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Stakeholder Analysis to Enrich the Systems Thinking and Modelling Methodology

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Abstract

A systematic analysis of stakeholders could enrich the systems thinking and modelling methodology. Among the five phases of the systems thinking and modelling framework, namely, problem structuring, causal loop modelling, dynamic modelling, scenario planning & modelling, and implementation & organisational learning, the importance of stakeholder analysis in the problem structuring and scenario planning & modelling phases is explained in this paper. A New Zealand transportation infrastructure case study is presented in this paper to illustrate the potential usefulness of stakeholder analysis in the systems thinking and modelling methodology.

Key Words: Stakeholders, Systems Thinking and Modelling Methodology, System Dynamics, Strategic Management

Introduction

The systems thinking and modelling process (Maani and Cavana, 2000) is a useful framework for strategic decision-making. It consists of five major phases namely, problem structuring, causal loop modelling, dynamic modelling, scenario planning & modelling, and implementation & organisational learning. These phases incorporates both qualitative and quantitative approaches that make it attractive for many strategic decision makers.

In our opinion, although it is a useful process, systems thinking and modelling process at its present form, leaves scope for improvement. New concepts and developments in management and other related literature could be incorporated for its development. In this paper we propose that stakeholder analysis would enrich the systems thinking and modelling process.

The research interest in the field of stakeholder identification, analysis and salience is growing (Elias, et al., 2000). Since the publication of Freeman's landmark book, Strategic Management: A Stakeholder Approach (1984), about a dozen books and more than 100 articles with primary emphasis on the stakeholder concept have appeared in the management literature (Donaldson and Preston, 1995). Stakeholder theories are being proposed and experts in the field are debating over the acceptability of these theories.

We begin this paper by presenting the different stages through which the stakeholder concept developed in the management literature. Using a chronological map (Figure 1), we explore and classify stakeholder literature for a better understanding of the stakeholder concept. In the next stage we briefly explain how system dynamicists used the concept of stakeholders.

We also examine the relevance of stakeholder analysis in systems thinking and modelling. We suggest that a systematic analysis of stakeholders could enrich the 'problem structuring' and 'scenario planning & modelling' phases of systems thinking and modelling framework. We demonstrate the usefulness of stakeholder analysis by presenting a case study related to the transportation infrastructure in New Zealand.

2. Stakeholder Literature

Fig. 1. Stakeholder Literature Map

The development of the stakeholder concept in the management literature can be classified into different stages as shown in the stakeholder literature map (Figure 1). After its origin in 1963, the concept diversified into four different fields namely, corporate planning, systems theory, corporate social responsibility and organisation theory. We call this stage as classical stakeholder literature.

The next landmark in the development of stakeholder literature was the book by Freeman (1984), Strategic Management: A Stakeholder Approach. After this book, this literature developed around

three different aspects namely, descriptive/empirical aspect, instrumental aspect and normative aspect. Donaldson and Preston (1995) brought these three aspects together in their stakeholder theory of corporation.

Further, the stakeholder literature started spreading its wings to interesting areas like dynamics of stakeholder and stakeholder theories. Several empirical studies were also conducted to validate the theoretical claims relating to the stakeholder concepts.

A detailed description of this literature map is available in Elias et al (2000). But for the scope of this paper we discuss three important stages in the development of this literature, namely, classical stakeholder literature, strategic management: a stakeholder approach and dynamics of stakeholders.

Classical Stakeholder Literature

The origin of 'stakeholder' in management literature can be traced back to 1963, when the word appeared in an international memorandum at the Stanford Research Institute (cited in Freeman 1984). Stakeholders were defined as *'those groups without whose support the organisation would cease to exist'*. The core concept, in other words was 'survival'; without the support of these key groups, the firm will not survive.

During its formative stage, stakeholder theory itself had to fight for survival, when Ansoff (1965) in his classic book 'Corporate Strategy' argued for the rejection of stakeholder theory. According to him 'responsibilities' and 'objectives' were not synonymous but were made one in stakeholder theory.

