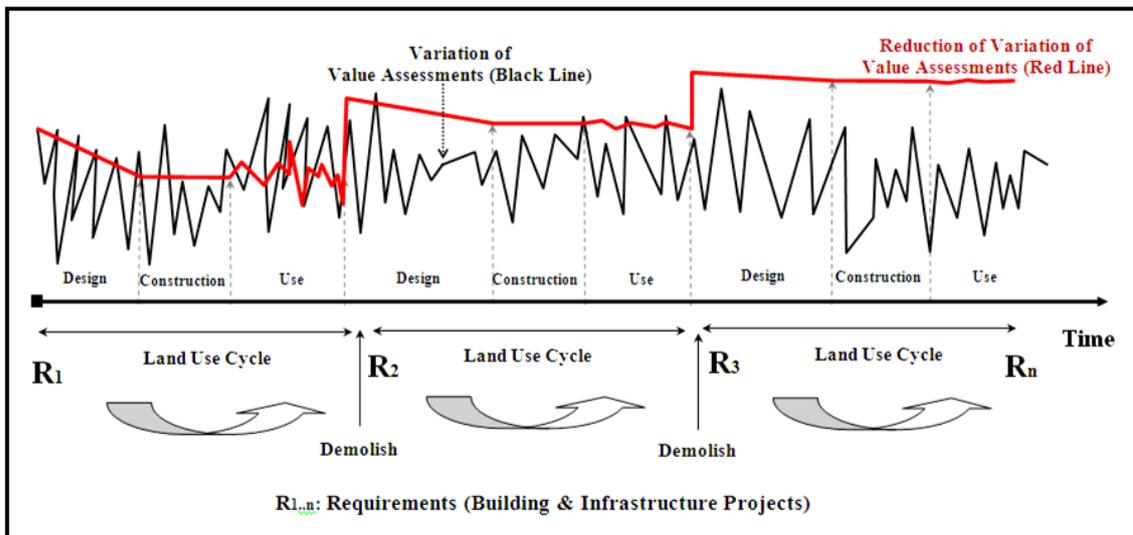


Figure 7.3. Variation of Value Assessments over time

Note: The red line in Figure 7.3 represents an ideal situation, where the construction industry learns from previous experience contributing to reduce the variation of Value judgements from different stakeholders over the time. Accordingly, measurement of customer satisfaction and post-sale service contribute to improve results of future project requirements.

In order to achieve the comprehension of Value as a context dependent and dynamic concept, time is included in the F&LVM. Figure 7.4 illustrates the variation of Value judgements for each particular requirement (Building or Infrastructure projects — R_i in the figure) originated from the interaction of three Value domains: Production and delivery capacity of the construction industry, stakeholders' perspective and social perspective.

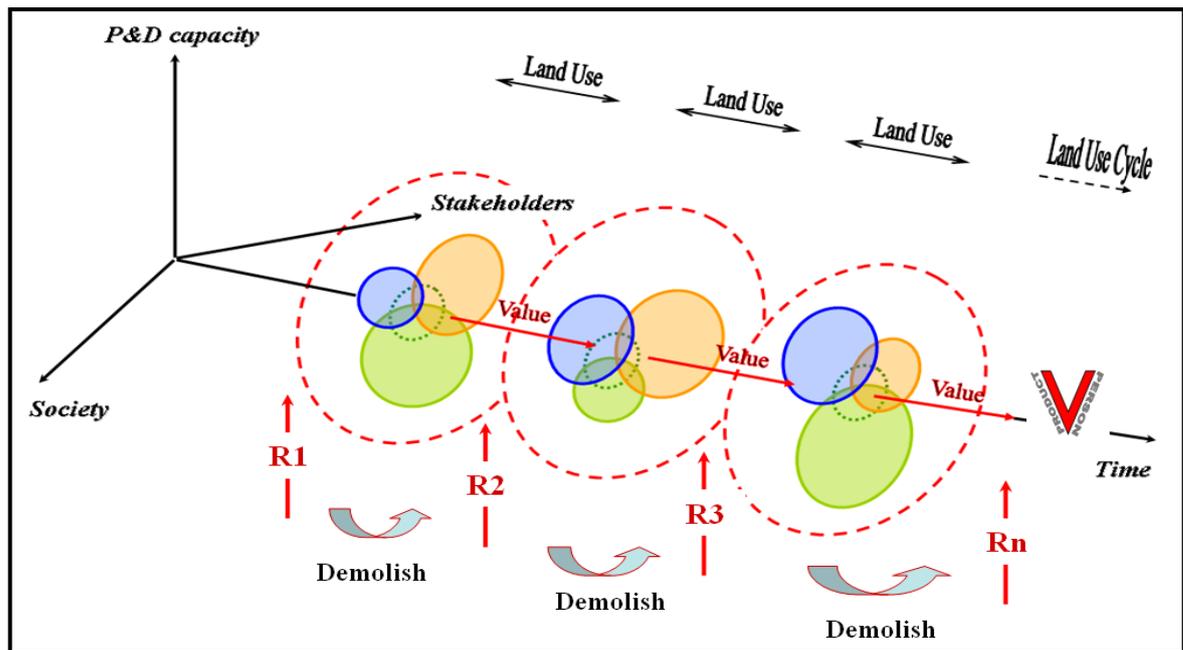


Figure 7.4. Value as a dynamic concept in the F&LVM

As Value assessments are continuously changing over time, the same size of Value domains in the F&LVM is understood as an ideal situation. Therefore, the size of the Value domains included in the F&LVM also varies for each particular requirement. For example, construction outputs such as social housing projects, hospitals, schools etc. deliver Value to the entire society; thus, social perspective of Value should predominate over particular interests. Figure 7.5 shows how the size of different Value domains is changing in function of diverse situations.

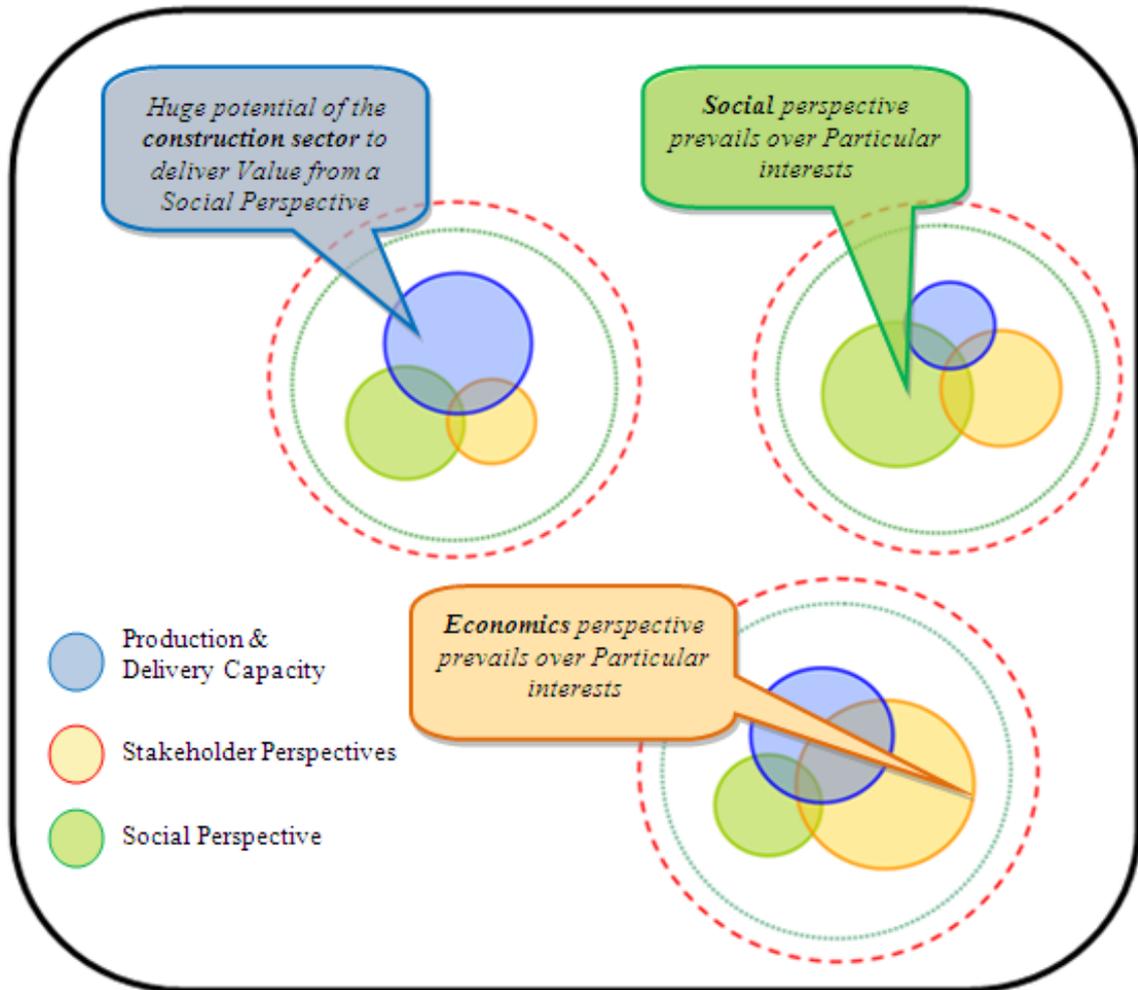


Figure 7.5. Variation of Value domains in the F&LVM

4. **The “oscillating” feature of Value:** As discussed in previous chapters, construction sector outputs impact society and deliver a legacy to future generations. Therefore, in a long term scale Value assessments for future projects could be based on the impact of previous projects over society (Short time and long time scale) and the legacy of those projects to future generations (Long time scale). Figure 7.6 shows Value as an “oscillating” concept. In this figure, three different opportunities to deliver Value are considered (linked to Land Use 1, 2 and 3). Thus, the first project (Requirement R₁: linked to Land Use 1) delivers Value to society and provide a legacy for future generations. Therefore, when a second opportunity to deliver Value arises (Requirement R₂: linked to Land Use 2), this new project

requirement is also influenced by previous experiences, providing the opportunity to improve earlier results. Thus, this new requirement causes a different effect on society and future generations. The same situation could be observed when a third requirement arises (Requirement R₃: linked to Land Use 3), and so on and so forth.

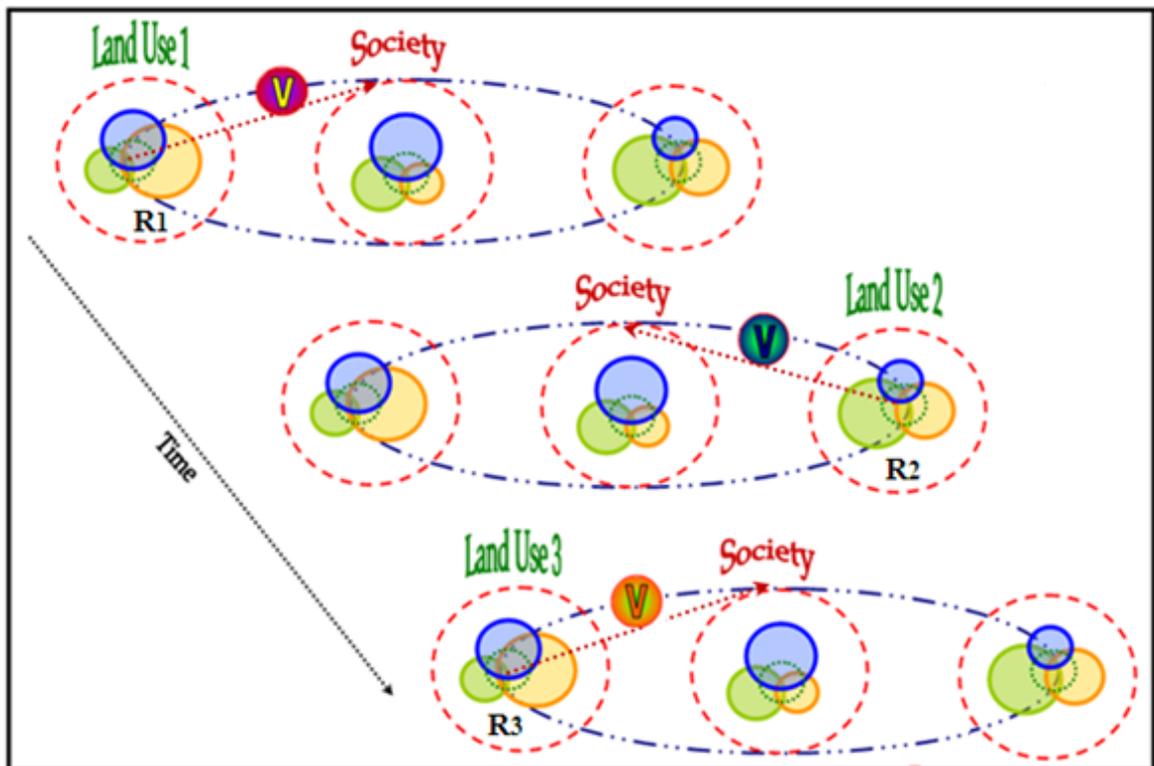


Figure 7.6. Value as an “oscillating” concept:

7.4 Visualise Value in the F&LVM from Chilean Experience in SHP

The F&LVM includes the interaction of three Value domains, four perspectives of Value and different features and multidimensional attributes of this concept. To provide support in the comprehension of those elements, the following points use data collected from Chilean experience (case studies) as an example:

7.4.1 Identification of Different Value Domains and Perspectives

Table 7.2 summarises qualitative data from three case studies investigated in Chapter 6. Thus, the exploration of stakeholders’ activities through the life cycle of SHP aids to identify actions linked to different domains of Value considered in the F&LVM.

Table 7.2. Actions Linked to Different Value Domains in SHP in Chile

Production and Delivery capacity:	Stakeholders' perspective:	Social perspective:
<ul style="list-style-type: none"> • Addressing of end users expectations; • Housing design and construction; • Balance between product attributes (location, quality, materials, etc.) and available resources (money); • Management of monetary, human and natural resources; and • Planning and control of activities (design and construction). 	<ul style="list-style-type: none"> • Maximisation of profitability (private organisations); and • Fulfilment of saving requirements (families) to participate in governmental projects. 	<ul style="list-style-type: none"> • Promulgation of social policies; • Optimisation of public resources delegating tasks to other private organisations; and • Insertion of low income people into society; • Improvement of social issues.

In addition, Table 7.3 summarises stakeholders' objectives linked to different Value perspectives included in the F&LVM. Those objectives are closely related to previous action included from different Value domains.

Table 7.3. Action Linked to Different Value Perspectives in SHP in Chile

Value Perspectives	Activities
Technical Perspective:	<ul style="list-style-type: none"> • To deliver the best possible house: both technically and functionally; • To plan and control production process activities; and • To address family expectations.
Economic Perspective:	<ul style="list-style-type: none"> • To deliver profitable projects; and • To balance money with product attributes such as quality, function, location, etc.
Environmental Perspective:	<ul style="list-style-type: none"> • To reduce environmental & acoustic pollution; • To care about the use of available land; and • To provide green areas.
Political Perspective:	<ul style="list-style-type: none"> • To optimise public resources • To speed up formal processes; • To enact social policies; • To stabilise national economy; and • To remain in the government (pleased voters).

7.4.2 Identification of Different Features and Multidimensional Attributes of Value

Investigation of Chilean experience assist in the exploration of previous features and multidimensional attributes of Value identified from literature:

1. **The objective and subjective part of Value from SHP in Chile:** early involvement of end users aids to recognize individual Value assessments from early stages of SHP. Therefore, current practices provide the opportunity to consider the interaction between the product and the person, which is the most subjective part of Value. Despite this situation, the urgent need of families (house provision) and the delay of formal processes decreased motivation and influenced the active participation of families through project definition and development stages. Consequently, projects could be delivered without consideration of end users Value assessments.
2. **Value as a relative concept from SHP in Chile:** Chilean experience has demonstrated a close relationship between customer satisfaction and the delivery of projects with improved features, such as quality, space and location. Accordingly, Value is related to different product attributes, whose management influences future user fulfilment.
3. **Value as a context-dependent concept:** Value assessments vary according the specific context where are expressed. Thus, decisions and activities of low-income families could be strongly influenced by the need of quickly meeting several basic requirements. Also, the critical social context that these families face could generate a common misunderstanding of houses as the only solution of several social issues.
4. **Value as a dynamic concept:** Exploration of Chilean experience in SHP revealed that most efforts to address Value assessments have been endeavoured on early stages of projects (briefing & early design), and construction stage. However, a lack of continuous support of families in future stages (use) has been distinguished by current stakeholders. Therefore, the variation of Value over the time is not fully considered, and opportunities to learn from the experience are still not fully considered.
5. **Value as an “oscillating” concept:** Integration of low income families into social networks exemplified the impact and legacy that the construction industry caused to the whole society. Data collected from case studies

demonstrated that stakeholders do not clearly connect their activities with the mitigation of environmental issues. Consequently, the promulgation of social housing policies which encourage environmental friendly practices could increase the benefit of those projects commonly limited by the scarcity of urban land. Thus, the alleviation of social issues could be complemented by other policy's principles concern about environmental issues (e.g. encouragement of sustainable practices. Figures 7.7 and 7.8 show the importance of consider Value as a dynamic concept in SHP in Chile.

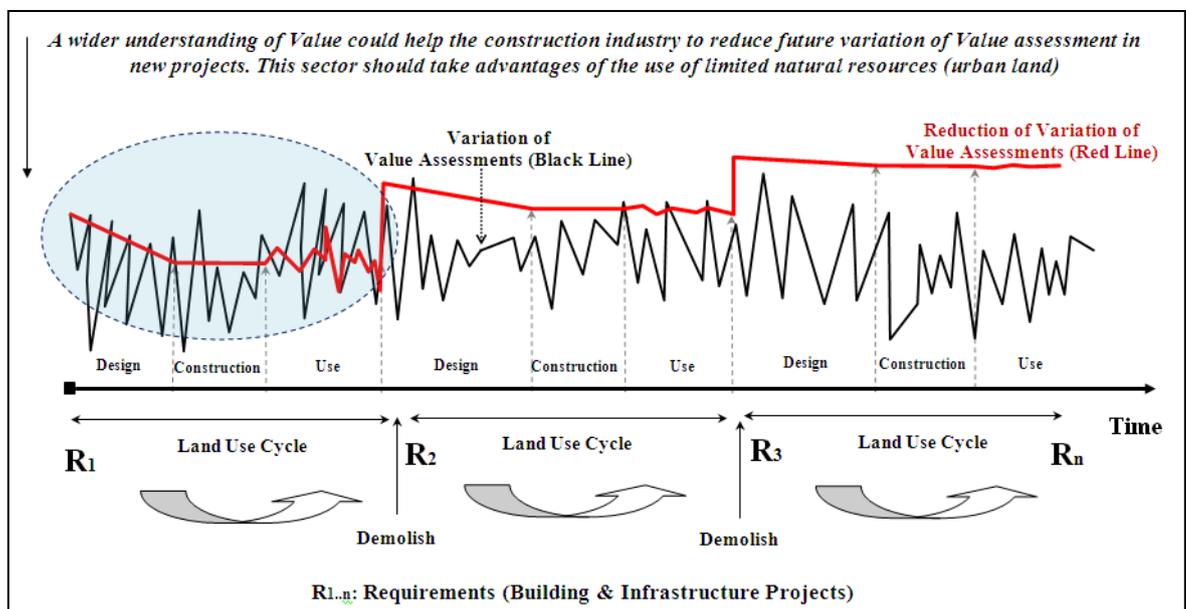


Figure 7.7. Variation of Value perspectives in SHP in Chile

As Value perspectives changes across the time, different domains of Value also vary from one project to another. In the case of SHP different domains of Value should interact in an ideal equilibrium considering the impact of these projects in the society and the huge legacy for future generation.