By the 1970's stakeholder concepts began to surface in the strategic planning literature. Taylor (1971) predicted that the importance of stockholders would diminish and that, in the 1970's, businesses would be run for the benefit of other stakeholders too. King and Cleland (1978) came up with a method of analysing stakeholders in project management. Hussey and Langham (1978) developed a model of the organisation and its environment with stakeholders and used it in the corporate planning process.

Systems theorists also contributed to the development of the stakeholder literature in the 1970's. Ackoff (1974) developed a methodology for stakeholder analysis of organisational systems. He argued that stakeholder participation is essential for system design and the support and interaction of stakeholders would help in solving many societal problems. Churchman (1968) also contributed by developing systems theory to address social issues in an open systems point of view. The systems model of stakeholders emphasised participation and argued that problems should not be defined by focusing or analysis, but by enlarging or synthesising.

Many researchers were also concerned with the social responsibility of business firms. Post (1981) categorised the main lines of research in this area, covering many ideas, concepts and techniques (Sethi, 1971; Votaw & Sethi, 1974, Preston, 1979). The distinguishing feature of this literature is that the concept was used to include non-traditional stakeholders who were having adversarial relationships with the firm. The sub discipline of management called 'business and society' developed by researchers at the School of Management at Berkley (Votaw, 1964; Epstein, 1969) and Harvard Business School (Ackerman, 1975; Murray, 1976) argued for responsiveness instead of responsibility.

In the organisation theory literature, Rhenman (1968) used the term stakeholders explicitly to designate the individuals or groups, which depend on the company for the realisation of their personal goals and on whom the company is dependant. Pfeffer and Salancik (1978) constructed a model of organisation -environment interaction and claimed that the effectiveness of an organisation derives from the management of demands, particularly the demands of interest groups.

Thus, classic stakeholder theory originated on the concept of survival, falls into four groups namely, corporate planning, systems theory, corporate social responsibility and organisational theory (Freeman, 1984).

Strategic Management: A Stakeholder Approach

Researchers in the stakeholder field differ in their worldview on stakeholder concepts, but most of them acknowledge Freeman's (1984) book 'Strategic Management: A Stakeholder Approach' as a landmark in stakeholder literature. In his book, Freeman defines stakeholders as *'any group or individual who can affect or is affected by the achievement of the firm's objectives'*.

He proposed a framework, which fits three levels of stakeholder analysis - rational, process and transactional. At the rational level, an understanding of 'who are the stakeholders of the organisation' and 'what are their perceived stakes' is necessary. As a technique, Freeman uses a generic stakeholder map as a starting point. It is also possible to prepare a stakeholder map around one major strategic issue. As the next step, a stakeholder chart is prepared by identifying specific stakeholders based on the stakeholder map. Further, the stakes of the specific stakeholder groups is identified and analysed. He also uses a two dimensional grid as an analytical device to depict an organisation's stakeholders. The first dimension categorises stakeholders by interest or stake and the second dimension is in terms of power. He makes the grid more realistic by improving on the classical stakeholder grid to prepare a real world stakeholder grid.

At the process level, it is necessary to understand how the organisation either implicitly or explicitly manages its relationships with its stakeholders, and whether these processes fit with the rational stakeholder map of the organisation. According to Freeman, existing strategic processes that work reasonably well could be enriched with a concern for multiple stakeholders. For this purpose, he uses a revised version of Lorange's schema for strategic management processes.

At the transactional level, we must understand the set of transactions or bargains among the organisation and its stakeholders and deduce whether these negotiations fit with the stakeholder map and the organisational processes for stakeholders. According to Freeman successful transactions with stakeholders are built on understanding the legitimacy of the stakeholder and having processes to routinely surface their concerns.

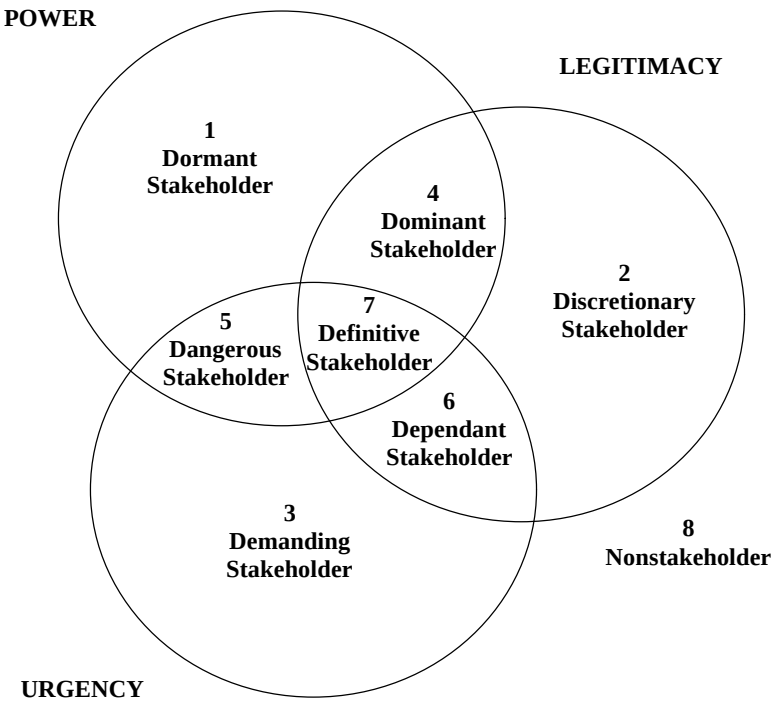
Broadly, the emphasis of Freeman's book is to construct an approach to management that takes the external environment into account in a systematic way. He provides a solid theoretical basis for the understanding of the stakeholder concept and paved the way for extensive future research in the field.

Dynamics of Stakeholders

Another interesting characteristic of the stakeholder concept is the dynamics of stakeholders. Over time, the mix of stakeholders may change. New stakeholders may join and wish to be included in any considerations, while others may drop out, through no longer being involved in the process.

The concept of the dynamics of stakeholders was acknowledged by Freeman (1984), and according to him, in reality stakeholders change over time, and their stakes change depending on the strategic issue under consideration. Alkhafaji (1989) also contributed to the understanding of this concept. To explain the dynamics, he defined stakeholders as the 'groups to whom the corporation is responsible'.

Another notable work on this concept was by Mitchell, *et al* (1997). They proposed that classes of stakeholders can be identified by the possession or attributed possession of one or more of three relationship attributes: power, legitimacy and urgency. By including urgency as an attribute, a dynamic component was added to the process whereby stakeholders attain salience in the minds of managers. By combining these attributes they generated a typology of stakeholders.



Source: Mitchell, et al. (1997), Figure 2, p874.

Fig. 2. Stakeholder Typology

According to their typology (Figure 2), if a stakeholder possesses only one of the three attributes, they are termed Latent stakeholders and have low stakeholder salience. If the only attribute present is power, such stakeholders are called Dormant stakeholders; if it is only legitimacy, they are called Discretionary stakeholders and if only urgency, they are called Demanding stakeholders. Stakeholder salience will be moderate, if two attributes are present and such stakeholders are called Expectant stakeholders. Among the expectant stakeholders, those having power and legitimacy only are called dominant stakeholders; those having legitimacy and urgency only are called Dependent stakeholders and those having power and urgency only are called Dangerous stakeholders. Stakeholder salience will be high where all the three attributes are perceived by managers to be present in a stakeholder and they are called Definitive stakeholders. Further the dynamic qualities were illustrated by showing how stakeholders can shift from one class to another, when the salience of stakeholders increase/decrease by attaining/loosing one or more of the attributes. Later, Agle *et al* (1999) confirmed the model by empirically testing Mitchell *et al* (1997) theoretical model.

The dynamics of stakeholders is a very interesting and important aspect of the stakeholder concept. Further research and empirical studies are required to get a better understanding and to gain deeper insight of this area.