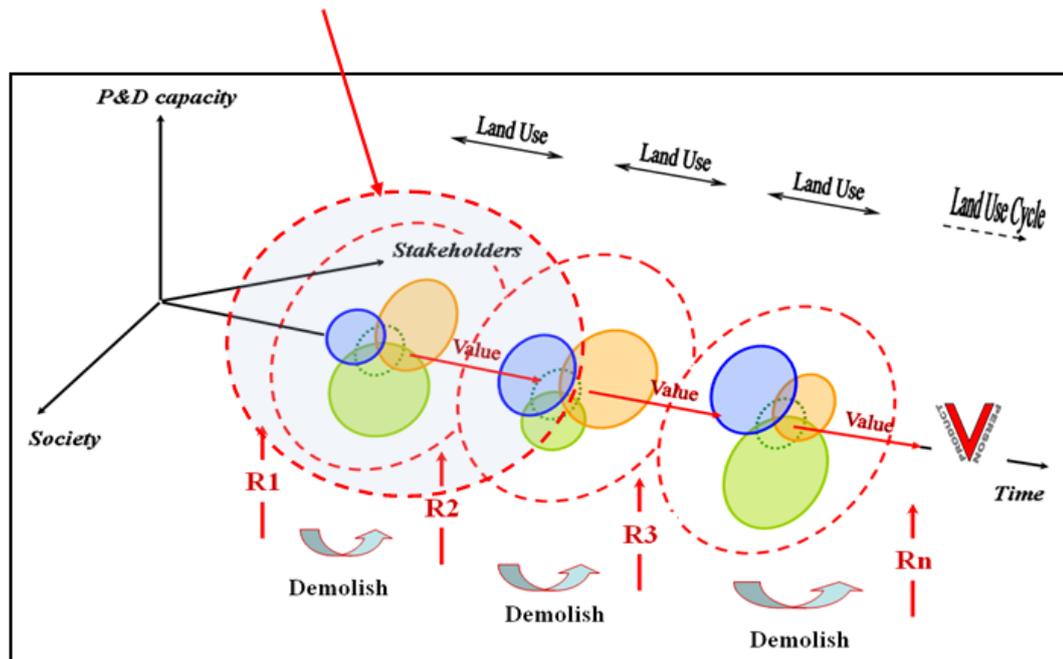
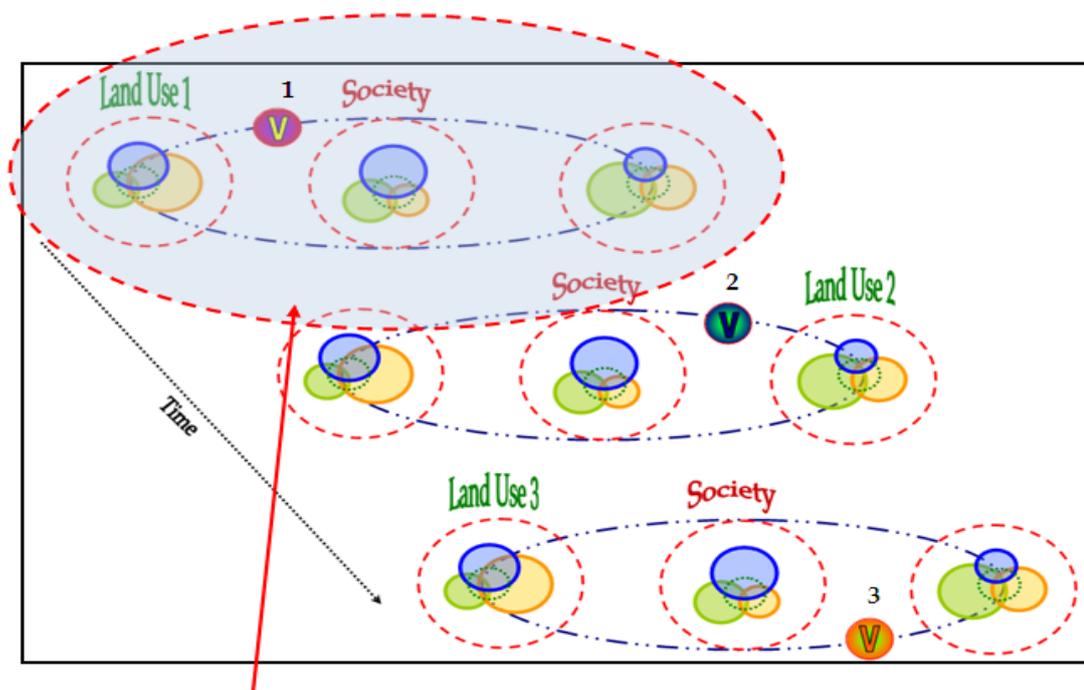


Figure 7.8. Value as a Dynamic concept in SHP in Chile

Finally, Figure 7.9 highlights the importance of consider Value as an “oscillating” concept in SHP.



In SHP, scarcity of land increases the importance of consider Value as an “oscillating” concept. Despite the huge impact and legacy that SHP cause in the Chilean society, the analysis of activities performed by different stakeholders evidences a strong economic perspective of Value (trade-off between money and other product.).

Figure 7.9. Value as an “oscillating” concept in SHP in Chile

7.5 Conclusion

As discussed in previous chapters, different perspectives of Value concerning the construction industry have been broadly linked to the fulfilment of particular customer requirements. Consequently, environmental and social issues have been addressed only if they are considered important from the bill payer’s perspective. The investigation of Chilean experience on SHP (policy and case studies) identified an emerging phenomenon in developing countries such as Chile. This phenomenon is based on the delivery of Value and legacy from construction projects to the entire society. Social projects provide an opportunity to address several social issues. Accordingly, the construction industry contributes continuously to the welfare of society as a whole. Besides, literature review evidences several features and multidimensional attributes of Value, which have been fully or partially considered from different approaches in the construction sector. Therefore, the construction industry lacks a wider conceptualisation of Value, providing an overarching understanding of this concept.

The F&LVM is proposed as a prescriptive model to conceptualise the total context Value in the construction industry. This model suggests an expansion or an improved differentiation of a common customer-focused perspective (“one who pays”) to benefit the entire society. According to the F&LVM, the delivery of Value spans across two different contexts: *First context* refers to Value delivery to the society (Environmental & Social issues), and *Last context* deals with Value delivery at project level (Production process – the work). The F&LVM distinguished three domains of Value: (1) Production and Delivery capacity, (2) Stakeholders’ perspectives, and (3) Social perspectives. Thus, a wider conceptualisation of Value from early stages of projects could help the construction sector researchers and practitioners to use the production and delivery capacity to benefit the whole population and contribute to the mitigation of universal topics, such as degradation of our ecosystem. Additionally, every part representing particular interests (Stakeholders’ perspectives in the F&LVM) is encouraged to perform ethical and responsible practices. Consequently, activities focused in the alleviation of environmental and social issues could become an integral part of the social domain of Value.

Regarding the four perspectives of Value included in the F&LVM, the environmental perspective, for example, is linked to the question: How do our activities & products impact our planet (biodiversity)?. Therefore, management approaches and technological tools should be oriented to the achievement of common goals which fulfil the needs of stakeholders and society as a whole especially in public sector projects. Consequently, the role of governments is essential to regulate and encourage environmental friendly practices (policy development).

Finally, the following Chapter includes the evaluation process of the F&LVM.

CHAPTER EIGHT. EVALUATION OF THE FIRST & LAST VALUE MODEL – F&LVM

8.1 Introduction

Chapter 8 focused on the evaluation process for the F&LVM. This activity aims at appraising whether this prescriptive model supports researchers and practitioners from the construction industry to visualise the relationship among Value, society and the built environment (building and infrastructure projects). Besides, the fact whether the F&LVM helps to visualise different features and multidimensional attributes of Value is also considered. To evaluate the F&LVM, interactive workshops were conducted; two of them as pilot evaluations at Loughborough University, and the final evaluation that took place at the 12th meeting of the EGLC (Luxembourg - November 2010). In addition, an individual evaluation was conducted to acquire opinions from Glenn Ballard (Lean Thinking researcher and practitioner). Thus, qualitative data was collected from different questionnaires and analysed both qualitatively and quantitatively.

8.2 Evaluation Process of the F&LVM

Evaluation can be regarded as a systematic process consisting of the collection and revision of data from different entities: individuals, organizations, and even society (Morris et al. 1987; Pratt and Loizos, 1992; Preskill and Torres, 1999; Rossi et al. 2004). According to Futrell et al. (2002), the evaluation process is about reviewing the systems or products with the active collaboration of end users. Thus, data collected allows learning and modification of current results aimed at satisfying user expectations. Similarly, it is argued that *“When the research has been completed, the original terms of reference should be reviewed to see how far the results of the research have met the original needs the terms of reference expressed.”* (Pratt and Loizos, 1992:83).

In order to understand the process conducted to evaluate the F&LVM, this chapter basically explores the evaluation purpose, questionnaire design, evaluation process design, evaluation findings and final discussion. Figure 8.1 illustrates activities performed to evaluate the F&LVM.

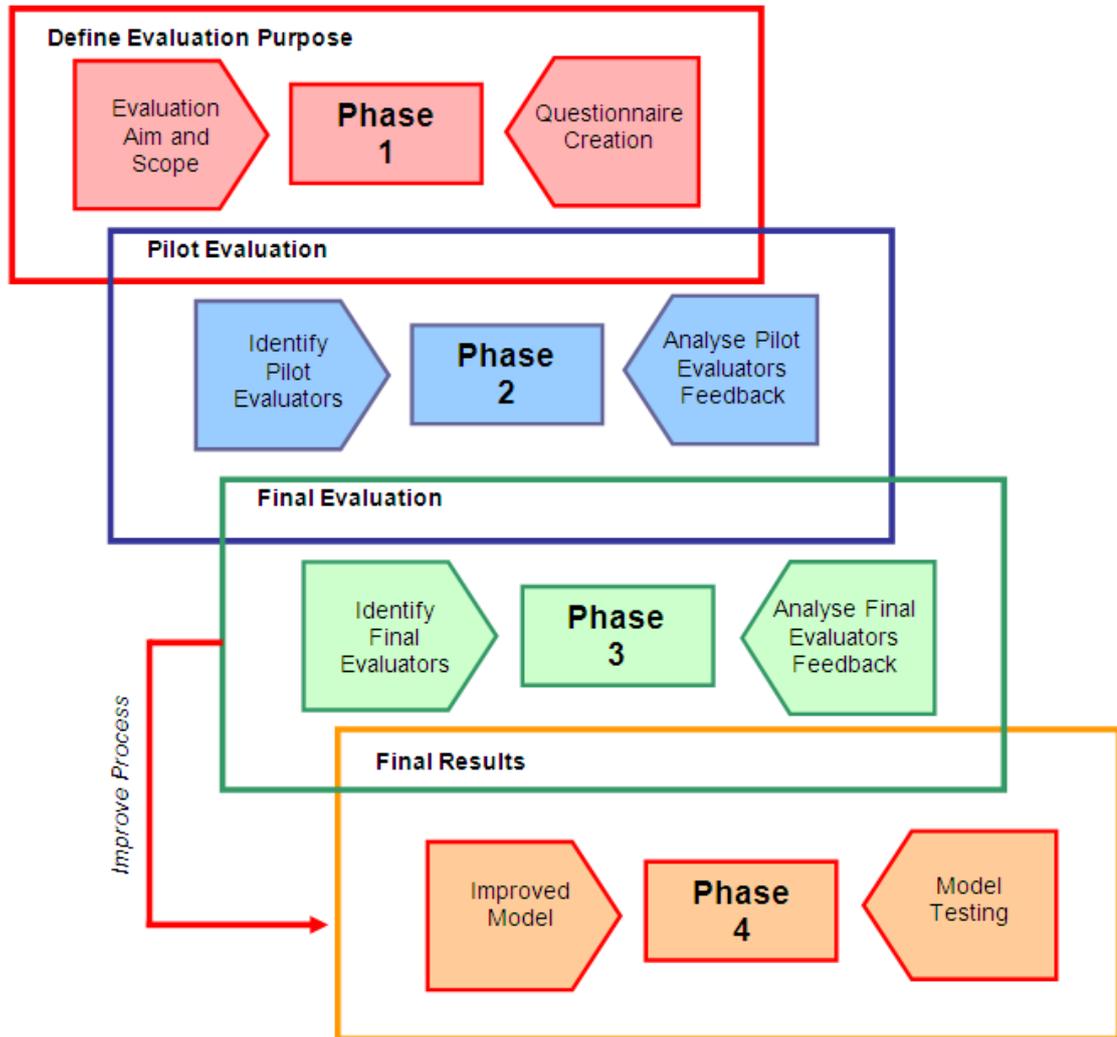


Figure 8.1. Evaluation Process of the F&LVM

8.2.1 Evaluation Aim and Objectives

The first step in the evaluation process consists of defining its aim and scope. In this research, the evaluation process aimed to test if the F&LVM supports researchers and practitioners of the construction industry to visualise a wider conceptualisation of Value, which includes (1) the relationship between Value, society and the build environment, and (2) main features and multidimensional attributes of this concept.

In order to achieve the evaluation's aim, the following objectives were established:

- To collect individual opinions on the concept of Value from current researchers and practitioners of the construction industry;
- To evaluate the effectiveness, comprehension and acceptability of the F&LVM;
- To evidence comprehension of the concept of Value using the F&LVM;
- To identify advantages and barriers of the F&LVM; and
- To identify opportunities to improve the F&LVM (pilot evaluation workshop).

In addition, the evaluation process also explored individual consideration of early stages of projects from workshop participants. Through literature, it has been largely regarded that opportunities to add value are greater in the early stages of projects. Therefore, it is important to identify what is considered to be early in the life cycle of projects by the workshop participants. To collect data, the RIBA work stages were utilised to guide answers.

8.2.2 Evaluation Nature

Once evaluation aim and objectives have been stated, the following step supported the type of evaluation to be conducted. According to Preskill and Torres (1999), five kinds of evaluation were identified:

- **Developmental Evaluation:**

Developmental evaluation makes the evaluator an active part of the system's design and the developmental process. Consequently, evaluation process could include different tools, such as evaluation questionnaires, logic evaluation, etc. In addition, evaluators are considered an active part of the developmental team, and therefore they can participate in the conceptualization, design and testing of the products (long-term, ongoing process of continuous development, adaptation, and experimentation). According to Patton (2010), developmental evaluation *"supports innovation development to guide adaptation to emergent and dynamic realities in complex environments. Innovation can take the form of new projects, programs, products, organizational changes, policy reforms, and system interventions."* (pg. 3).

- **Formative Evaluation:**

Formative evaluation aims at improving designed programs, systems, etc. This kind of evaluation is often conducted by internal evaluators and commonly makes use of a reduced group of evaluators. (Weston et al. 1995; Worthen et al. 1997). According to Scriven (1981) Formative evaluation is usually *“conducted during the development or improvement of a program or product (or person, and so on) and it is conducted, often more than once, for in-house staff of the program with the intent to improve. The reports normally remain in-house; but serious formative evaluation may be done by an internal or an external evaluator or preferably, a combination; of course, many program staff is, in an informal sense, constantly doing formative evaluation.”* (pg. 63).

- **Summative Evaluation:**

Summative evaluation is carried out after completion of designed programs, systems, etc. It is used for the benefit of external audience or decision makers. Accordingly, summative evaluation could be conducted by internal or external evaluators or a combination of both (Scriven, 1981). It is argued that summative evaluation provides information on the product’s efficacy (its ability to perform what it was designed to do). For example, whether the beginners learnt what they were supposed to learn after using the instructional module. In a sense, this method allows the beginner be aware of *“how they did, but more importantly, by looking at how the learner’s did, it helps you know whether the product teaches what it is supposed to teach. Summative evaluation is typically quantitative, using numeric scores or letter grades to assess learner achievement.”* (www.janus.ucc.nau.edu).

- **Outcome Evaluation:**

Outcome evaluation aims to recognise the effects on knowledge, behaviour, attitude, etc. after using programs, systems, treatments, etc. Consequently, it is argued that *“Outcome evaluation measures how clients and their circumstances change, and whether the treatment experience has been a factor in causing this change. In other words, outcome evaluations aim to assess treatment effectiveness.”* (WHO - Workbooks on evaluation, 2000).

- **Impact Evaluation:**

On the final outcomes stages, impact evaluation is focussed on participants, as a result of the implementation of programs, systems, etc. According to Baker (2000), impact evaluation *“is intended to determine more broadly whether the program had the desired effects on individuals, households, and institutions and whether those effects are attributable to the program intervention. Impact evaluations can also explore unintended consequences, whether positive or negative, on beneficiaries.”* (pg. 1).

To achieve the aim and objectives of the evaluation process, the opinions of potential users such as researcher and practitioners of the construction industry were considered through a **summative evaluation** process.

8.3 Evaluation Questionnaires

Based on the aim and objectives of the evaluation process, a new survey was designed and structured according to Figure 8.2. Questionnaire 3 included in this survey is described as follows:

Questionnaire 3.1:

Q.3.1.1: This is a set of four statements aimed at understanding the personal views on the concept of Value. Thus, final evaluators opinions were collected according to the following statements:

- *I recognise the need to expand the common perspective of Value from the construction industry.*
- *I recognise the importance of discussing the concept of Value in the construction industry.*
- *I include the discussion of Value in my current research or practice in the construction industry.*
- *I consider the concept of Value as a difficult concept to be delivered in the construction industry*

Q.3.1.2: This open-ended question aimed at recognizing the individual consideration of early stage of projects. Therefore, evaluators were asked about:

- *According to RIBA Work Stages: What stage do you consider to be early in the life cycle of projects?*

Q.3.1.3: This one open-ended question helps to determine the individual conception of the concept of Value.

- *Based on your experience in the construction industry: What is the concept of Value?*

Questionnaire 3.2:

Q.3.2.1: This is the same set of statements included in Q.3.1.1. Its objective is to observe possible modifications of previous answers after introducing and explaining the F&LVM.

Q.3.2.2: This set of five statements is based on a Likert scale. The objective of this set of statements is to test acceptability of the model of Value proposed. In addition, it is possible to note whether the concept of Value is included in the F&LVM from a wider perspective, including a global context and different features of Value. Thus, the opinions of final evaluators were collected according to the following statements:

- *The F&LVM reflects the relationship between Building & Infrastructure projects and Society as a whole.*
- *The F&LVM would contribute to the consideration of the concept of Value.*
- *The F&LVM can help to understand the Value generation process in the early stage of Building & Infrastructure projects.*
- *The F&LVM can help to understand Value generation process through the life cycle of Building & Infrastructure projects.*
- *The F&LVM can contribute to address environmental & social issues.*

Q.3.2.3: This set of six statements aims at identifying barriers, advantages and opinions to improve the F&LVM in the future. Therefore, opinions of final evaluators were collected according to the following statements:

- *The F&LVM aids to understand Value as an Objective Concept.*
- *The F&LVM aids to understand Value as a Subjective Concept.*
- *The F&LVM aids to understand Value as a Relative Concept.*
- *The F&LVM aids to understand Value as a Dynamic Concept.*
- *The F&LVM aids to understand Value as a Context Dependent Concept.*
- *The F&LVM aids to understand Value as an Oscillating Concept.*

Appendix 6 includes copy of Questionnaires described above.