Stakeholders in System Dynamics Literature

In this section we briefly explain the main works of system dynamicists who used the stakeholder concept in their work. In our opinion some of these major works can be seen in classical system dynamics, group model building and public policy applications of system dynamics.

Classical System Dynamics

A survey through the work of Forester revealed that although he did not use the term stakeholder explicitly, the concept of stakeholders, the differing worldviews of different individuals and the importance of conflicting opinions were quite extensively used in his work. The very introduction of his first book, Industrial Dynamics (1964), 'as a book that presents his own personal view of the management process' is an evidence of this. A close look into the production distribution model presented in his first paper, Industrial dynamics: A major breakthrough for decision makers (1958), as well as in Industrial Dynamics (1964) reveals that different stakeholders like managers in the factory, distributors, retailers and customers were incorporated into the model. To understand the effect of advertising he extended this model to other stakeholders like prospective purchasers, agencies & media and public.

In World Dynamics (1973), his guidance for system dynamicists implicitly covers the essence of stakeholder analysis. 'The system dynamicist starts most effectively from intense discussions with a group of people who know the system first hand. Such people should be active participants in the social system. They should speak from a variety of backgrounds and viewpoints, so opinions will clash. The atmosphere of the discussion should require that conflicting opinion be at least partially resolved, for its is by that process that the underlying assumptions are most quickly revealed. During such a discussion, the dynamicist gleans the fragments of information from which he assembles a model that captures the essential structure of the system'.

In Principles of Systems (1968), while examining the nature of systems, he included families and small groups as social systems representing interactions between people. Accordingly, he defined management as a system of people for allocating resources and regulating the activity of a business.

In Urban Dynamics (1969), while representing the urban area as a social system, he used three categories of stakeholders, namely, managerial-professional, labour and underemployed.

In his paper Churches at the transition between growth and world equilibrium (1975), he explained the concept of goal conflict. 'A social system, if it is to fulfill human needs, must meet a multiplicity of goals. These goals can conflict with one another in several dimensions - in current trade offs, in time and in hierarchy. Furthermore, the nature of the most important goal conflicts can change, depending on the mode in which the system is operating.'

His explanation of Information distortion is also useful in stakeholder analysis. He explains in Industrial Dynamics: Information is interpreted differently by different people and organisations. Prejudices, past history, integrity, hope and the internal political environment of an organisation all bias information flows.

Thus, the concept of stakeholders was used implicitly in classical system dynamics literature. Some of the aspects of this concept which Forrester developed in his work, are very useful for stakeholder analysis and specially while trying to incorporate stakeholders into system dynamics models.

Group Model Building

Group Model Building is another area where the concept of stakeholders was used while developing system dynamics models. Vennix (1996) explains Group Model Building as process in which team members exchange the perceptions of a problem and explore such questions as: what exactly is the problem we face? How did the problematic situation originate? What might be its underlying causes? How can the problem be effectively tackled?

An important characteristic of Group Model Building is that 'fact' is separated from 'value'. The primary focus is descriptive and diagnostic: the way the team members think is a system works is separated from the question how they would like a system to work. The goal of Group Model

Building is to create a consensus after sufficient deliberation and contrasting of viewpoints has taken place.

A major problem while incorporating stakeholders into system dynamic models is addressed by Group Model Building experts when they ask the question - How many people to involve in Group Model Building sessions? Experienced model builders advise that the selection of group members should incorporate a wide variety of viewpoints in order to ensure that the model constructed will not become overly idiosyncratic (Forrester 1980, Morecroft and Sterman 1994, Philips 1984). But when selecting participants the model builder is faced with a couple of dilemmas: 1) Increasing the group size will be beneficial to crate a larger organisational platform for change and commitment with a decision, but it simultaneously decreases participation and satisfaction of group members. 2) Increasing a group's diversity will be advantageous with respect to model's quality, but it might at the same time create more tension within the group, which in turn reduces group performance. In general include those who have the power to implement change and from the point of view of platform for change better have one person too many than one too few (Vennix, 1994).

Andersen and Richardson (1997) initiated a discussion of shared scripts and techniques for group model building. In their article they discussed some fairly sophisticated pieces of small group process involving planning for a group model building conference, scheduling the day, particular scripts and techniques for various model building tasks, and closing a group model building conference.

Thus Group Model Building is one of the approaches, which took stakeholders into consideration while developing system dynamic models. The lessons learned from group model building approach are useful for stakeholder analysis in general and for incorporating stakeholders into system dynamics model in particular.

Public Policy Applications of System Dynamics

On the Public Policy scene, many interests and objectives meet in a process of give and take. Public Policy goals are many dimensional and are continuously discussed and re-defined. Public Policy is formed through a bargaining between a large no. of interest groups, each with many members (Stenberg, 1980).

In a study to identify and clarify the problems faced by the Scandinavian forest sector, Stenberg used the concept of 'Reference groups'. Reference groups served as a mini universe of the part of the real world under study. After the initial planning period, the research staff approached several high level decision makers representing labour unions, corporate management, forest owners, research institutions and government authorities. Reference groups of approximately 8 people each were formed. A series of ten half-day meetings over a 5 month period focussed on current problems, concerns for the future and interpretations for past development of forestry and forest industry. During the discussions with reference groups, the only modelling tool employed was causal loop diagrams and the end product of this series of meeting was a problem definition judged relevant by the reference groups. Contacts were maintained with the reference groups throughout the project. The study produced results of two different kinds. First, the members of the reference group found that the group discussions increased their ability to see their own situation in a large context and put them in a better position to evaluate the long term effects of various policies. Second, the team produced a no. of documents of value for future policy discussions.

In some of the public policy applications of system dynamics, where stakeholders were considered, a trend towards combining another methodology, along with system dynamics is visible. Gardiner & Ford (1980) used such a multi-methodology to predict and evaluate the impacts of management decisions in social systems. The approach taken was a merger of two policy analysis techniques: system dynamics and an evaluation technology called multi attribute utility measurement (MAUM). In one of the first system dynamics papers which explicitly used the term

stakeholders, they merged an SD model which simulated the impacts of a construction boom on a small, isolated town with SMART (simple multi attribute rating technique), a version of multi attribute utility measurement. They illustrated this multi-methodology in a field setting where the SD model acts as the front end for value models developed for elected officials, local industry representatives and other interested view points.

Cavana and Coyle (1984) while developing a policy analysis model for New Zealand's plantation forestry system observed that it is important to realize that there are probably many ways of measuring the performance of the "real" New Zealand plantation forestry system, perhaps reflecting different interest groups such as government, forestry managers and trade unions. Coyle (1996) has further discussed this forestry policy work in his system dynamics modelling book.

In another multi-methodology approach Hsiao (1998) proposed a conflict analysis procedure combining judgment analysis with system dynamics modelling. They used the JOBS (Job Opportunities and Basic Skills Training) welfare reform programme as a case study with three hypothetical policy stakeholders. Their procedure tried to demonstrate its capability to elicit subjective values of the public policy stakeholders on policy alternatives & outcomes and to deal with the complexity of the disputed policy issue. Specifically, judgement analysis experiments elicit policy stakeholders' subjective values and explicate their cognitive conflict. System dynamics modelling contributes to, building up important structures of the disputed policy, simulating various policy alternatives (means), and producing outcomes (ends).

Gill and Wolfenden (1998) used a multi-methodology approach labelled IdeaMap, combining cognitive mapping and system dynamics. They described this approach as a group model building technique developed for application to local and regional environmental planning problems. They claimed that this approach has a number of unique features including a major focus on the facilitation of comprehensive stakeholder involvement, ownership and learning as the foundation for all subsequent planning and policy development activities. They used IDeaMap successfully in a number of environmental management areas, and described it in the context of the holistic management of a rural city's water supply.