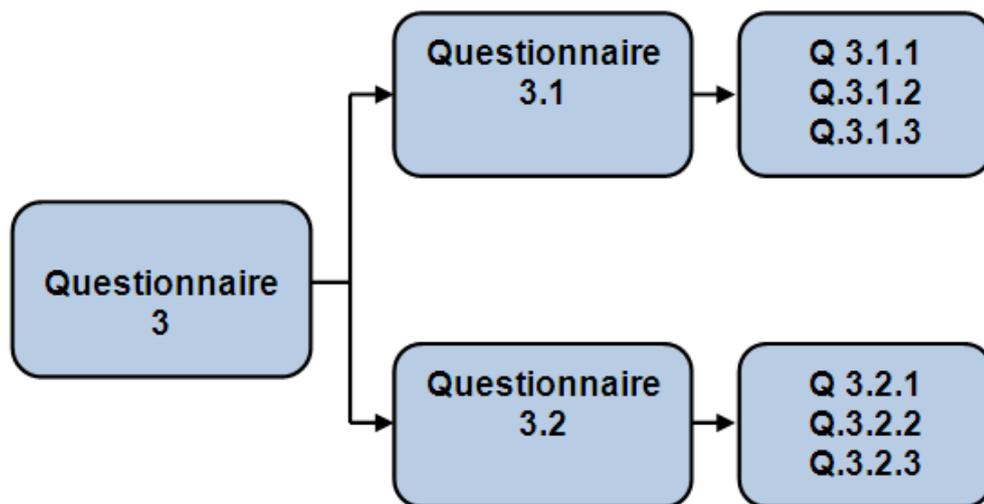


Figure 8.2. Data Collection - Structure Questionnaire 3

8.4 Workshops Description

To evaluate the F&LVM, workshops were conducted and structured according to the following steps:

1. Introduction of the subject;
2. Evaluators were requested to complete the first questionnaire 3.1;

3. Introduction of the F&LVM, research background and development process of the Value model proposed;
4. A focus group discussion was conducted; and
5. Evaluators were requested to complete the second questionnaire 3.2.

- **Pilot Evaluation Workshops**

Aimed to reduce possible mistakes in the final evaluation, the purpose of the pilot experience was to identify possible problems in the structure of the workshop (steps 1 to 5 detailed above) and helpfulness of the questionnaires. Additionally, data collected is used to increase the comprehension regarding the F&LVM. To organise the pilot experience, an unsolicited email was sent to researchers and professors of the Department of Civil and Building Engineering of Loughborough University. A total of four answers were received. As it was not possible to coordinate a date to meet all together, two sections were conducted with two evaluators attending each time. Participants profile is included in Table 8.1. Additionally, feedback from initial evaluators is included in Appendix 7.

Table 8.1. Pilot evaluators profile

Pilot evaluators	Background
Evaluator 1	<ul style="list-style-type: none"> • Research associate at Loughborough University. Broad interests and expertise: VM, problem solving and best practices.
Evaluator 2	<ul style="list-style-type: none"> • Research Engineer sponsored by ServQ at the CICE in Loughborough. Broad interests and expertise: Partnering and alliancing, knowledge management, VM, risk management and concurrent engineering.
Evaluator 3	<ul style="list-style-type: none"> • Research associate at Loughborough University. Broad interests and expertise: LC, management of science and innovation.
Evaluator 4	<ul style="list-style-type: none"> • Professor of structural engineering at Loughborough University. Broad interests and expertise: integrated working and management techniques, information management, process re-engineering, VM and structural materials and their design.

- **Final Evaluation Workshop**

Aimed at evaluating whether the F&LVM supports researchers and practitioners of the construction industry to visualise Value from a wider perspective, the final evaluation workshop follows the recommendations obtained from pilot experiences. As a result of the positive feedback about workshop organisation, this workshop was conducted following the same structure of the pilot evaluations (steps 1 to 5). This final experience was conducted at Luxembourg at the second annual meeting of the EGLC (November, 2010). The total sample includes seventeen Lean Construction researchers and practitioners. In addition, an individual evaluation was conducted to survey Glenn Ballard's opinion. Therefore, the sample included eighteen professionals of the construction sector, whose profiles are summarised in Table 8.2.

Table 8.2. Final evaluator's profiles

Pilot evaluators	Background
Evaluator 1	<ul style="list-style-type: none"> • Assistant professor at Delft University of Technology. Broad interests and expertise: The synergy of Open Building and Lean Construction.
Evaluator 2	<ul style="list-style-type: none"> • Project Manager at CRP Henri Tudor. Broad interests and expertise: Research and development engineering in Lean Construction Management.
Evaluator 3	<ul style="list-style-type: none"> • Senior project manager at Grontmij. Broad interests and expertise: Lean Construction, Last Planner System, Proces Management, Collaboration in Construction Industry, Learning in Construction.
Evaluator 4	<ul style="list-style-type: none"> • Associate Professor, Dr.Ing, Faculty of economics and social sciences, Department of working life and innovation, University of Agder. Broad interests and expertise: Business perspectives, Lean Construction, technology and social science.
Evaluator 5	<ul style="list-style-type: none"> • Construction Manager. Broad interests and expertise: Lean Construction, economic.

Pilot evaluators	Background
Evaluator 6	<ul style="list-style-type: none"> • Building Engineer. Broad interests and expertise: Lean Construction, project & construction management.
Evaluator 7	<ul style="list-style-type: none"> • Account Manager. Broad interests and expertise: Lean Construction, finance.
Evaluator 8	<ul style="list-style-type: none"> • R&D manager at CRP Henri Tudor. Broad interests and expertise: Improvement of organisation processes.
Evaluator 9	<ul style="list-style-type: none"> • Architect. Broad interests and expertise: Lean Construction.
Evaluator 10	<ul style="list-style-type: none"> • Reader in Operations Supply Chain Management at Nottingham Business School - Nottingham Trent University. Broad interests and expertise: Operations strategy, operations and supply chain management, project management, variation and uncertainty buffering, Theory of Constraints (TOC), lean leadership, health and social care planning and control, continuous improvement strategies, construction management, Theory of Inventive Problem Solving (TRIZ).
Evaluator 11	<ul style="list-style-type: none"> • Project Director & Chief Operating Officer. Broad interests and expertise: Project Management, Team Building & Leadership, Network & Business Development, Understanding of the global operation, Construction Planning & Scheduling, Cost Control, Estimating and Job Costing, Quality Control Management, Budget analysis, Safety & Compliance Management.
Evaluator 12	<ul style="list-style-type: none"> • Senior Lecturer in Design at University of Salford. Broad interests and expertise: Research and teaching in architectural design, new product development, Lean Construction and healthcare design.
Evaluator 13	<ul style="list-style-type: none"> • Researcher at Public Research Centre Henri Tudor. Broad interests and expertise: Architectural programming/Briefing process, Requirements Engineering, Functional Analysis, Construction projects, Building specifications, Product-Service System and Design, AEC.

Pilot evaluators	Background
Evaluator 14	<ul style="list-style-type: none"> • Visiting lecturer in Lean Construction at Nottingham-Trent University, co-Editor at Lean Construction Journal, Director at The Change Business Ltd. Broad interests and expertise: project and organisation level lean transformation; the implementation of Last Planner in design & construction; construction logistics; co-evolution of product design and production system design, target value design, creating results.
Evaluator 15	<ul style="list-style-type: none"> • Scientific collaborator at the Swiss Federal Institute of Technology Zurich (ETH Zürich). Broad interests and expertise: Continuous Product Development, Continuous Innovation, Product design, architecture and innovation, Lean Product Development.
Evaluator 16	<ul style="list-style-type: none"> • Critical Chain Project Management Lecturer at the Quality Management Master at CRP Henri Tudor, Engineer at R&D Strategy & Management at Centre of Public Research Henri TUDOR. Broad interests and expertise: Theory of Constraints, Drum Buffer Ropes, Master Plan Scheduling, Critical Chain Project Management, Thinking Process.
Evaluator 17	<ul style="list-style-type: none"> • Architect, Executive MBA, Entrepreneur. Broad interests and expertise: Architecture, planning and Lean Construction.
Evaluator 18	<ul style="list-style-type: none"> • Co-founder and research director of the Lean Construction Institute (LCI), Associate Adjunct Professor at University of California, Berkeley. Broad interests and expertise: Lean Construction, Design Management, Performance and Productivity Improvement, Quality Management.

8.5 Findings from Final Evaluation

The following sections analyse data collected from the opinions of final evaluators:

8.5.1 Understanding of the Concept of Value

As a result of the subjective opinion of different evaluators, the perception of Value varies according to their individual experiences. Despite this situation, qualitative data collected from question **Q.3.1.3** supports the identification of two main tendencies:

1. Customer-focused perspective of Value; and
2. Understanding of Value in function of other parameters such as cost, quality and product functionality.

It is important to underline that according to the professional background of some evaluators, the concept of Value is regarded from a wider perspective. Accordingly, social needs are also emphasized. Table 8.3 included the opinion of evaluators classified into three main groups:

1. Conception of Value from a customer focused perspective;
2. Conception of Value as a function of other parameters; and
3. Conception of Value from a wider perspective.

Table 8.3. Conception of the notion of Value from final evaluators

Classification	Value understanding
Customer-focused perspective of Value	<ul style="list-style-type: none"> • Value comes up when client demands are fulfilled. • Value comes up when you manage to meet your clients' needs and expectations. • Make clients happy! (and pay). • What the customer wants. • The goal of the user. • Product's benefit precisely from the perspective of end users. • Client's needs and user's needs.

	<ul style="list-style-type: none"> • Client’s satisfaction about the project. • Defining product’s benefit precisely from the perspective of end users.
Value as a function of other parameters	<ul style="list-style-type: none"> • Value= Function/Cost. • What is the use of the building?. • Quality. • Value = money →costs. • Transformation in production. • Use value. • Specific product with specific functionalities. • Product offered at a specific price and time.
Wider perspective of Value	<ul style="list-style-type: none"> • Client’s needs and user’s needs, social needs (energy efficiency, etc). • Value is generated by identifying customer/users/society needs, appropriately translating those to design solutions, and achieving /exceeding needs through these solutions.

8.5.2 Variation of Personal Vision of Value (before and after F&LVM)

In order to determine whether there are significant differences among the opinions of respondents, the same set of questions was included before and after explanation of the F&LVM (**Q.3.1.1** and **Q.3.2.1**).

Evaluators were asked to assess questionnaires’ subject matters at an agreement level on a Likert scale from 1 to 5, where: 1=Strongly Disagree; 2=Somewhat Disagree; 3=Neither Agree nor Disagree; 4=Somewhat Agree; 5=Strongly Agree (Bamberg et al. 2006). Data collected is used to show central tendencies, so a combination of different analytical techniques is used. These techniques include comparison of means, medians and standard distribution. In order to find central tendency, Mean and Median are considered the most accepted measurements (Kvanli et al. 2000).

Table 8.4 includes Mean, Median and Standard Deviation of data collected from the opinions of final evaluators. Additionally, qualitative data collected is analysed below:

- **Expansion of a common perspective of Value:**

In terms of personal view of the concept of Value, Table 8.4 aids to observed that before introducing the F&LVM, final evaluators are mostly aware of the importance to expand the common perspective of Value (fulfilment of customer's perspectives and linked to product attributes). Thus, a mean of 4.78 is measured. However, Mean decreased to 4.33 after the explanation of the F&LVM. Mean reduction can be associated to the narrow understanding of most evaluators before introducing the F&LVM, which includes different domains, perspectives, features and multidimensional attributes of Value. Therefore, this model might cause confusion as a result of the multiple concepts associated to a wider conceptualisation of Value in the construction industry.

Despite the previous situation, after the introduction of the F&LVM the mean measured is still high considering the limited understanding of Value of some respondents before explanation of the Value model and the related concepts. Figure 8.3 shows that 89% of the sample agrees – somewhat and strongly.

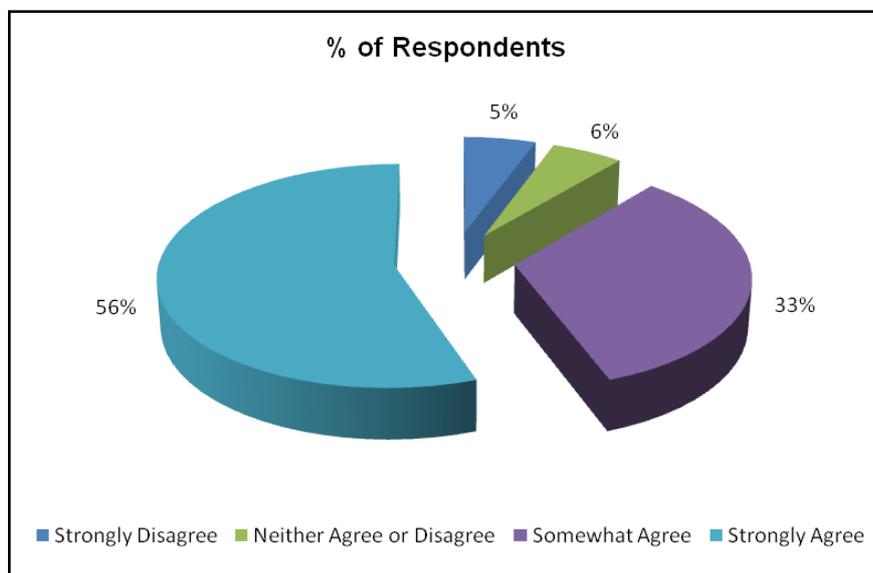


Figure 8.3. Recognition of the need to expand the common perspective of Value in the construction industry (After introduction of the F&LVM)

- **Importance of discussing Value:**

When final evaluators were asked about the importance of discussing the concept of Value, the mean of 4.72 was obtained before introducing the F&LVM. This data was slightly reduced to 4.56 after the workshop. Therefore, there is a high agreement on the importance of discussing this concept from current researcher and practitioners of the construction industry.

- **Consideration of Value:**

When respondents were asked about their own consideration of Value, before the introduction of the model, the total sample was reduced from eighteen to sixteen (two respondents considered the question as not applicable), the mean was 4.50, with a standard deviation of 0.63. Additionally, after introducing the F&LVM the sample was eighteen, the mean was 4.31, with a standard deviation of 1.01. The diverse opinions of respondents is observed through the high standard deviation measured after the introduction of the Model. This high variation of opinions could be associated to individual reflexion after the wider visualisation of Value presented.

- **Difficulty to deliver Value:**

When evaluators were asked about the complexity of delivering Value in the construction industry, there is a high agreement of respondents before and after the workshop evaluation, with a mean of 3.89 and 4.18, respectively. It is important to emphasise an important variation of responses before and after the introduction of the Value model, with a standard deviation of 1.18 and 0.95, respectively. This situation can be associated to the several and somewhat unknown Value information discussed in the workshop. It is important to underline that before (76%) and after (88%) the introduction of the F&LVM, evaluators considered Value delivery as a difficult task.

8.5.3 Effectiveness, Comprehension and Acceptability of the F&LVM

Table 8.5 includes mean, median and standard deviation of the second set of questions (Q.3.2.2). Thus, five statements were included to evaluate effectiveness, comprehension and acceptability of the F&LVM.

- **Relationship between building & infrastructure projects:**

In terms of the relationship between building & infrastructure projects and the entire society, final evaluators of the F&LVM mostly agree with the usefulness of the model to reflect this situation, with a mean of 3.72. However, it is important to mention that the evaluators' opinions were diverse, with three of the total eighteen somewhat disagree.

- **Consideration of Value:**

When the F&LVM was evaluated in terms of its contribution to consider Value in the construction industry, a mean of 3.78 was measured. Nevertheless, the same dispersion in the opinion was observed, two of the total eighteen respondents somewhat disagreed.

- **Value generation process in the early stage of projects:**

When evaluators were asked about the usefulness of the model to understand the process of generating Value in the early stage of projects, a high agreement was observed, with a mean of 4.06. Figure 8.4 shows that 77% of the respondents agreed about the previous model feature.

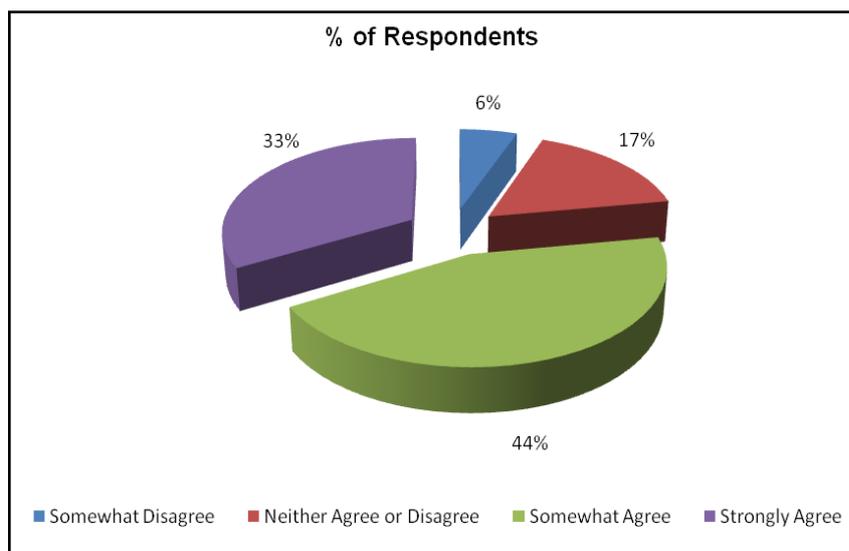


Figure 8.4. *The F&LVM can help to understand Value generation process in the early stage of projects*

Literature review underlines the importance of the discussion about Value from early stage of construction projects. However, there is not a fully agreement about what is considered to be earlier. According to Work Stages by The Royal Institute of British Architects (RIBA), final evaluators were asked about their own consideration of early stage (Q.3.1.2).

Data collected demonstrates that for most evaluators, the early stage of a project is linked to the Preparation stage, which includes two sub stages: Appraisal and Design Brief. Thus, 79% of the sample considers the first sub stage Appraisal as an early stage of projects whose activities are detailed as follows:

- *Identification of client's needs and objectives, business case and possible constraints on development.*
- *Preparation of feasibility studies and assessment of options to enable the client to decide whether to proceed.*
- **Value generation process through the life cycle of projects:**

When respondents were asked about the usefulness of the model to understand the process of generating Value through the life cycle of projects, the sample was reduced from eighteen to seventeen (one respondent considered the question as not

applicable). The mean obtained was 3.88 and the standard deviation was 0.86, with one respondent answering somewhat disagree.

- **Contribution to address environmental & social issues:**

When final evaluators were asked about the contribution of the model to address Environmental & Social issues, there is a high agreement with a mean of 4.0. Figure 8.5 shows that 78% of the respondents agreed that the model of Value could contribute to address environmental and social issues.