Cavana et al. (1999) described a practical attempt at surfacing the conflicting world views of stakeholders like clinicians and health care managers at the New Zealand Ministry of Health. This qualitative study also used a multi-methodology approach combining clustered hexagon technique with causal loop diagramming.

Other Public Policy applications of system dynamics incorporating stakeholders include MODUM (Environment-Mobility model) research project by the Switzerland science foundation (Heeb et. Al 1999) and group decision making for environmental problems in Australia (Wolfenden and Gill 1999).

This brief literature survey makes it clear that the concept of stakeholder was taken into consideration by some system dynamicists in their work. Nevertheless, it also projects the fact that there is considerable scope for improvement in systematically incorporating stakeholder concept into system dynamics. This could benefit both system dynamics and stakeholder literature.

Systems Thinking And Modelling

Systems methodology or the systems approach refers to a set of conceptual and analytical methods used in systems thinking and modelling. The development of a systems thinking and modelling intervention involves five major phases (Maani and Cavana, 2000, p16) as shown in Figure 3.

	Phases
1.	Problem Structuring
2.	Causal Loop Modelling
3.	Dynamic Modelling
4.	Scenario Planning and Modelling
5.	Implementation and Organisational Learning

Fig. 3. Phases for Systems Thinking and Modelling Methodology

We would like to propose that a well structured stakeholder analysis along with the active interaction of stakeholders would enrich the different phases of the systems thinking and modelling process. However in this paper, we would like to draw attention to the usefulness of stakeholder analysis in the 'problem structuring' and 'scenario planning & modelling' phases.

Problem Structuring

In the problem structuring phase, the situation or issue at hand is defined and the scope and boundaries of the study are identified. This is the common first step in problem solving approaches. The problem-structuring step consists of the following steps (Maani and Cavana, 2000, p17).

1. *"Identification of the problem area or policy issues of concern to management. This step requires that we clearly establish the objectives, taking into account multiple **stakeholders** and perspectives.*
2. *Collection of preliminary information and data including media reports, historical and statistical records, policy documents, previous studies and **stakeholder** interviews."*

Scenario Planning and Modelling

In this phase, policies and strategies are tested under varying external conditions. This is referred to as scenario modelling. In Maani and Cavana(2000), the method used to construct scenarios is based on the approach outlined by Schoemaker (1993). Schoemaker provides a 10 step method, which explicitly refers to stakeholders in steps 2 and 8:

*"Step 2: Identify the major **stakeholders** or **actors** who would have an interest in these issues, both those who may be affected by it and those who could influence matters appreciably. Identify their current roles, interests and **power** positions.*

*Step 8: Assess the revised scenarios in terms of how the key **stakeholders** would behave in them. Where appropriate, identify topics for further study that would provide stronger support for your scenarios, or might lead to revisions of these **learning scenarios**."*

Stakeholder Analysis of a Transportation Infrastructure Project

The stakeholder analysis methodology we propose in this paper is based on the literature discussed in the previous sections. Mostly, the present literature focuses on an organisation, while discussing stakeholder analysis. We try to adapt this methodology for project management. In this section, we illustrate this methodology, using a New Zealand case study relating to a transportation infrastructure development project.

The project that we use in this study is managed by the Wellington Regional Council. Wellington Regional Council has been seeking a suitable solution to the increasing problems of congestion,

safety and community severance along the existing State highway route between Paremata and Paekakariki. A possible solution to these problems is the construction of the Transmission Gully motorway, a 27-km inland route. The vision of the Wellington Regional Transport strategy is 'A balanced and suitable land transport system that meets the needs of the regional community', and it in turn demands, the proposed transmission gully to be environmentally and economically sustainable.

The cost of constructing Transmission Gully is estimated to be NZ$245 million. At present, government funding alone may not meet this cost. This situation suggests the introduction of road pricing. Thus, if the early construction of Transmission Gully becomes a reality, it is likely to be the first application of road pricing in New Zealand and the principle of 'doing it right the first time' becomes relevant in this case. Due to the importance of this situation, the Wellington Regional Council started a project to explore the different aspects of road pricing.

A systematic stakeholder analysis for this project consists of the following steps:

(i) Develop a stakeholder map of the project
(ii) Prepare a chart of specific stakeholders
(iii) Identify the stakes of stakeholders
(iv) Prepare a power versus stake grid
(v) Conduct a process level stakeholder analysis
(vi) Conduct a transactional level stakeholder analysis
(vii) Determine the stakeholder management capability of the project
(viii) Analyse the dynamics of stakeholders

Develop a Stakeholder Map of the Project

For a project, the rational level of stakeholder analysis should start with the development of a stakeholder map. The stakeholder map of the transportation infrastructure project is shown in Fig. 4

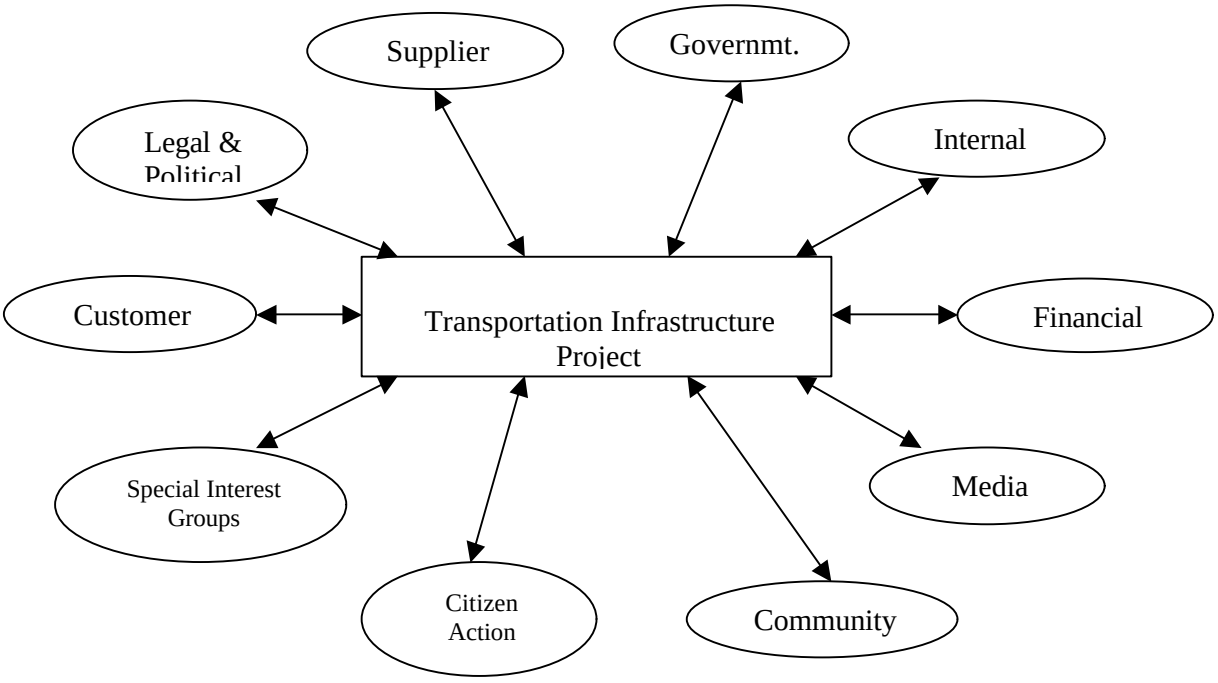


Fig. 4. Stakeholder Map of the Transportation Infrastructure Project

Prepare a Chart of Specific Stakeholders

As the next step in rational level analysis, a stakeholder chart is prepared. This chart consists of the specific stakeholders based on the stakeholder map. For the transportation infrastructure project this chart is shown in Figure 5.