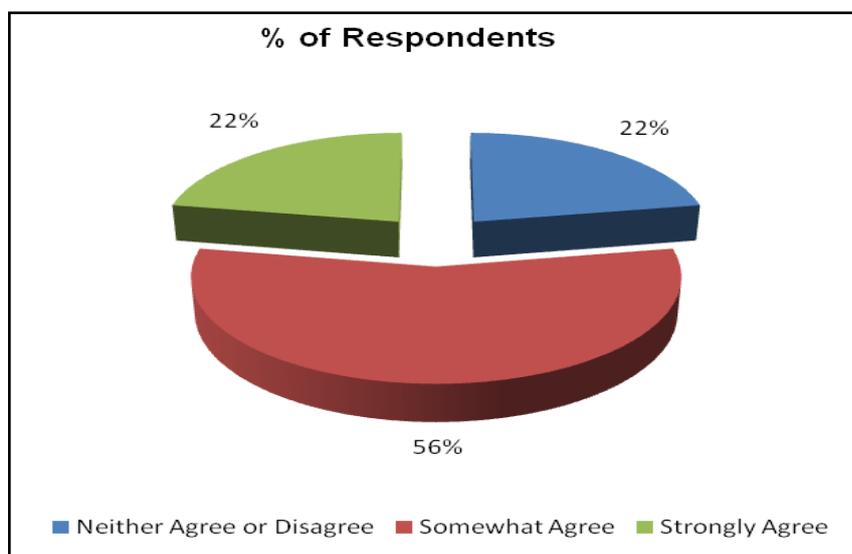


Figure 8.5. The F&LVM can help to address environmental and social issues.

8.5.4 Comprehension of the Concept of Value Using the F&LVM

Table 8.6 includes mean, median and standard deviation of the third set of statements (Q.3.2.3).

- **Objective & subjective nature of Value:**

When the objectivity of Value through the F&LVM was asked about, the percentage of acceptance was 57% (see Figure 8.6), which is still high based on the huge population which regarded Value as a difficult concept to be delivered in the construction industry (88% after the introduction of the F&LVM). More optimistic results were achieved when asking about the subjectivity of Value through the F&LVM, the percentage of acceptance was 75% (Figure 8.7).

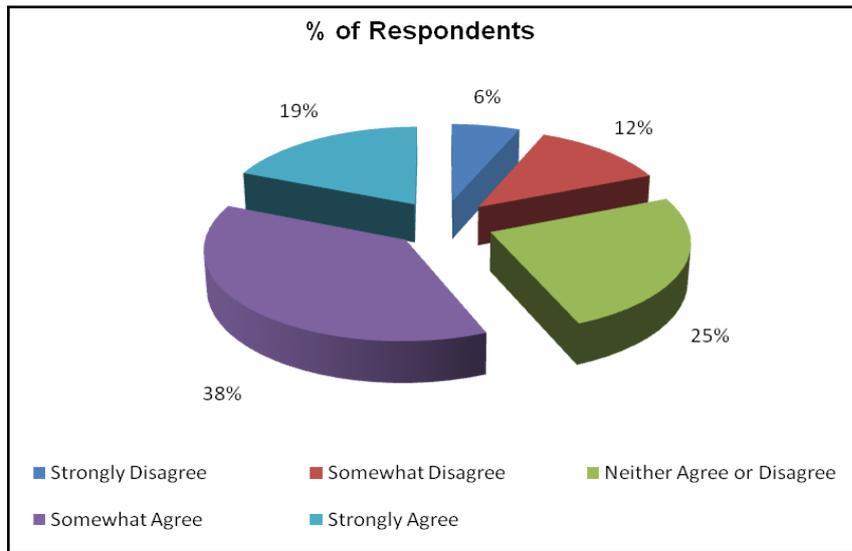


Figure 8.6. Objectivity of Value in the F&LVM.

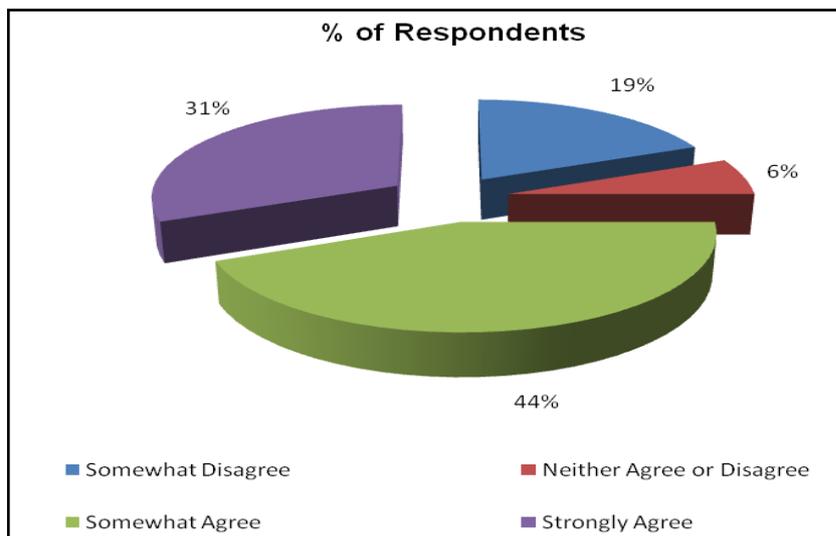


Figure 8.7. Subjectivity of Value in the F&LVM

- **Relative, dynamic and context-dependent nature of Value:**

In terms of the relative, dynamic and context-dependent nature of Value, the model contributes highly to understand those features, with means of 4.06, 4.13 and 4.13, respectively.

- **“Oscillating” nature of Value:**

In terms of the “*oscillating*” nature of Value, the F&LVM also contributes to be aware of this phenomenon, with means of 3.94. The percentage of acceptance was 75% (Strongly agree – somewhat agree).

Table 8.4. Evaluation of Mean, Median and Standard Deviation for responses of the first set of statements.

Ref. No.	Statements	Initial Opinion (Before introduction of the F&LVM)			Final Opinion (After introduction of the F&LVM)		
		Mean	Median	Std.Dev	Mean	Median	Std.Dev
A.1.1 – A.1.2	I recognise the need to expand the common perspective of Value from the construction industry.	4.78	5.0	0.55	4.33	5.0	1.03
A.2.1 – A.2.2	I recognise the importance of discussing the concept of Value in the construction industry.	4.72	5.0	0.57	4.56	5.0	0.62
A.3.1 – A.3.2	I include the discussion of Value in my current research or practice in the construction industry.	4.50	5.0	0.63	4.31	5.0	1.01
A.4.1 – A.4.2	I consider the concept of Value as a difficult concept to be delivered in the construction industry.	3.89	4.0	1.18	4.18	4.0	0.95

Table 8.5. Evaluation of Mean, Median and Standard Deviation for responses of the second set of statements.

Ref. No.	Statements	Final Opinion		
		Mean	Median	Std.Dev
B.1	The F&LVM reflects the relationship between Building & Infrastructure projects and Society as a Whole.	3.72	4.0	1.07
B.2	The F&LVM would contribute to the consideration of the concept of Value.	3.78	4.0	0.94
B.3	The F&LVM can help to understand the Value generation process in the early stage of Building & Infrastructure projects.	4.06	4.0	0.87
B.4	The F&LVM can help to understand Value generation process through the life cycle of Building & Infrastructure projects.	3.88	4.0	0.86
B.5	The F&LVM can contribute to address environmental & social issues.	4.00	4.0	0.69

Table 8.6. Evaluation of Mean, Median and Standard Deviation for responses of the third set of statements.

Ref. No.	Statements	Final Opinion		
		Mean	Median	Std. Dev
C.1	The F&LVM aids to understand Value as an Objective Concept.	3.50	4.0	1.15
C.2	The F&LVM aids to understand Value as a Subjective Concept.	3.88	4.0	1.09
C.3	The F&LVM aids to understand Value as a Relative Concept.	4.06	4.0	0.93
C.4	The F&LVM aids to understand Value as a Dynamic Concept.	4.13	4.0	0.89
C.5	The F&LVM aids to understand Value as a Context Dependent Concept.	4.13	4.0	0.81
C.6	The F&LVM aids to understand Value as an “Oscillating” Concept.	3.94	4.0	0.85

8.6 Discussion on Evaluators' Feedback

The opinions of researchers and practitioners in the construction industry have been considered to show the potential of the F&LVM to conceptualise the global context of Value in the construction industry. Qualitative data provides helpful information to regard benefits and barriers of the F&LVM.

Table 8.7 includes the Value model benefits underlined from evaluators. These benefits have been divided into three main topics that need further discussion: (1) Wider perspective of the concept of Value, (2) awareness of the concept of Value, and (3) usability of the model of Value proposed.

Table 8.7. Benefits of the F&LVM

Benefits	Evaluators' opinion
Wider perspective of Value	<ul style="list-style-type: none"> • Integration of society into the value of construction. • Understanding the impact of society. • Exhaustive view. • Open customer-focused perspectives. • Global overview. • Inclusion of environment. • Expanding the concept of "lean" (Womack & Jones, 1996) – five principles. • Value for society.
Comprehension of the concept of Value	<ul style="list-style-type: none"> • Understanding more properly the meaning of value. • Good explanation of the concept of value. • Using a good definition of value at a time considered. • Showing the evolution over time, the context.
Usability of the model	<ul style="list-style-type: none"> • Modelling complex aspects of value. • Defining and better addressing the client's needs. • Adding value easier.

Previous information underlined several benefits closely linked to the initial aim of the F&LVM. The following ideas are emphasized:

- **Benefits of the F&LVM in terms of a wider perspective of value:**

Evaluators clearly stated that the F&LVM helps to expand the common customer-focused perspective of Value in the construction industry. This Model differentiates three Value domains; thus, social perspective is differentiated from stakeholders' perspectives. Therefore, the presence of society is evidently regarded, as well as environmental & social issues.

- **Benefits of the F&LVM in terms of the comprehension of Value:**

Data collected demonstrated that the F&LVM provides a holistic picture of the concept of Value. Evaluators underlined that this model can be used as a visual tool to conceptualise Value from a wider perspective. Additionally, it is highlighted that the F&LVM aids to better understand Value in projects different stages. Therefore, its dynamism and context dependency are Value features identified from this model.

- **Benefits of the F&LVM in terms of its practical use:**

Finally, the F&LVM is considered a practical and conceptual tool to better address the concept of Value in the management of construction projects. It is underlined that the model helps to model complex aspects of Value.

8.6.1 Barriers of the F&LVM

Despite the previous benefits underlined by final evaluators, barriers were also identified (Table 8.8). Constrains of the F&LVM have been divided into three main groups: Modification of common behaviour, comprehension of Value concept, and usability of the model.

Table 8.8. Barriers of the F&LVM

Barriers	Evaluators' opinion
Modification of common behaviour	<ul style="list-style-type: none"> • Architects focus on project features. • Contradiction between quick building and long term value.
Comprehension of the concept of Value	<ul style="list-style-type: none"> • Difficult to explain a general definition of value. • A very subjective, in-evolution and dynamic concept to be defined. • Multiple definitions to be considered.
Usability of the model	<ul style="list-style-type: none"> • Too many participants to define value. • Somewhat very complex. • Very high perspective vs. Operational. • No implementation guidelines. • Measurement. • Only a theory.

Previous information underlined perceived barriers of the F&LVM. These constrains are discussed as follows:

- **In terms of modifying common behaviour:**

To adapt current practices linked mostly to deliver Value from a customer focussed perspective could be considered as an important constrain for using the F&LVM. As it was explored in previous chapters, customer focused perspectives has caused a close relationship between Value delivery and improved product attributes such as quality, cost and function.

- **In terms of understanding Value:**

As a result of its subjective nature, Value becomes a difficult concept to be investigated and addressed in the management of construction projects. Therefore, a

wider perspective including society could be considered as a multiplier effect of this general misunderstanding.

- **In terms of practical use of the F&LVM:**

According to evaluators' opinions, the complexity of the model is observed in terms of the number of participants to be included in order to represent particular and social Value perspectives. Additionally, some evaluators criticised the lack of operational application of this model because it is considered as a theoretical perspective.

8.6.2 Final Comments on the F&LVM

Final comments of evaluators are considered with regard to the aim and objectives of the F&LVM. Those comments are discussed from two points of view:

1. Perceived limitation of the F&LVM (PL); and
2. Outside scope of current research (OS)

Table 8.9 includes data collected from final evaluators.

Table 8.9. Final comments on the F&LVM

Further improvements & comments	Discussion
Measurement of Value	Measuring Value delivery to customer and society is considered a step towards research aim and objectives (OS)
Outcome of the building as value. example: Hospital, factory, office, etc. - First user probably would be enough	Value as the delivery of physical product (building project) is a common perspective in the construction industry. However, this research aims at visualising the global perspective of the concept of Value. Thus, this comment is considered contrary to the aim and objectives of this research. (OS)
Apply one example of F&LVM	Chilean experience has been used as a reference through this thesis to visualise Value delivery from a wider perspective, which considers the alleviation of social issues. Therefore, this recommendation has been addressed to help the understanding of this model. (PL)

8.7 Usability of the F&LVM

Based on the opinions of evaluators, it is underlined that the F&LVM could contribute to construction sector performance and the management of Value in two main areas:

- **Development of public policies:**

At present, the majority of society has no “voice”; therefore, decisions concerning traditional construction design processes are made without considering the global perspectives of Value. In addition, project participants lack a fully understanding of different features and multidimensional attributes of Value, whose total visualisation could contribute to the enactment of public policies. This idea is very important in the developing world where opportunities to design a build environment that supports society and impacts directly on the national economy are available. In this case, the relationship between these factors is more visible and cause and effect over time that can be measured.

- **Design of sustainable projects and communities:**

Over the years, the construction industry has been using a huge quantity of limited natural resources and, as noted, this situation has originated increasing concern for the welfare of future generations. Consequently, the use of the F&LVM is relevant in the promotion of sustainable development, where global issues should be raised to a first level strategy of the construction sector. To achieve this objective, a wider conceptualisation of Value can contribute to enhance client and social values from an early stage of construction projects. It is important to emphasize the interaction of different stakeholders towards the consideration of the expanded customer focused Value perspectives. Thus, the interaction of different domains and perspectives of Value provides an opportunity to consider society and future generations as potential customers.

8.8 Conclusion

This Chapter has explored the evaluation process of the F&LVM. This activity was undertaken to appraise the usability of this model as a visual tool to conceptualise

Value from a wider perspective. Thus, the possible contribution of the Value model to better understand different features of Value was evaluated, as well as its helpfulness to show the generation of Value considering the relationship between construction project and the society.

At the beginning, the evaluation process included a set of four statements aimed to understand the personal vision of the concept of Value. This set was compared with the same set of statements after the workshop evaluation. Accordingly, it is important to underline the high percentage of respondents that consider Value as a difficult concept to be delivered in the management of construction projects. Before the workshop validation the percentage was 76% and after this activity, the percentage increased to 88%. As a general tendency, after the introduction of the Value model, a reduction of mean and an increase of standard deviation was observed. This situation could be associated to the several and somewhat unknown information discussed in the evaluation workshop. However, population surveyed mostly agreed with the need to expand common perspective of Value in the construction sector linked to the fulfilment of customer requirements, through the improvement of product attributes.

When the individual comprehension of the concept of Value was evaluated, answers clearly showed two main tendencies: Customer-focused perspective of Value; and understanding of Value in function of other parameters such as cost, quality and product functionality. It is important to underline that according to the professional background of some evaluators, the concept of Value is regarded from a wider perspective. Consequently, social needs are also emphasized.

In terms of model effectiveness, comprehension and acceptability, final evaluators mostly agreed about the usefulness of the model to support the understanding of Value. A similar situation was observed when the model was evaluated in terms of its contribution to consider the concept of Value in the construction industry, and its usefulness to regard the process of Value generation in the early stage of projects. Additionally, when respondents were asked about the contribution of the model to address environmental and social issues, there is a high agreement; thus, 78% of the respondents agreed that the F&LVM can contribute to address global issues.

When evaluators were asked about Value feature in the F&LVM, high acceptance was observed in terms of the relative, dynamic and context-dependent nature of Value. The feature less evidenced using the model was objectivity of Value. Lastly, a set of open-ended questions was included to identify barriers and advantages of the F&LVM. Likewise, benefits were observed in terms of expanded and holistic perspective of Value. Additionally, it is also underlined that the Value model can be considered as a practical conceptual tool to better address the concept of Value in the construction industry. However, barriers of the F&LVM were also identified in relation to behavioural aspects of future users, subjective nature of Value, and complexity of the model. In addition, data collected demonstrates that for most evaluators, the early stage of a project is linked to the Appraisal stage according to RIBA.

Finally, based on the result achieved, next Chapter includes conclusions and final discussions.

CHAPTER NINE. CONCLUSIONS & FINAL DISCUSSION

9.1 Introduction

This chapter summarises key findings of this research. Accordingly, research questions are addressed in terms of research aim and objectives. The aim of this research was to establish the link between Value delivery from the construction industry concerning society and the built environment (building & infrastructure projects), and represent this situation through a conceptual model, which considers different features and multidimensional attributes of Value. Literature review identified key research findings: a lack in an overarching understanding of Value, a predominance of customer focused perspectives, Value mainly understood as an objective concept, Value commonly delivered at project level, and several features and multidimensional attributes of this concept. In addition, Lean Thinking arose as a potential philosophy to move towards a wider conceptualisation of Value, where the legacy of the construction industry becomes the delivery of Value and legacy to society by addressing environmental and social issues. This chapter goes on to underline the contribution to original knowledge, research publications and other works to be published in the future. Finally, recommendations for application and future research topics are made.

9.2 Achievement of Research Aim and Objectives

To achieve research aim, five objectives were established and they are discussed in the following paragraphs.

Objective 1: *Building a general understanding of the concept of Value.*

Targeted at understanding Value as a general concept the literature review explores the evolution of the concept of Value and its objective and subjective nature. From this review, Value was differentiated from “values” (human guidelines) and “value

systems". In addition, the concept of Value from the general perspective of the construction industry was investigated, and three kinds of Value were identified: Product value, process value and a tacit value closely related to learning from experience. Thus, different features and multidimensional attributes of Value were distinguished, a concept which is objective, subjective, relative, context-dependent and dynamic. Therefore, objective one was fulfilled through previous activities.

Objective 2: *Investigating different perspectives of Value used in the construction industry and identifying similarities and differences.*

This objective was achieved and the concept of Value was investigated from the perspectives of: Value Engineering (VE), Value Management (VM), Lean Thinking (LT), Customer Value Management (CVM), Value Based Management (VBM) and Value in Design (VALiD). By exploring different theories and management tools used in the construction industry the lack of an overarching understanding of Value was identified. Common trends in current perspectives observed were as follows:

1. The concept of Value has been mostly managed from a customer-focused perspective. Thus, environmental & social issues have been left behind by individual requirements;
2. The concept of Value has been commonly understood as a product attribute. Consequently it has been considered an objective concept associated to several measurable parameters such as cost, quality, function, etc.; and
3. The concept of Value has been mainly linked to Market and Utility Value which have been addressed through the continuous improvement of project planning and control of production process activities.

Objective 3: *Identifying the potential of different perspectives to consider the return of Value from construction industry to the entire society.*

This objective was driven by the desire to appreciate the extent to which the social and environmental legacy of the construction industry was understood and how well that legacy was expressed within previous theories and management tools. The literature reviewed evidences a frequent customer-focused perspective on the

delivery of Value. Thus, individual interests have commonly predominated over wider social issues. In addition, the Supply Chain usually understands a customer as the “*one who pays*”. As a result, social issues continue to be considered provided they are important from the bill payer’s perspective. Thus, a general failure to regard the social and environmental legacy of the construction sector output as a whole beyond that required by any planning legislation has been observed.

From several identified aspects, LT arises as a philosophy able to be engaged to expand the common customer-focused Value perspective. Lean Construction has emphasised the importance of delivering Value at every stage, elevating this activity to the first principle of current practices. Consequently, environment and society could benefit from the consideration of a wider or interchangeable customer notion (e.g. customer = environment / customer = society, etc.).

Objective 4: *Exploring the concept of Value from Chilean policies and three SHP used as case studies.*

Investigation of official documents allowed identifying key element of current Chilean processes such as main phases along the life cycle of projects, stakeholders groups and their associated responsibilities. Additionally, qualitative data collected from stakeholders participating in three case studies allowed to differentiate diverse perspectives and domains of Value. Thus, theory about the concept of Value, documentary data analysis from Chilean policies and case studies were triangulated to finally obtain a the wider picture of Value and better comprehend Chilean experience.

Previous activities revealed an emerging phenomenon in developing countries such as Chile, where Value was understood as an “*oscillating*” concept. This demonstrated the way in which Value is exchanged and influenced by construction project design and construction and its social and environmental legacy.

This phenomenon supports the identification of Value delivery from two main contexts:

1. *Last context:* Value delivery focuses on the product and its attributes (closely linked to Market & Utility Value); and

2. *First context*: Value delivery focuses on social improvement (Insertion of low income people into society and its intrinsic consequences: Less social vulnerability & risk).

Therefore, this objective was achieved through the investigation of Chilean experience based on SHP policies and three cases studies.

Objective 5: *Developing and evaluating a conceptual model to visualise Value from a wider perspective.*

A theoretical model to visualise Value from a wider perspective was developed. This model places the relationship between construction projects and society at the centre of the features and multidimensional attributes of Value wherein social issues are the First context of Value and construction output the Last. Thus, the F&LVM is proposed as a prescriptive tool to conceptualise an overarching view of Value to resolve problems detected in literature, and to place the social and environmental legacy of the construction industry at the heart of the definition of Value.

Additionally, the F&LVM considers the interaction between three Value domains: Production & Delivery capacity; Stakeholders' perspective; and Social perspective within Technological, Economic, Environmental and Political perspectives. Finally, this model includes different features and multidimensional attributes of Value, a concept which is objective, subjective, dynamic, context dependent, relative, and "*oscillating*". This results in a complex model that not only presents a new perspective of Value, but also shows how it changes over time.

The evaluation of the F&LVM identified the potential of this model to become a conceptual tool for the construction industry. Thus, evaluators largely agreed that this model could contribute to the conceptualisation of Value from a wider perspective. In addition, the concept of *First* and *Last Value* could help to differentiate between Value delivery from a project-focused perspective and Value delivery to the society.

9.3 Research Questions

Two research questions informed this project:

1. How has Value been considered in the management of building projects?;
and
2. Could Value be conceptualised to emphasise the role of construction within
society?

Both questions were positively answered through the achievement of the objectives.

9.4 Contribution to Knowledge

According to the research findings, contribution to knowledge can be summarised in two key achievements:

- **Review of different perspectives of Value and the identification of the main features of this concept:**

This research includes an extensive review of different perspectives of Value in the construction sector, and places them together by identifying the extent and limitations of the concept. This review exposes the social and environmental legacy of construction projects commonly missed or relegated to a second level of current strategies. This situation is evidenced through the exploration of three case studies of SHP in Chile, where current policy has been focused on the integration of low-income people into social networks. The new understanding arising from this emerging phenomenon is Value as an “*oscillating*” concept. This situation can be linked to the tacit Value identified from literature, which comes from the design and construction process and is closely related to learning from experience. However, this sort of Value has been less explored through current approaches in the construction management field.

From the exploration of different perspectives of Value evident in the construction industry, LT arises as a philosophy with the potential to expand current visualisation of Value towards the consideration of environmental and social issues. LT elevates Value to the customer as a fundamental principle in the manufacturing sector and, consequently, the consideration of Value has been transferred into LC. Therefore, this philosophy provides the opportunity to consider environment and society as

“potential customers” to be fulfilled. Previous experience underlined the contribution of LC in the alleviation of environmental and social issues such as reduction of carbon emissions, health and safety, labour force, etc. In addition, continuous improvement is a fundamental Lean principle, so *First Value* is intended to form an aspiration rather than a tangible set of criteria, in the sense that perfection is a final Lean principle (Womack and Jones, 2003).

- **Global & Multidimensional Value model:**

A prescriptive model was developed to conceptualise Value from a wider perspective in the construction industry, and to represent several features of Value and its multidimensional attributes. The F&LVM includes the delivery of Value spanning across two different contexts: *First context* refers to Value delivery to the society (Environmental & Social issues); meanwhile, *Last context* deals with Value delivery at project level (production level - the work). Additionally, this model considers the interaction of three Value domains) and four Value perspectives in a manner that is objective, subjective, dynamic, context dependent, relative, and “oscillating”. Therefore, the F&LVM promotes the consideration of a wider set of customers including owner, user, environment and society opening the opportunity for debating the concept of Value from a wider perspective, considering the return of Value and legacy from the construction industry to the whole society.

9.5 Research Implications to Wider Industry

Over the years, various theories and management tools have been considered to deliver Value from different approaches in the construction industry. Thus, Value delivery to customers and project participants have been regarded as a main goal of this sector. As a result, the potential of the construction industry has been limited by the fulfilment of particular requirements. Thus, planning and controlling projects’ activities have been key parameters to evaluate the performance of this sector. In addition, the Supply Chain commonly regards customer notion as *the “one who pays”*. Therefore, environmental and social issues continue to be considered provided they are important from the bill payer’s perspective.

This common situation evidences the need for a softer and wider visualisation of Value, where sustainability and whole life issues should be included. Consequently, this research underlines the need for a wider visualisation of Value, which includes the relationship between construction projects and society, main features and multidimensional attributes of this concept. This wider visualisation of Value implicates several aspects to the construction industry so far:

- That society, considered as human survival and development, encompasses environmental and economic sustainability. Thus, construction industry should regard society as dependent on these outputs. Therefore, sustainable practices can be elevated to first level strategies of this sector and be considered as the legacy of the industry for future generations.
- That Value so far is regarded as a self-contained project attribute/set of attributes that can be defined, delivered and measured, allowing Value to be visualised along a scale that permits wider goals and responsibilities to be considered by the construction industry.
- That recognising the “*oscillating*” nature of Value with the strategy of social goals influencing projects which feed benefit back to society and so on will contribute to the construction industry view for the management of the built environment and urban and rural planning.

9.6 Research Publications

To support research findings, the following papers were developed through this research:

Conference papers:

1. Salvatierra-Garrido, J., Pasquire, Ch., and Thorpe, T., (2008). “Social Housing in Chile: Opportunities to apply Value concept in early stage of projects.” Proceedings of 24th ARCOM Conference, Cardiff, UK, 1-10.
2. Salvatierra-Garrido, J., Pasquire, Ch., and Thorpe, T., (2009). “Value in construction form lean thinking perspective: current state and future

development.” Proc., 17th Annual Conference on Lean Construction, IGLC, Taipei, Taiwan, 127-136.

3. Salvatierra-Garrido, J., Pasquire, Ch., and Thorpe, T., (2010). “Critical review of the concept of Value in Lean Construction Theory.” Proc., 18th Annual Conference on Lean Construction, IGLC, Haifa, Israel, 33-41.
4. Salvatierra-Garrido, J., and Pasquire, Ch. (2011). “The First and Last Value model: Sustainability as a First Value delivery of Lean Construction Practices.” Proc., 19th Annual Conference on Lean Construction, IGLC, Lima, Peru, 2-11.

Journal papers:

1. Salvatierra-Garrido, J., and Pasquire, Ch. (2011) "Value theory in lean construction", Journal of Financial Management of Property and Construction, Vol. 16 Iss: 1, pp.8 – 18.
2. Salvatierra-Garrido, J., and Pasquire, Ch. (2011) “Introducing the concept of First and Last Value to aid Lean Design: Learning from Social Housing Projects in Chile” (2011), Journal of Architectural Engineering and Design Management, Vol. 7 Iss: 2, pp.128 – 138.

In addition, a third Journal paper is in preparation. This paper summarises the work undertaken through this research and proposes “*oscillating*” Value delivery as new phenomenon to build future legacy.

9.7 Research Limitations

The main limitations of this research are summarised as follows:

- Reduced literature on Value from a wider perspective: This concept has been mainly explored from a project-focused perspective. Thus, the impact of the construction industry on society has been commonly missed or addressed from a strong economic perspective;
- Subjective nature of Value: The subjective nature of this concept could be a questionable point of this research. The proposed wider visualisation is

supported by individual observation, which is clearly supported by an individual vision. To reduce this impact, other research methods were used. However, final results will be always affected by other critical visions of Value; and

- Limited scenario to test the F&LVM: This research has explored Chilean experience to visualise a not well explored phenomenon, which regarded Value as an “*oscillating*” concept. However, other realities should be included to observe similar situations. For example, the way schools layout can contribute to students’ socialisation and reduce depression.

9.8 Recommendations for Future Research

This investigation underlines the potential of a construction industry’s strategy supported by the return of Value from this sector to the entire society. This wider visualisation is built over its several features and multidimensional attributes. Thus, this research opens the opportunity to further discuss and investigate different topics from a theoretical and applied dimension. Thus, this section provides some recommendations for further research:

- As a way to better understand how Last Value could be translated into First Value and vice versa. Different stakeholder layers should be identified to balance particular Value judgements with common social goals.
- From an economic perspective, it is important to answer the following questions:
 - Are customers able to pay for Value delivery from a social perspective?;
 - Can companies be rewarded other than by payment with money for delivering *First Value* to society as a whole?; and
 - If not, how can payment for *First Value* be made to reflect *Last Value* in a better way?
- From a design management perspective, decision making process should be reformulated considering the different features of Value and its

multidimensional attributes. Accordingly, cases studied should be investigated to understand the dynamic nature of Value. A better comprehension of the variation of value over time could contribute to expand the potential of LT, which requires an end to end view of the system under consideration.

9.9 Closing Comments

According to different knowledge fields, the experience of the management of Value is plentiful, but still in some ways is confusing. This situation has been transferred to the construction industry, where the understanding of Value can be associated to individual and somehow limited perspectives. As a result, neither researchers or practitioners have yet assimilated an overarching understanding of Value.

As a result of the “*oscillating*” nature of Value observed from the exploration of SHP in Chile, this research underlines the need for a wider conceptualisation of Value in the construction industry. This idea is supported by the relationship between Value and legacy delivery to society, the construction sector and the built environment & products (building & infrastructure projects). Consequently, the F&LVM was designed and evaluated under the perspective of Lean Construction, whose potential is emphasised as a philosophy able to address social & environmental issues as a first level strategy of the construction sector. Results from the evaluation process confirmed the effectiveness, comprehension and acceptability of this model. Therefore, the use of this model could contribute in the future to better visualize Value and recognise society as dependant on the outputs of the construction industry. Thus, Value could be differentiated from project focused and social perspectives (*Last & First Value*).

The proposed situation does not overlook the importance of money and other parameters such as quality, function, etc., used to deliver Value. This research proposes that society provides a wider set of “customers” whose needs are dependent on the built environment but have little or no voice in its design and construction. It is indisputable that the activities of the construction industry have an impact on society and provide a legacy to future generations. Moreover, ALL human

beings depend on many sorts of construction to support their activities and that the more developed a society or country is, the more such structures are needed. The understanding of Value as an *“oscillating”* concept provides a real opportunity for sustaining a legacy for future generations, particularly in terms of encouraging participants of the construction industry to improve their performance as much as possible.

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APPENDIX 1

I. Life Cycle of Social Housing projects in Chile

According to MINVU's "FONDO SOLIDARIO DE VIVIENDA-Manual para dirigentes y familias" (HOUSING SUPPORT FUND - Handbook for leaders and families) (www.minvu.cl), bellow activities are performed:

1. Project elaboration

1.1 EGIS selection

1.1.1 Collect information about available EGIS: These organisations must have an agreement with MINVU to demonstrate their capabilities to build Social Housing Projects under governmental and client requirements. In this way, it is necessary:

- To contact Information Office of SERVIU and request a listing of EGISs having an agreement with MINVU.
- To request information about EGIS responsibilities.
- To contact EGIS selected and inquire about:
 - Services provided.
 - Timeframe for executing these projects.
 - Involvement of the said EGIS to find and value building site.
 - Expectations of the EGIS on families and Committee directive.
 - Projects built by said EGIS.
 - Possibility to meet other committees to get feedback.
 - Financing of additional tasks (Are such to be paid? How?).
 - Cost of additional tasks.
 - Additional tasks description.

1.1.2. Evaluate alternatives: If there is more than one alternative, Committee board must make the decision to select the EGIS. In order to choose the best alternative, it is important to:

- Collect information about requirements, offers, and previous experience of each EGIS.
- Compare information about each EGIS and choose 2 or 3 alternatives.
- Write down relevant information in order to show it to other families applying to these projects.

1.1.3. EGIS selection: Information collected should be released to other families in order to make a final decision. Best alternatives should be selected as follows:

Committee board will show EGIS information to other families participating in these projects

- They will discuss what is the most secure alternative.
- They will vote to choose the best option.

1.2. Agreement between Committee and EGIS

1.2.1 Make an agreement between Committee and EGIS. For this purpose, it is necessary to:

- Report EGIS selected and request a list with all their compromises and what information families must proportionate.
- Discuss possible doubts.
- Create decision making systems in order to solve possible disagreements

1.2.2 Register the agreement between Committee and EGIS. To achieve this objective, the following activities are necessary:

- Register the agreement between legal Committee board and EGIS in a formal document.
- Register and sign individual responsibilities.

1.3. Building site selection

- Search of building site: EGIS must advise families through this process.
- Collect information about building site: Collection of legal, technical, and financial characteristics.
- Visit to alternative sites.
- Building site selection: It is necessary to meet with families to talk about the best options.
- Signature of a promissory sales agreement: this document should be included for the evaluation process to be performed by MINVU.

1.4. Defining type of project and site allocation: Families must participate actively in this process, which is part of the SIP:

1.4.1 Identify alternatives, for which following activities should be carried out:

- Planning a meeting for the EGIS to collect families' concerns.
- Introduction of different alternatives for the project by the EGIS.
- Deciding which alternatives families want to know in detail in order to make a final decision.

1.4.2 Select one type of housing project: Families and EGIS must decide on which project will be built. Basic requirements are to be considered:

- Space: Living room-Kitchen, 2 bedrooms, 1 toilet and corridors.
- Future extension (55 m²). Does the project consider a third bedroom?.
- Is a special design for disabled people being considered?.
- What about ventilation?.
- Will the house have natural daylight?.
- Is it possible to pass through doors and corridors?.

1.4.3 Acknowledge and approve house design

- After EGIS finishes pre-project design — Site division and architectural project design - these have to be submitted for revision.
- If families agree on a design for the project, it is necessary to approve and register this election in a formal certificate.

1.4.4. Review life cycle process and deadlines, as families need to know important milestones in order to develop future activities

1.4.5. Operation of Sanitation Services

1.5. Complete saving requirements

1.5.1 Knowing deadlines: Before submitting project to MINVU's revision, all families need to complete their saving requirements

1.5.2 Completing saving requirements and showing bank evidence (certificate)

1.6. Participate in Social Insertion Activities:

1.6.1 Participate in diagnosis phase. To do that, families must:

Ask EGIS when will a meeting take place to collect information about families' interests and concerns related to the importance of having a new house and form a new neighbourhood

- Encourage people to participate enthusiastically in this activity.
- Ask EGIS for a meeting in order to show conclusions of diagnosis stage.
- With information collected in previous activities, comment Social Insertion Plan's activities considered in the next phase.
- Important aspects to be discussed in diagnosis phase.
- Expectations on a housing solution, neighbourhood and neighbours.
- Valuation of the house in the future.
- Existence of public spaces for kids, young people and seniors.
- Community equipment works interesting for families.

- In case of having delinquency, drugs, or unemployment problems, what is being done?.
- Coverage of special needs, i.e. of disable people.
- Important topics to be discussed in future workshops.

1.7. Choosing a building company

The building company must ensure quality fulfilling all agreements with families. Besides, they must meet Governmental requirements, technical specifications and construction laws.

1.7.1 Contact building companies. To do so, following activities are to be carried out:

- Contact building companies acquainted with members of the committee.
- Get in touch with other committees and, if they have had a good experience, register all necessary information regarding building companies.
- Discuss conclusions with EGIS and decide which building companies are to be contacted.
- Ask EGIS to contact selected companies in order to know their interest in participating in their project.

1.7.2 Choose one building company. To make the best choice, these activities should be carried out:

- Check project's budget with EGIS.
- Discuss if there are important points needing clarification.
- Decide which is the best alternative (building company).
- Sign a contract between EGIS and building company or submit a compromise letter (document necessary for applying to subsidy).

1.8. Submit project design to SERVIU

- Considerations for the project to qualify.

- Group and family vulnerability: children, seniors, members with disabilities, etc.
- Vulnerability according to social protection record (FPS, Ficha de protección social).
- Project's technical quality.
- Social Insertion Plan's quality.
- Additional resources received from other companies.
- If the project meets all requirements but has not been selected in a previous application.

2. Project Revision and Qualification

2.1 Obtaining information on project's evaluation

At the Service of housing and urban matters (SERVIU), a technical committee verifies technical, economic, legal, and social aspects to proceed with evaluation of the project. Families have no direct participation in this process.

2.1.1 Obtaining information on project's submission to SERVIU: The EGIS submits every project's information to SERVIU for evaluation by an assessing technical committee.

2.1.2 Obtaining qualification: SERVIU's Assessing Technical Committee reviews and qualifies the project. This qualification can be definitive or conditional. The committee can also make some remarks. In order to learn about project's qualification, families need to ask EGIS:

- Have they received a definitive qualification? If so, it means that the project meets all requirements and the benefit can be applied for.
- However, if there are remarks, it means that SERVIU's Assessing Technical Committee requires modifications to be made or the addition of more information. The EGIS has to inquire after required changes and how are they to be fixed in order to apply successfully.

- If the project received a conditional qualification, it means that more information is required. Probably, the project is failing construction permission, certification of land propriety or promissory selling agreement. In this case, an application can be submitted for the project which may be pre-selected. Information required, however, needs to be completed before receiving the benefit.
- Tasks fulfilment within required deadlines should be verified. If adjustments are required, the EGIS should explain the effects of such changes to stakeholders.

2.2 Application to get the benefit: In order to apply, projects need a qualification certification. Moreover, requirements need to be met by all families of the group.

2.2.1 Information on project's application and selection

Projects are selected by MINVU according to the score obtained through the corresponding evaluation. The higher the score obtained by the project is, the greater its probabilities to be selected and to obtain the resources required for its execution. The aspects considered in resources allocation are the following:

- Vulnerability of the group as a whole and of each participant family. When there are minors, elders, or persons with disabilities, or victims identified in the Political Imprisonment and Torture report in families applying, higher scores may be obtained.
- Vulnerability condition according to the social protection record (FPS - Ficha de protección social).
- Project's technical quality.
- Quality of a social rating plan.
- Additional contributions.
- Participation in previous callings. If a project has applied previously meeting all requirements but not being selected, an additional score is awarded.

2.2.2 Benefits reception: When a project is selected, each family receives a Benefit Certificate.

3. Project execution

3.1 Contracting construction company: If no construction company has been hired by the EGIS yet, a bidding is conducted to find such company and a contract is signed in order to continue advancing with the project.

3.2. Supervision of construction process: To keep track, following activities are performed:

3.2.1 Creation of a working committee: The working committee is a group organised by the EGIS to bring together SERVIU's representatives and families receiving the housing benefit. The working committee is created to provide information on the project execution throughout its lifecycle until final reception. In order to create the working committee:

- After consulting the EGIS, families need to discuss who of them may form part of the Committee participating in the working committee who may represent properly families' interests. Participants may or may not be part of the board.
- A provisory schedule of activities must be drafted.
- A system to provide ongoing information to the rest of the Committee needs to be defined.
- Families are to be informed by the EGIS about Working Committee's function: who its members are, how to ask questions, and how will families be informed.

Note:

According to the agreement between MINVU and the EGIS, a working committee will be created which will meet quarterly.

Works' quality is to be safeguarded by SERVIU. To do this, it supervises directly that all quality requirements are met or outsources a specialist to do so. This will be the Works' Technical Inspector (ITO)(*).

(*)The Works' Technical Inspector is a professional specialised in construction matters who will visit regularly the construction site and who will safeguard the quality of the works taking place.

3.2.2 Meetings with Construction Company: Construction Company is required to keep families informed on the progress of works. A regular contact is provided by the Working Committee; however, other meetings must be held for Construction Company to keep families directly informed. Therefore, bellow activities are to be included:

- Consulting EGIS and informing families about meetings scheduled with Construction Company.
- During these meetings, all concerns are to be presented. A visits schedule to construction site will be established allowing a follow-up without hindering works.
- The EGIS may be questioned about deadlines compliance.
- Any modification to original project must be approved by families and EGIS. In case of modifications, families need to be informed about final costs which will be recorded in the meetings minutes book.

3.2.3 Visits to show unit: Depending on the quantity of houses included in construction projects in new plots, a unit is to be finished in advance so that families can see their future housing and plan moving to their new house.

3.3. Preparing to become proprietors: During this step, construction works are executed, a process which families follow closely. It is also the time to take part in Social Rating Plan's activities, allowing families to fit into the community, to know their future house and to improve their life quality.

3.3.1 Preparing for living in community: Family wellbeing not only relates to the quality of a new house, but also to a good integration into the community. Aiming at this, the EGIS organises a series of activities included in the Social Rating Plan allowing families to get a better knowledge of community organisations and services in the surrounding area. Therefore, bellow activities are to be performed:

- EGIS is required to explain the Social Rating Plan in detail to families.
- Families have to be encouraged to participate actively in the activities proposed.
- In case of construction works in new plots, it is important that families understand that moving implies changing their entire way of living: other neighbours, a new neighbourhood, etc. An activity to talk of this is to be organised by the EGIS.
- Even though families may have been living in the area for a long time, they should participate actively in workshops, as these will be helpful to improve their knowledge of existing services.
- Families need counselling by the EGIS to know the Act of Neighbours Committees and how this act affects them.
- The EGIS must provide information on community networks that may be accessed.

3.3.2 Preparing to maintain and improve the new house: Receiving a house implies new duties and responsibilities. In the future, there will be additions, improvement works and maintenance works to improve further families' life quality. So, the EGIS organises a series of activities allowing families to understand basic care and improvement activities for their new houses and to introduce them to other benefits that will help them throughout the way.

Some training is needed in the following areas:

- Use, care and maintenance of the new house.
- House extensions.
- Sanitary utilities (in case of constructions in rural zones).

3.4 Distribution of houses: The decision on how houses will be assigned to families will be made by the Committee, agreed by participating families, and applied. This decision should be made when houses works are advanced.

3.4.1. Definition of a system to allocate houses: One of EGIS responsibilities in terms of social rating consists of providing families with support to allocating the houses.

3.4.2. Houses allocation: After defining an allocation system, this must be put into practise so that each family knows in advance which their house will be. To allocate houses, the complex must be completed and have the reception of the Direction of municipal works.

3.4.3 Registering the house: After each family knows which their house in the complex will be, the EGIS draws a deed up. Once the Direction of Municipal Works issues a final reception of the works, each family signs their deed. Afterwards, the EGIS registers each house in the Real Estate Registrar acknowledging their condition as owners (registration of ownership).

3.5. Inauguration and removal: Due planning of inauguration and removal activities helps to keep order and efficiency, allowing these moments to be enjoyable.

3.5.1 Inauguration arrangements: It is important that every person involved in the process takes part in the inauguration of houses.

3.5.2 Removal: In order to make removal in a quick, seamless and orderly fashion, proper arrangements are required.

4. Settlement

4.1 Expressing approval: It is very important that all families receive their houses in good condition, with the same characteristics offered. That is the reason why they are asked to express conformity with the house delivered.

4.1.1 Defining a procedure: A procedure for each family to express its conformity with the house delivered should be established. Following steps may be considered to define such procedure:

- The EGIS should advise families on what they should consider to be satisfied or not with the house delivered. For example, faucets, door handles, door locks, switches, etc. must be in good working condition; doors must not be too tight; rainwater should not leak through the windows, etc.

- The EGIS should be asked to advise families on the correct way to register their satisfaction or dissatisfaction with the house received.
- Period to establish these observations and to sign-up reception must be determined.
- Families are to be informed of all previous aspects to comply with this requirement on time.

4.1.2 Expressing approval: Once the procedure is made known, each family must express its approval or disapproval.

4.2 Knowing and using post-sale service: According to the agreement between the EGIS and MINVU, all new houses belonging to the Housing Support Fund have a post-sale service to correct construction failures that may appear after house delivery. To make the most of this post-sale service, families need to know it, understand how it works and what is included.

4.2.1 Getting to know: The EGIS is to be asked to prepare an informal lecture with families about post-sale service. All participants need to understand clearly what is included, the timeframe, how it is used and for how long. If appropriate, families will be able to ask for necessary modifications to be done following informed procedures within corresponding deadlines.

Note:

Construction quality: The document “Ordenanza General de Urbanismo y Construcciones” (General rules for town planning and constructions) make it possible to complain against the construction company for construction failures in the house: three years for finishings, five years for fixtures and ten years for structure issues. These periods apply from reception date of the house by corresponding authority. However, this rule does not cover problems because of misuse, carelessness or insufficient maintenance of house.

4.3 New address registration: If families have moved to an entirely new area, they need to update their data and to register their new address wherever needed.

4.4 Involvement with the social network: Becoming part of the new neighbourhood will provide the family with all benefits offered by different agencies and institutions.

4.4.1 Updating Social Protection Record (formerly FPS): It is crucial to have it updated as this information determines which social programs may be accessed by the family.

4.4.2 Participation in neighbours' committee: Neighbours' committee is a source of information and a means to become part of the community.

4.4.3 Enrolling in family healthcare centre: Enrolment at the appropriate family healthcare centre is required in order to receive the benefits provided by community's primary healthcare network.

4.4.4 Enrolling kids in schools: It is advisable that kids go to schools near their new houses, so their parents need to do required arrangements to enrol them.

4.4.5 Getting information about security systems: Every family needs to know security systems in place in the community where their new house is.

4.4.6 Knowing public transportation: Public transportation needed by each member of the family may change substantially, so it is necessary to know each one's timings and ways in advance.

4.4.7 Identifying places to buy items needed

APPENDIX 2

Problems in Social Housing Projects in Chile

The present exercise is part of the research to obtain the Doctor Degree of Loughborough University. Please, be aware that all the information provided will be treated responsibly.

Q.1.1. General Information:

Which are the most important problems in Social Housing Projects in Chile?

Q.1.1.1. Relative to the Government

Q.1.1.1.1 SERVIU METROPOLITANO: (Respondents: Profesionales Subdirección Operaciones Habitacionales - Professionals of the Sub-Department of Housing Operations Division of Housing Operations)

- *The current and previous governments of the "Concertación" (the ruling sector) have introduced improvements in standard and quality of housing projects. The new Housing Policy strengthens new housing solutions arisen from the people affected by the housing problem, who get the initiative to apply with housing projects in new urbanizations as also under densification plans. In this new policy, the aspects of quality are addressed by increasing subsidy's amount by means of a bonus for good location and with a close evaluation of projects, which occurs since the subsidy is awarded and during the whole process of construction, in order to assure the quality of the constructions. Nevertheless, still there are pending challenges, specially about the designing of housing solutions types according to the particular characteristics of each recipient family.*

Q.1.1.1.2 ELEMENTAL: (Respondent: Project Architect)

- *Located in the peripheral zones of the city, lack of offer. Not opened to new alternatives, because the rules are not precise for them.*

Q.1.1.1.3 Lo Espejo-Town Council: (Respondent: Chief Housing Department)

- *Restricting Regulating drawings*
- *Lack of land*
- *Elevated costs of urban lands (real estate speculation)*

Q.1.1.1.4 Simonetti Building Company: (Respondent: Project Manager)

- *Complicated payment system; a system that is foul and recognizes the irresponsibility of building companies which, in turn, makes the government protect itself and to apply even more complicated payment conditions. Besides, public workers are known for not having the necessary skills, which is made up for with supervision. The delay in payment makes that only few competent building companies get involved and get off this kind of projects.*

Q.1.1.1.5 Foundation “Un Techo para Chile”: (Respondent: Director Definitive Housing Area)

- *In general, it always has drastic budget restrictions, even though the housing policy is good enough to develop projects fulfilling the standards previously mentioned. On the other hand, most of the time it is necessary to soften the public administration in order to develop definitive and sustainable solutions; otherwise, it takes much time and the social work wears out.*

Q.1.1.1.6 ELEMENTAL: (Respondent: Project Architect)

- *The government, through the organizations involved to social housing, gives rules too restrictive from the perspective of design. Therefore, there are no design innovation opportunities to satisfy the actual needs of the families involved in the project.*

Q.1.1.1.7 Renca - Town Council: (Respondent: Project Architect)

- *The support provided by the government is very important; its guidelines allow it to regulate private entities to build up new housing projects considering not only the buildings, but also the layout of the neighbourhood and the city.*

Q.1.1.1.8 SIESCON Building Company: (Respondent: Civil Constructor -Shareholder)

- *Resources available are always insufficient to satisfy the requirements of Department of Housing and Urban Planning.*

Q.1.1.1.9 JUNDEP-EGIS: (Respondent: Manager of Technical Department)

- *Under policies targeted to better neighbourhoods over better houses, it becomes necessary to reallocate resources for housing to create recreation areas and to improve neighbourhoods surrounding areas. Matching this situation with resources available is difficult, as quality standards are also higher.*

Q.1.1.1.10 EPS Architectural Company and EGIS: (Respondent: Project Architect)

- *Troublesome and unclear processes; processes are extremely customized; most of the time people disregard established procedures.*
- *Generation of more flexible guidelines in terms of design.*
- *Generation of a standard which is not so ambiguous; technical conditions of projects are too unclear; technical specifications targeted to social housings are needed.*

Q.1.1.1.11 ORMUZ Ltda. Building Company: (Respondent: Project Manager)

- *Projects uncertainty; projects are entered in an informative state in all cases but for architecture's, which is the only one approved by SERVIU and the direction of municipal works.*

Q.1.1.1.12 Lo Barnechea- Town Council and EGIS: (Respondent: Communal Development Department Director)

- *Subsidy's amounts – basic housing does not consider the real necessity. It is believed to be an easy solution, because there is an expansion subsidy which should be incorporated to project's initial amounts.*

Q.1.1.2. Relative to Families

Q.1.1.2.1 SERVIU METROPOLITANO: (Respondents: Profesionales Subdirección Operaciones Habitacionales - Professionals of the Sub-Department of Housing Operations Division of Housing Operations)

- *Alignment of expectations/resources/private interests.*

Q.1.1.2.2 ELEMENTAL: (Respondent: Project Architect)

- *Better habilitation at the time of receiving the houses. Health and education programs could be included as associated subjects.*

Q.1.1.2.3 Lo Espejo-Town Council: (Respondent: Chief Housing Department)

- *Insufficient income not allowing saving to opt to a housing subsidy.*
- *Lack of family compromise.*
- *People who do not want to loose support of their birth families (uprooting).*

Q.1.1.2.4 Simonetti Building Company: (Respondent: Project Manager)

- *Counting with a good EGIS to guide and advise us through the project is a key factor. Lack of support after delivering projects. The participation of families, their savings, etc., are factor associated to distribution of houses.*

Q.1.1.2.5 Foundation “Un Techo para Chile”: (Respondent: Director Definitive Housing Area)

- *The inertia of the untrust must be overcome as many projects have been offered which did not work and many interventions have been started which have last too little time without yielding any results or explanations. However, there is such a need of housing that, in general, it is a very good hook to begin the social work.*

Q.1.1.2.6 ELEMENTAL: (Respondent: Project Architect)

- *Families make the mistake of hoping the Government will solve all their problems for free; so, they go from playing a passive role to be active*

participants of the project development. Finally, eventually families start to be part of the project by seeing it as the solution to overcome poverty. Therefore, there is an effect of passive beings turning into active ones sharing the development of the project which not always occurs.

- *Social problems such as drug addiction, alcoholisms, delinquency, unemployment, overcrowding, etc. In this particular case, families intend to avoid the last problems. However, economical problems and lack of opportunities makes them potential groups in social risk.*

Q.1.1.2.7 Renca - Town Council: (Respondent: Project Architect)

- *There are no problems with families, as the EGIS is working with them.*

Q.1.1.2.8 SIESCON Building Company: (Respondent: Civil Constructor -Shareholder)

- *Long waiting periods to settle the definitive project: living in the own new house.*

Q.1.1.2.9 JUNDEP-EGIS: (Respondent: Manager of Technical Department)

- *There are people who want a quick final solution that meets their needs without getting involved in the process. Thus, it is difficult to innovate in solutions as they are presented with previously approved solutions. Families feel they are entitled to own a house but, meanwhile, they do not know their duties, such as the duty to get involved in these projects' process.*

Q.1.1.2.10 EPS Architectural Company and EGIS: (Respondent:, Project Architect)

- *Some committees believe that monetary value of houses allows getting better quality standards for the project (surface, lands, etc.).*
- *Families are not aware of the future payments for supply services.*

Q.1.1.2.11 ORMUZ Ltda. Building Company: (Respondent: Project Manager)

- *Preparation of community; after living in precarious conditions, people comes to live in condominiums with a system which is new to them. Relationship's problems appear when living in projects begin.*

Q.1.1.2.12 Lo Barnechea- Town Council and EGIS: (Respondent: Communal Development Department Director)

- *In most of them, social enabling is insufficient or incomplete; it is necessary to engage more municipalities; if EGIS are allowed to act alone, they may buy or prepare a land, so they may build up their projects without considering the existence of a public system associated to this greater demand of public lighting, maintenance of green areas and garbage withdrawal. And in that area there is a problem indeed, as they are not inserted in a wide sense of the solution, so a higher participation of city towns plus introduction of more resources is required. Social enabling not only means responding to a housing solution, it is a wider solution, giving real opportunities to become part of the society. Nowadays there are subsidies oriented to localisation, which improve the surroundings but not the house.*

Q.1.1.3. Relative to the Society

Q.1.1.3.1 SERVIU METROPOLITANO: (Respondents: Profesionales Subdirección Operaciones Habitacionales - Professionals of the Sub-Department of Housing Operations Division of Housing Operations)

- *Alignment of expectations/resources/private interests/common wellness.*

Q.1.1.3.2 ELEMENTAL: (Respondent: Project Architect)

- *Segregation.*

Q.1.1.3.3 Lo Espejo-Town Council: (Respondent: Chief Housing Department)

- *No interest in personal and family improvement among people living in peripheral districts.*
- *Internalization of marginality.*
- *Dependency on an auxiliary state.*
- *Overcrowding of peripheral districts with low income families.*
- *Absence of collaborative and integrated projects (diverse social groups) to conform better neighbourhoods.*

Q.1.1.3.4 Simonetti Building Company: (Respondent: Project Manager)

- *The most relevant deficit in Santiago city relates to site availability, as it is difficult to find sites not detrimental for the added value of houses. For example, the district of Renca is known because of projects of higher value which do not want social housing projects surrounding them.*

Q.1.1.3.5 Foundation "Un Techo para Chile": (Respondent: Director Definitive Housing Area)

- *In general, there exist some resistance among people living in the neighbourhoods to the site who are afraid of delinquency these new neighbours may bring (even though they even know the families that will live there). Not in my Backyard (Nimby) referring to solutions considered necessary by the society, but which nobody wants "in ones backyard". This is what happens with social housing projects in Chile.*

Q.1.1.3.6 ELEMENTAL: (Respondent: Project Architect)

- *Stigmatisation of people who participate in social housing projects, difficulty to build these houses in neighbourhoods with a better social standard.*

Q.1.1.3.7 Renca - Town Council: (Respondent: Project Architect)

- *Initial rejection of social housing projects, especially when they are next to projects of more monetary value.*

Q.1.1.3.8 SIESCON Building Company: (Respondent: Civil Constructor -Shareholder)

- *Finding a SOCIAL housing complex next to houses of a better level.*

Q.1.1.3.9 JUNDEP-EGIS: (Respondent: Manager of Technical Department)

- *No one wants a project of social housing behind their backyards.*

Q.1.1.3.10 EPS Architectural Company and EGIS: (Respondent: Project Architect)

- *Underestimation of solutions delivered to families.*
- *Rejection of social housing projects in the surroundings (usually because of governmental institutions, directors of municipal works).*

Q.1.1.3.11 ORMUZ Ltda. Building Company: (Respondent: Project Manager)

- *Inequity by providing housing for free when most Chilean people take years to get it.*

Q.1.1.3.12 Lo Barnechea- Town Council and EGIS: (Hugo Bugueño, Communal Development Department Director)

- *There is all kind of manifestations but, in general, there is no rejection. In this particular district, there are help manifestations but also much indifference.*

APPENDIX 3

Data collection Social Housing Projects in Chile

Questionnaires: Q.1.2.1 – Q.1.2.2 – Q.1.2.3 – Q.1.2.4

1. Vista Hermosa Project

This questionnaire was answered by the following representatives of the different group of stakeholders:

- Ministry (Sub-Department of Housing Operations): Respondent: Housing Operations, Sub-director Assessor
- Lo Espejo-Town Council: Respondent: Chief Housing Department of Lo Espejo-Town Council
- Architectural company (Elemental): Respondent: Project Architect
- Building company (Simonetti): Respondent: Project Manager
- EGIS (UTpCH): Respondent: Director - Área Vivienda Definitiva UTpCH (Definitive Housing Area UTpCH)

General experience:

Q.1.2.1.1) *In relation to families, which needs are you trying to meet?*

Q.1.2.2.1) *In relation to the Society, which needs are you trying to meet?*

Particular project experience, Case Study:

Q.1.2.3.1) *In relation to families, which needs are you trying to meet?*

Q.1.2.4.1) *In relation to the Society, which needs are you trying to meet?*

PROJECT 1	Q.1.2.1.1)	Q.1.2.2.1)	Q.1.2.3.1)	Q.1.2.4.1)
SERVIU	In social housing's area: 1. Housing solution 2. Social integration	Emphasize the sense of urbanity in projects' locations and subsidies in the urban area in order to create citizenship	Primarily the need for a definitive housing, but also to insert the families in a community which provide social networks and connection to local productive networks, contributing this way to improve the life quality of families	Hard urban poverty, Residential and social segregation, Failing of public safety, stigmatization associated to the territory, Social vulnerability/risk
EGIS	The housing problem in first place, but from a social perspective and not only as infrastructure. In relation to the problem of housing, or taking this problem as an excuse because of the interest it arises, the purpose is to provide the tools that may help the community in developing a sustainable work which in the long term translate into overcoming their poverty condition.	Mainly, the integration of social housing projects inside the urban web of the city, so avoiding to take them to the outskirts of the town where the poverty cycle becomes worse. Moreover, the objective is to fight the most relevant problems in this district by attracting partners such as schools and turning neighbourhoods into development centres.	The project begins because of the latent need for housing; in fact, shanty towns are a consequence of that need. Moreover, UTPCH's proposal goes far beyond providing just a housing solution. It also takes into account location of houses, a superior technical standard, facilitation of green areas and equipment zones, social insertion for families and incorporation of partners that may add quality to projects.	Drugs (Dealing) Lack of green areas Poverty Insufficient job options

<p>Town Council</p>	<p>Due to the high demand, the Town Council became an EGIS in order to manage the access to housing and to other social programs as those for repair or improvement of houses or their surroundings, with the option to recover "neighbourhood-life"</p>	<p>Improve housing quality and recover community spaces. Generate amusement spaces, and contribute to the facilitation of new construction projects</p>	<p>Finding a housing solution in the very same district</p>	<p>The lack of sites to create other housing projects as this district belongs to the most populated ones of the region. High poverty indexes. Great number of not-paying lodgers (families living together) "Sleeping district"</p>
<p>Architectural Team</p>	<p>Improvement of housing standards in Chile, pointing out to a mid-class standard. Locate families inside their own social network. Make it possible that extensions made afterwards by the owners are included in the design, so that this does not deteriorate the neighbourhood.</p>	<p>To locate low income families in a better location so that they have a better access to opportunities.</p>	<p>To deliver a house having a great surface in comparison to the marketplace, thus locating 30 families in a small land.</p>	<p>Poverty environment; drug dealing.</p>
<p>Building Company</p>	<p>Supporting the EGIS to provide a complete project of architecture, facility and urbanization according to the budget amount and breaking down the myth</p>	<p>To avoid marginalization of social projects thus providing a decent solution inside the concept of "habitable rough work".</p>	<p>The most basic aspect was having a bathroom as before only basic facilities (hut including a small kitchen and toilette) were provided. Counting with a bathroom</p>	<p>These families did not show significant social problems.</p>

	<p>that the problem lies on the costs. Providing families with a chance to change their lives and leave the shanty town so improving their life quality specially of children so that they grow up knowing another lifestyle which is more thriving. Not in order to make profit but to contribute with professional know-how and optimising state resources.</p>		<p>incorporated to the house is a key factor for families.</p>	
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2. Lo Boza Project

- Ministry (SERVIU METROPOLITANO): Mrs. Terreros, Professional of the Housing Operation Subdepartment - (DFC)
- Renca-Town Council: Mr. Oyarce, Architect of Renca-Town Council
- Architectural company (Elemental): Mr. Cerda, Project Architect
- Building company (SIESCON Constructora): Mr. Sara, Home builder - Shareholder
- EGIS (JUNDEP): Mr. Aldana, Manager of Technical Department JUNDEP

General experience:

Q.1.2.1.2) *In relation to families, which needs are you trying to meet?*

Q.1.2.2.2) *In relation to the Society, which needs are you trying to meet?*

Particular project experience, Case Study:

Q.1.2.3.2) In relation to families, which needs are you trying to meet?

Q.1.2.4.2) In relation to the Society, which needs are you trying to meet?

PROJECT 2	Q.1.2.1.2)	Q.1.2.2.2)	Q.1.2.3.2)	Q.1.2.4.2)
SERVIU	<p>In social housing's area:</p> <ol style="list-style-type: none"> 1. Housing solution 2. Social integration 	I have no information on the subject	The necessity giving rise to the Supportive Fund for Housing Program in order to provide with a definitive house including enlargement project financed with available resources.	I have no information on the subject
EGIS	<p>Deliver houses that comply with standards and people's needs</p> <p>Provide with tools that allow families feeling part of the project acting as active parts of the process to get their definitive house. So, the outcome results also from</p>	Denying a segregation situation, as the society in general pretends to be away from these kinds of projects.	The most important thing was to make them feel participants of the project that is, providing with a solution obtained by their own effort. This way, it was intended to channel all efforts to get a solution that meets their requirements.	There was a problem with the Town Council as the location chosen to build up the project was considered a strategic location (because of the good location of site, it was intended for other kinds of projects, not for social housing). It was necessary to

	their own decisions.			ask for Controller's intervention as the Town Council was denying building permissions for free as stated in the Act of Neighborhood's Committees and Community Organizations.
Town Council	Speeding up of processes during revision of projects.	Improvement of people's life quality.	Reduction of working periods by means of revisions facilitating revision and supervision of projects in order to get a prompt solution for their houses.	Shortage of houses, jobs and secondary problems such as drug abuse and delinquency. And as a consequence of these, lack in opportunities.
Architectural Team	Housing solution	Making the town an equity source	Need of space (square meters in their houses; building of houses able to satisfy size standards of middle class people. Provide families with	Social problems of the surroundings of the project are those associated to vulnerable groups: drug addiction, alcoholism,

			<p>that part of the house they cannot build by themselves or their own resources, such as framework, installations and roofing. The rest of the extension could be easily built by themselves to achieve a good size standard. Build communal spaces such as public yards where children can play safely</p> <p>Good location in areas which form part of urban “spaces” in order to gain access to the opportunities inside the network of these families.</p>	<p>delinquency, unemployment, overcrowding, etc. In this particular case, families intend to avoid the such problems. However, economical problems and lack of opportunities make them potential groups in social risk</p>
Building	A well constructed project.	To avoid altering daily living, that is reducing as much as	Those needs targeted by the project. A well constructed	None

Company		possible environmental and acoustic contamination.	Project and a guarantee of that	
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3. San Francisco Project

- Ministry (SERVIU METROPOLITANO): Respondents: Professional of the Housing Operation Subdepartment - (DFC)
- Pudahuel-Town Council: Respondent: Welfare worker of the Housing Department – Substitute Director
- EGIS & Architectural company (EPS): Respondent: Project Architect
- Building company (ORMUZ Ltda.): Respondent: Project Manager

General experience:

Q.1.2.1.3) *In relation to families, which needs are you trying to meet?*

Q.1.2.2.3) *In relation to the Society, which needs are you trying to meet?*

Particular project experience, Case Study:

Q.1.2.3.3) *In relation to families, which needs are you trying to meet?*

Q.1.2.4.3) *In relation to the Society, which needs are you trying to meet?*

PROJECT 3	Q.1.2.1.3)	Q.1.2.2.3)	Q.1.2.3.3)	Q.1.2.4.3)
SERVIU	<p>In social housing's area:</p> <ol style="list-style-type: none"> 1. Housing solution 2. Social integration 	<p>I have no information on the subject</p>	<p>The necessity giving rise to the Supportive Fund for Housing Program in order to provide with a definitive house including enlargement project financed with available resources.</p>	<p>I have no information on the subject</p>
EGIS & Architectural Team	<p>To provide a housing solution that functionally meets their expectations. Providing significance to the space indoors where they stay most of the time. Raw materials used for the project, i.e. solid material, with some isolation and quality.</p>	<p>To keep or improve conditions of surrounding areas of the project (aesthetics). To fulfil successfully with road network's conditions next to the project. Materials used are considered also an improvement of social environment. Significance is</p>	<p>Absence of a formal tool; just direct contact with families by means of meetings and direct works on site.</p>	<p>Basic need to provide for a house.</p>

		attired to the fact of not delivering a timeless character to houses delivered.		
Town Council	Delivering a house incorporated to social networks. "Bridge-families" beneficiaries to obtain better solutions are incorporated.	Houses should deliver a better quality of life to families. Therefore, they have been integrated into social networks; their children are studying in "semi-private" schools. Today families are not paying a rent or their houses, allowing them to invest in other improvements to their houses.	The Town Council assesses these projects in regular meetings with housing committees' boards of directors.	Delivering a house incorporated to social networks. "Bridge-families" beneficiaries to obtain better solutions are incorporated.

Building Company	Need for a house.	House quality improving people's standard of living.	Here, we intend to meet EGIS's expectations as it is ORMUZ's main client.	Need for a house.
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APPENDIX 4

Data collection Social Housing Projects in Chile

Questionnaire: Q.2.1

1. Vista Hermosa Project

This questionnaire was answered by the following representatives of the different group of stakeholders:

- Ministry (SERVIU METROPOLITANO): Respondent: Professional of the Housing Operation Subdepartment - (DFC)
- Lo Espejo-Town Council: Respondent: Manager of Housing Department of Lo Espejo-Town Council
- Architectural company (Elemental): Respondent: Project Architect
- Building company (Simonetti): Respondent: Project Manager
- EGIS (UTpCH): Respondent: Director - Área Vivienda Definitiva UTpCH (Definitive Housing Area)

Q.2.1.1 Particular project experience, Case Study:

Based on the job performed, provide detailed information on the activities carried out through the life cycle of projects?

PROJECT 1	New Building Required	Feasibility	Scheme design	Detail design
SERVIU	<p>Coordination of meetings with professional workers of Elemental through the EGIS UTpCh.</p> <p>Meetings in the Department of Contestable Fund (Departamento de Fondo Concursable, DFC), with professionals of Elemental and Department of Studies' architects.</p>	<p>Visits to construction site with EGIS and families, for instance, in the project Elemental Renca</p> <p>Technical consultancy in DFC, with attendance of: DFC' architect, Department of Studies' architect; architect and social worker of SERVIUS' Land Management Team, professionals of EGIS UTpCh and Elemental to evaluate project's costs and feasibility aspects.</p>	<p>Technical consultancy in DFC, with attendance of: DFC's architect, Department of Studies' architect, and architect and social worker of SERVIU's EGT, professionals of EGIS UTpCh and Elemental to review houses' design and urban planning</p>	<p>Without information (this phase belongs to the work developed by the EGIS from possible suggestions made by SERVIU's professional during consultancy activities)</p>
EGIS	<p>Workshops related to the NChHP</p>	<p>Technical and legal studies in relation to sites</p>	<p>Participative workshops on housing design</p>	<p>Procurement of permissions</p>

	Workshops on location and added value Assessment of site alternatives	Development plan Economical feasibility	Participative workshops on neighbourhood Workshops on equipment	Adjustment Budget-Design
Town Council	<p>“...I must inform you that, about the information requested on this shantytown (Campamento Vista Hermosa, Un Sueño por Cumplir) and the tasks carried out by this Department in relation to it, I did not find any kind of information nor systematization of this experience. Moreover, the official you were in contact with works no longer with us and left no report on the subject behind...”. (Elcira Cáceres Manager of Housing Department, Lo Espejo, District)</p>			
Architectural Team	Before designing activities by the architectural team, the approximate number of families to be included in the available site (pre-development plan) was determined. Thus two house models were taken into account to decide the	The exact number of houses to be included in the available site was determined, and based on this the number of square meters of each house was defined as initial parameter. In order to do this, different models of housing and urban sketches	Once the alternative was chosen in the previous phase, models to scale and 3D models were elaborated and showed in meetings with the families involved, in which the EGIS also took part. The insights on the project were collected based on a “house	With the feedback obtained in the previous phase, a list of drawings was produced, edification permission requested and submitted to the DFC to be assessed and, after approval, for the resources to be allocated.

	number of houses to be accommodated. This site had been previously chosen by the families plus UTpCh acting as EGIS.	were tried. Cost of solutions was not considered as a limiting parameter for the final solution. The final result was a house fulfilling the space requirement fixed by the architectural team alone.	in use” notion rather than personal taste.	
Building Company	Workshops Lectures	I have no information on the subject	Workshops with families I have no information on the subject as this phase belongs to the Architectural team	I have no information on the subject as this phase belongs to the Architectural team

PROJECT 1	Construction	Use	Refurbish	Demolish
SERVIU	Without information; this phase belongs to SERVIU's Department of Edification Works (Departamento de Obras de Edificación, DOE) and Management Unit of Technical Assistance (Unidad de Gestión de Asistencia Técnica, UGAT).	Without information (SERVIU Metropolitano has not implemented "after sale services" activities, which are carried out in other regions of Chile with enough human resources available)	Without information (I don't know if the project applied to the program of Protection of Family Patrimony, which belongs to Application Subdepartment)	Not related to this project
EGIS	Construction contract writing Meetings in the construction site Payment Management	Workshops: Use and maintenance Workshops: House Extension Workshops: Joint ownership	We do not participate in this phase of the project	We do not participate in this phase of the project

<p>Town Council</p>	<p>“...I must inform you that, about the information requested on this shantytown (Campamento Vista Hermosa, Un Sueño por Cumplir) and the tasks carried out by this Department in relation to it, I did not find any kind of information nor systematization of this experience. Moreover, the official you were in contact with works no longer with us and left no report on the subject behind...”. (Elcira Cáceres Manager of Housing Department, Lo Espejo, District)</p>			
<p>Architectural Team</p>	<p>Owing to the several modifications requested by the Construction company, the design had to be rebuilt, changing inclusively the materials of houses. As a result, deadlines were extended lowering the mood of the families and diminishing their expectations. However, families participated in guided visits to the site every</p>	<p>Architectural team does not participate in this phase of the project.</p>	<p>Architectural team does not participate in this phase of the project.</p>	<p>Architectural team does not participate in this phase of the project.</p>

	<p>15 days to decrease anxiety of future owners. Besides, meetings with families were carried out, to define common rules of coexistence and qualify families about future refurbishment activities to improve added value and ensure correct use of their houses. In the future, families will regulate refurbish tasks; however, there are n formal agreements nor legal rules to comply with good practices.</p>			
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Building Company	Visits to construction site Exhibition at end of rough works Exhibition at the end of works	Functions of houses were explained at delivery	Not carried out	Not apply
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2. Lo Boza Project

This questionnaire was answered by the following representatives of the different group of stakeholders:

- Ministry (SERVIU METROPOLITANO): Respondent: Professional of the Housing Operation Subdepartment - (DFC)
- Lo Espejo-Town Council: Respondent: Architect of Renca-Town Council
- Architectural company (Elemental): Respondent: Project Architect
- Building company (SIESCON Constructora): Respondent: Home builder - Shareholder
- EGIS (JUNDEP): Respondent: Manager of Technical Department JUNDEP

Q.2.1.2 Particular project experience, Case Study:

Based on the job performed, provide detailed information on the activities carried out through the life cycle of projects.

PROJECT 2	New Building Required	Feasibility	Scheme design	Detail design
SERVIU	<p>Coordination of meetings with professional workers of Elemental through the EGIS UTpCh.</p> <p>Meetings in the Department of Contestable Fund (Departamento de Fondo Concursable, DFC), with professionals of Elemental and Department of Studies' architects.</p>	<p>Visits to construction site with EGIS and families, for instance, in the project Elemental Renca</p> <p>Technical consultancy in DFC, with attendance of: DFC' architect, Department of Studies' architect; architect and social worker of SERVIUS' Land Management Team, professionals of EGIS UTpCh and Elemental to evaluate project's costs and feasibility aspects.</p>	<p>Technical consultancy in DFC, with attendance of: DFC's architect, Department of Studies' architect, and architect and social worker of SERVIU's EGT, professionals of EGIS UTpCh and Elemental to review houses' design and urban planning.</p>	<p>Without information (this phase belongs to the work developed by the EGIS from possible suggestions made by SERVIU's professional during consultancy activities).</p>

EGIS	No participation. Only Elemental and UTpCh take part.	No participation. Only Elemental and UTpCh take part.	No participation. Only Elemental and UTpCh take part.	No participation. Only Elemental and UTpCh take part.
Town Council	No participation.	No participation.	No participation.	No participation.

<p>Architectural Team</p>	<p>Provide an interpretation of families' vision on housing expectations related to this project.</p> <p>Develop a Project with limited resources (SERVIU Subsidy) equivalent to mid-class standard.</p>	<p>Technical Feasibility: Considering requirements of families which had previously chosen the land, it was necessary to solve problems in the division of the land and soil mechanics without having a previous evaluation and an economic feasibility (assessment).</p> <p>Social Feasibility: As a result of the participative work of families in design activities, it was necessary to satisfy their expectations; for the last reason, two possible design solutions were presented before achieving the final solution.</p> <p>conomic Feasibility: Innovation in design difficulted the search for building companies interested in this project with resources available.</p>	<p>As a good location is already available, inside residential complex common spaces were created improving the alternative of individual yards. Thus, it was decided to create common spaces controlled by families (20 families per yard).</p> <p>A house with individual yard was designed, and its future expansion was detailed. This design based on mid-class standards in relation to sizing measured in square meters, and is bigger than usual social houses.</p> <p>Specialities project was developed (sanitation, paving and electricity)</p>	<p>Building permit was granted and sent to SERVIU to obtain evaluation and resources allocation.</p> <p>The project was entered to the Direction of Works, Renca District, to be evaluated according to design regulations and for the building permit to be granted.</p>
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<p>Building Company</p>	<p>Determination of demand (Developed by EGIS)</p> <p>Selection (Developed by EGIS)</p> <p>Organization (Developed EGIS)</p>	<p>Empowering Committee before SERVIU (Developed by EGIS)</p>	<p>Find a land suitable for the number of families belonging to Committee (Developed by EGIS)</p> <p>Develop a preliminary draft of lot assignment (Developed by EGIS)</p> <p>Develop the preliminary draft of houses (Developed by EGIS)</p>	<p>Improve spaces for green areas and equipment according to requirements of Committee (Developed by EGIS)</p> <p>Improve preliminary draft of houses according to requirements of Committee (Developed by EGIS)</p>
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PROJECT 2	Construction	Use	Refurbish	Demolish
SERVIU	Without information; this phase belongs to SERVIU's Department of Edification Works (Departamento de Obras de Edificación, DOE) and Management Unit of Technical Assistance (Unidad de Gestión de Asistencia Técnica, UGAT).	Without information (SERVIU Metropolitano has not implemented "after sale services" activities, which are carried out in other regions of Chile with enough human resources available).	Without information (I don't know if the project applied to the program of Protection of Family Patrimony, which belongs to Application Subdepartment).	Not related to this project.
EGIS	Meetings (working meetings) and technical inspection.	Reception of houses with participation of families,. Post-sale attention required from the construction company.	No participation. Only UTpCh participates.	Not considered.

Town Council	No participation	No participation	There is a general problem as people refurbish their houses according to their own requirements, without previous permission from city council	Not related to this project.
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<p>Architectural Team</p>	<p>Here, the principle of lacking on additional resources plays a role; the only resources available are those provided by the government in the subsidy. In this case, families take on a material role in getting additional resources by means of donations allowing modifications on works to incorporate new items which improve chosen alternative. This involves a dynamic development of technical projects.</p> <p>During construction works, Committee's direction (2 people plus others) took part in all meetings related, expediting paper work, payment and approval of concerning permits.</p> <p>The 170 families involved participated in workshops conducted to explain valorisation of houses in time as owner's equity, and life in community</p> <p>Workshops were conducted to inform about correct practices to extend houses in the future.</p>	<p>Not apply.</p>	<p>Not apply.</p>	<p>Not apply.</p>
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<p>Building Company</p>	<p>Earthwork (debris removal and filling with selected materials)</p> <p>Urbanization and construction of houses</p> <p>Evaluation and solving of additional resources for extraordinary works.</p> <p>Reception of urbanization and houses, and delivery of residential complex to EGIS and Committee.</p>	<p>Developed by EGIS – Sessions on the use of houses.</p>	<p>Developed by EGIS – Sessions on the use of houses – Additions to houses.</p>	<p>No information available about session on demolition or similar.</p>
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3. San Francisco Project

This questionnaire was answered by the following representatives of the different group of stakeholders:

- Ministry (SERVIU METROPOLITANO): Respondents: Professional of the Housing Operation Subdepartment - (DFC)
- Pudahuel-Town Council: Respondent: Welfare worker of the Housing Department – Substitute Director
- EGIS & Architectural company (EPS): Respondent: Project Architect
- Building company (ORMUZ Ltda.): Respondent: Project Manager

Q.2.1.3 Particular project experience, Case Study:

Based on the job performed, provide detailed information on the activities carried out through the life cycle of projects.

PROJECT 3	New Building Required	Feasibility	Scheme design	Detail design
SERVIU	<p>Coordination of meetings with professional workers of Elemental through the EGIS UTpCh.</p> <p>Meetings in the Department of Contestable Fund (Departamento de Fondo Concursable, DFC), with professionals of Elemental and Department of Studies' architects.</p>	<p>Visits to construction site with EGIS and families, for instance, in the project Elemental Renca</p> <p>Technical consultancy in DFC, with attendance of: DFC' architect, Department of Studies' architect; architect and social worker of SERVIU'S Land Management Team, professionals of EGIS UTpCh and Elemental to evaluate project's costs and feasibility aspects.</p>	<p>Technical consultancy in DFC, with attendance of: DFC's architect, Department of Studies' architect, and architect and social worker of SERVIU's EGT, professionals of EGIS UTpCh and Elemental to review houses' design and urban planning.</p>	<p>Without information (this phase belongs to the work developed by the EGIS from possible suggestions made by SERVIU's professional during consultancy activities).</p>
EGIS & Architectural	<p>Evaluation of landfill. Verification of</p>	<p>Studying technical feasibility and services</p>	<p>General setting out of the housing solution</p>	<p>Compliance with SERVIU's regulations</p>

Team	<p>families' expectations. Suggesting a possible solution.</p>		<p>based on previous experiences. Dealing with families' expectations (type of house desired)</p>	<p>(technical specifications)</p>
Town Council	<p>This project is of a peculiar kind, as here tasks developed by EGISs in other projects were developed by we in this case; for example, we organized demand, carried out surveys, collected antecedents, etc. Today, families trust town councils more than they trust EGISs, accepting projects even without knowing them.</p>	No Information	No Information	No Information

Building Company	No involvement	Projects are accepted as informative in nature; that's why some of them are modified to make them more feasible to be constructed.	No involvement	No involvement
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PROJECT 3	Construction	Use	Refurbish	Demolish
SERVIU	Without information; this phase belongs to SERVIU's Department of Edification Works (Departamento de Obras de Edificación, DOE) and Management Unit of Technical Assistance (Unidad de Gestión de Asistencia	Without information (SERVIU Metropolitano has not implemented "after sale services" activities, which are carried out in other regions of Chile with enough human resources available).	Without information (I don't know if the project applied to the program of Protection of Family Patrimony, which belongs to Application Subdepartment).	Not related to this project.

	Técnica, UGAT).			
EGIS & Architectural Team	Supervision of layout Supervision of construction site: receiving each project's batch in particular.	Workshops are used to make recommendations on using and maintaining houses	No involvement	Not in relation with this project
Town Council	No information	No information	No information	Not in relation with this project.
Building Company	Carrying out all required activities to deliver a house with products of certified quality.	On the first place, a post-sale service is required	No involvement	Not in relation with this project.

APPENDIX 5

Negative Perception of Social Housing projects in Chile:

Data included in this section is part of different Chilean forums such as newspaper, magazines, radio, etc.

- *“...today, I have been in Chile and visited those neighbourhoods. I wonder... where is the backyard? That cultural space where everything was private and where we learnt values for our lives. Chile is four times Germany’s size and has only 16 million inhabitants. In Germany, the population is of 85 millions, and they do have backyards!” (www.lanacion.cl)*
- *“Chile is a developing country; at 200 years of independence, the government should care that every Chilean had a decent place to live in. Apparently, Chile has the resources for that. Politicians should take this problem more seriously or, otherwise, Chile’s future seems to be not so good...” (www.elnortero.cl)*
- *“Through their taxes, all Chileans are paying for our education, so we pay back with know-how to solve the different problems that afflict our country. We cannot do that if we don’t know shantytowns reality, where the deprived people of our society live. They need to become the most important for Chile...” (www.elvacanudo.cl)*
- *“... How long are these liars’ governments going to keep throwing the ball to the so called ‘Corporations’ to solve people’s big problems. This fairy tale of Un techo para Chile’ is rather a CHARITY we all should provide for, so the most unfortunate fellow Chileans have at least “a roof”...” (www.elrancahuaso.cl)*
- *“I think the private sector should develop their sense of business social responsibility forward to find out how they may contribute with their efficiency to the state management of resources and to overcome chronic problems within our economic and social structures.” (www.plataformaurbana.cl)*

- *“A close relationship between public and private sectors is required.”*
(www.plataformaurbana.cl)
- *“I used to live at Mapocho river shore and I think the houses they are going to deliver are a joke for people who have suffered for years living in a shantytown. Those houses are not finished. They don’t have the dimensions you say they would have either. When delivered, they will have 46 square metres. Would you live at an unfinished house? I don’t think so. Build decent houses!”*
(www.infoinvi.uchilefau.cl)
- *“That’s the limit!!! That families extremely vulnerable have to ‘SAVE’ 1.2 million pesos to obtain those miserable houses. Three floors with only the first one, and half of the second one finished. With no windows, and so on.”*
(www.infoinvi.uchilefau.cl)
- *“Un Techo para Chile is a crap that became a company in which only some people (Berríos, Pedro Pablo Pinochet, Irrarrázaval, Rojo Edwards, among others) are getting rich thanks to free labour. Thanks to young idealistic students who still believe their mission to eradicate shantytowns of Chile.”*
(www.needish.cl)
- *“The State assign less resources to find a real solution to this problem. When dealing with definitive houses, satisfaction from a psychological point of view should be taken into account.”* (www.elmercurio.cl)

APPENDIX 6

Q.3.1 Evaluation Questionnaire Part 1 (Pilot and Final Evaluation)

Instructions for Evaluation of the “First & Last Value Model” (F&LVM)

I. General Information and Instructions

- All the information provided will be retained, revised and used exclusively by the researcher.
- All the information will be used only for academic purposes.
- If you need additional space for comments, handwritten attachments may be added.

II. Personal Details:

Full name:

III. First Approach:

Q.3.1.1- Individual vision of the concept of Value in construction (I)

No.		N.A.	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
A.1.1	I recognise the need to expand the common perspective of Value from the construction industry.						
A.2.1	I recognise the importance of discussing the concept of Value in the construction industry.						
A.3.1	I include the discussion of Value in my current research or practice in the construction industry						
A.4.1	I consider the concept of Value as a difficult concept to be delivered in the construction industry						

Q.3.1.2. According to RIBA Work Stages. What stage do you consider to be early in the life cycle of projects?

Q.3.1.3. Based on your experience in the construction industry, what is the concept of Value?

Q.3.2 Evaluation Questionnaire Part 2 (Pilot and Final Evaluation)

Instructions for Evaluation of The “First & Last Value Model” (F&LVM)

(i) General Information and Instructions:

- All the information provided will be retained, revised and used exclusively by the researcher.
- All the information will be used only for academic purposes.
- If you need additional space for comments, handwritten attachments may be added.

II. Personal Details:

Full name:

III. F&LVM purpose and Evaluation:

The F&LVM aims to expand the common perspective of the concept of Value moving from a Last context (Project level) to a First context (Society). In this way, The F&LVM includes:

1. The relationship between Building & Infrastructure projects (Requirement - R) and Society as a whole;
2. Three different Domains of Value (Production & Delivery Capacity; Stakeholders; and Society);
3. Four Value perspectives (Technology, Economic, Environment and Political); and
4. Value as an Objective, Subjective, Relative, Dynamic, Context Dependent and Oscillating concept.

Q.3.2.1 Personal vision of Value in construction (II)

No.		N.A.	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
A.1.2	I recognise the need to expand the common perspective of the concept of Value in the construction industry.						
A.2.2	I recognise the importance of discussing the concept of Value in the construction industry.						
A.3.2	I include the discussion of Value in my current research or practice in the construction industry						
A.4.2	I consider the concept of Value as a difficult concept to be delivered in the construction industry						

Q.3.2.1 The First & Last Value Model – F&LVM

No.		N.A.	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
B.1	The F&LVM reflects the relationship between Building & Infrastructure projects and Society as a Whole.						
B.2	The F&LVM would contribute to the consideration of the concept of Value.						
B.3	The F&LVM can help to understand the Value generation process in the early stage of Building & Infrastructure projects.						
B.4	The F&LVM can help to understand Value generation process through the life cycle of Building & Infrastructure projects.						
B.5	The F&LVM can contribute to address environmental & social issues.						

Q.3.2.2 The concept of Value in The F&LVM

No.		N.A.	Strongly Disagree	Somewhat Disagree	Neither Agree or Disagree	Somewhat Agree	Strongly Agree
C.1	The F&LVM aids to understand Value as an Objective Concept.						
C.2	The F&LVM aids to understand Value as a Subjective Concept.						
C.3	The F&LVM aids to understand Value as a Relative Concept.						
C.4	The F&LVM aids to understand Value as a Dynamic Concept.						
C.5	The F&LVM aids to understand Value as a Context Dependent Concept.						
C.6	The F&LVM aids to understand Value as an Oscillating Concept.						

D- Final comments.

D.1- Advantages and Barriers of The F&LVM.

ADVANTAGES:

1.

3.ETC.

BARRIERS:

1.

2.

3.ETC.

D.2- Can The F&LVM be further improved? If yes, please give some recommendations. (ONLY FOR PILOT EVALUATION)

E- Additional comments.

TO ADD ADDITIONAL COMMENTS PLEASE INDICATE THE QUESTION NUMBER FOLLOWED BY THE COMMENTS.

Q.3.2.3 Evaluation Questionnaire Part 3 (Pilot Evaluation)

Pilot Evaluation Feedback

I. General Information and Instructions:

- All the information provided will be retained, revised and used exclusively by the researcher.
- All the information will be used only for academic purposes.
- If you need additional space for comments, handwritten attachments may be added.

II. Personal details:

Full name:

III. Pilot Questions:

1. Was the presentation structured adequately?
2. Was The GLVM explained properly?
3. Were the concepts included in The GLVM explained clearly?
4. Was the contribution of The GLVM stated properly?
5. Are the evaluation questions useful to further improve the current model?

APPENDIX 7

Pilot Evaluation Feedback

After Pilot evaluation, the following visual changes were made to the model of Value proposed at the beginning:

1. The original name GLVM (Global Lean Value Model) was replaced by F&LVM (First & Last Value Model). This suggestion improves the relationship with the concept First & Last Value introduced in this research;
2. The original Value domain “society’s perspective” was replaced with “social perspective”: This suggestion was made to avoid confusion when including the word SOCIETY to visualise the relationship between building projects and society ;
3. The green circle aimed to show delivery of Value in the Last context was moved to the central part of the model, where Requirement (construction projects) generates the interaction of the three domains of Value included in the model; and
4. The contexts where Value is delivered (First & Last), were included in the model of Value.

Therefore, the original GLVM (Figure A.7.1) became the F&LVM (Figure A.7.2) and modifications are showed as follows:

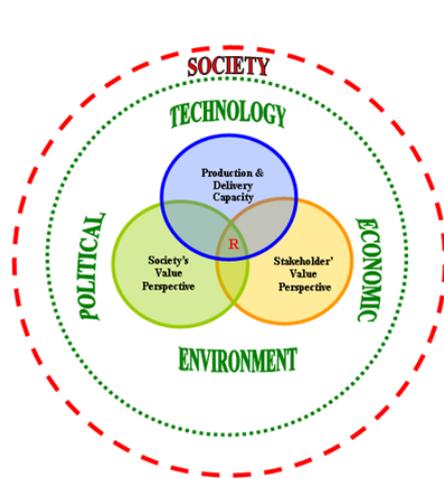


Figure A.7.1: Original GLVM

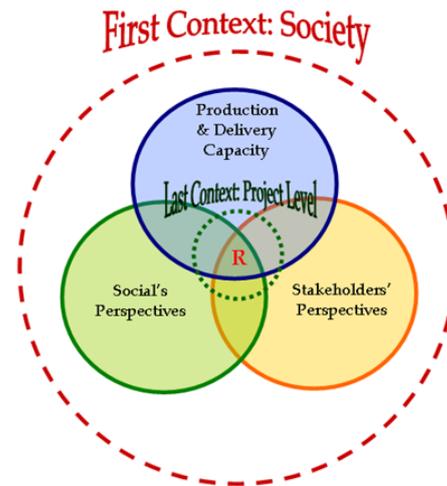


Figure A.7.2: Final F&LVM

Finally in order to improve visualisation of the dynamic nature of Value, the 3 axis graph (Value perspective, 3 project Dimensions and Time), showed in Figure A.7.3. was replaced with a 4 axis graph (P&D capacity, Society, Stakeholder and Time) (Figure A.7.4).

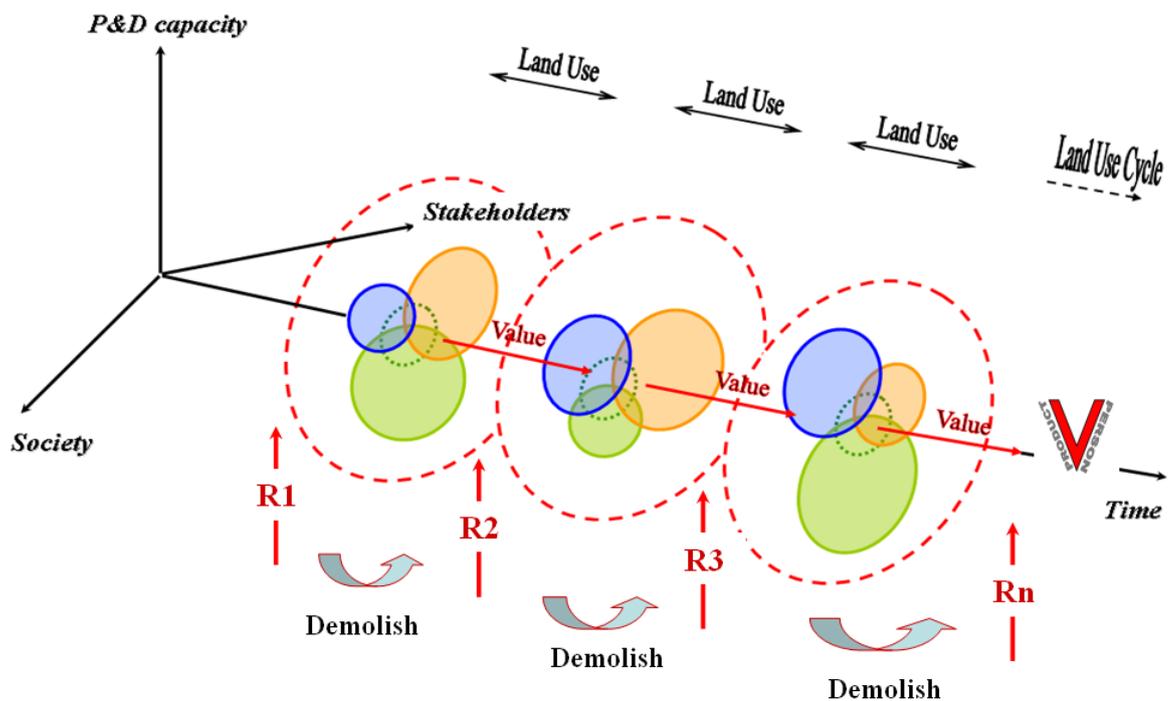


Figure A.7.3: Value as a dynamic concept in the F&LVM

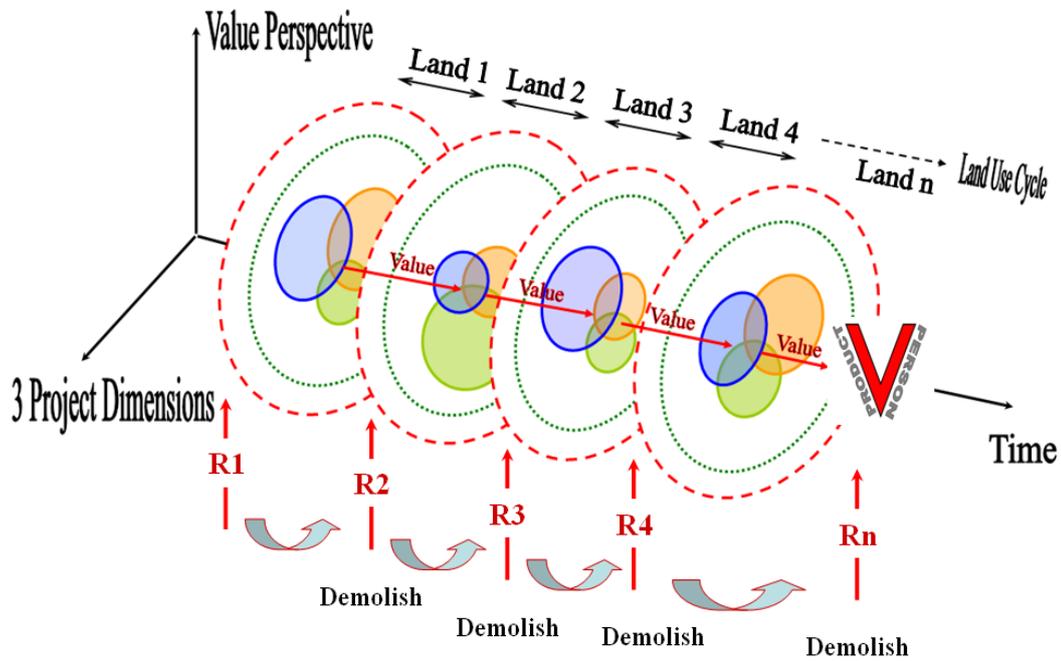


Figure A.7.4: Value as a dynamic concept in the GLVM