Internal Wellington Regional Councilors Regional Land Transport Committee Members Passenger Transport Committee Members Environment Committee Members WRC Environmental Management Department	Financial Commercial Banks Private Funding Companies The Treasury Inland Revenue Department
Media The Dominion Newspaper The Evening Post Newspaper TV New Zealand Radio New Zealand Other Local Newspapers	Community IWI Group - Ngati Toa IWI Group - Te Ati Whakarongotai Farming Community: Pastoral Farmers at Horokiri Valley Forestry: Land Management Group, WRC Property Owners Wellington Regional Residents
Citizen Action Transmission Gully Action Council Paremata Residents Association Pukerua Bay Residents Association Plimmerton Residents Association Mana Esplanade Action Committee Save Parameta Inlet Committee Pauatahanui Residents Association Tawa Progressive and Ratepayers Association Waikanae Progressive and Ratepayers Association Guardians of Pauatahanui Inlet	Special Interest Groups Department of Conservation Campaign for Better City Cycle Aware Friends of Pauatahanui Inlet Transport 2000 Haywards Action Group Gully Alternatives Information Network Regional Park Users and Officials Tranz Rail Porirua Gun Club Officials
Customer Commercial Road Users Association Regional Chamber of Commerce Public Transport Users Association Other Road Users	Legal/Political New Zealand Police Labour Party National Party Alliance Party Greens Party ACT Party New Zealand First Party
Government Ministry of Transport Wellington Regional Council Wellington City Council Hutt City Council Upper Hutt City Council Kapiti Coast District Council Porirua City Council Transit New Zealand	Supplier Booz. Allen Hamilton - Consultants Beca Carter Hollings & Ferner Ltd. Consultants McDermott Miller Ltd. - Consultants

Fig. 5. Specific Stakeholders of the Transportation Infrastructure Project

Identify the Stakes of the Stakeholders

Further, the stakes of the specific stakeholder groups is identified and analysed. In Figure 6 we have shown the major stakes of some selected stakeholders of this project

Regional Land Transport Committee Responsibility for regional transport development	Transfund New Zealand Allocation of available funds	Transit New Zealand Safe and efficient state highway system Management of the needs of road users and communities
Commercial Road Users Association High users of the road	Transmission Gully Action Council Construction of the Transmission Gully at the earliest Needs of local community	Regional Chamber of Commerce Regional business development Profits of member business groups

Fig. 6. Stakes of selected Stakeholders of the Transportation Infrastructure Project

Prepare a Power versus Stake Grid

In the next phase of rational level analysis, a two dimensional grid is prepared. The first dimension categorises the stakeholders by stake and the second dimension by power. For the transportation infrastructure project, this grid for some selected stakeholders is shown in Figure 7.

Power / *Stake*	Formal or Voting	Economic	Political
Equity	Wellington Regional Council		
Economic	Transfund New Zealand	The Treasury Inland Revenue Dept.	
Influencers	Regional Land Transport Committee Transit New Zealand Regional Chamber of Commerce	Private funding companies Commercial banks	Labour Party Alliance Party National Party

Fig. 7. Stakeholder Grid for Selected Stakeholders of the Transportation Infrastructure Project

Conduct a Process Level Stakeholder Analysis

After the rational level of analysis, it is necessary to understand how the project management implicitly or explicitly manages its relationships with its stakeholders. It is also important at this stage to know whether these processes fit with the rational stakeholder map of the project.

While analysing the project, we found that Wellington Regional Council has a well-structured stakeholder consultation process. A three-stage process – identifying needs and most desirable outcomes; selecting the best package; and confirming the policies and projects were found to ensure ownership and commitment of stakeholders. This three-stage process was clearly presented in the Wellington Regional Land Transport Strategy, 1999 –2004 (Wellington Regional Council, 1999).

Conduct a Transactional Level Stakeholder Analysis

At this level, we must understand the set of transactions or bargains between the project management and its stakeholders and deduce whether these negotiations fit with the stakeholder map and the organisational processes for stakeholders. Successful transactions with stakeholders are built on understanding the legitimacy of the stakeholder and having processes to routinely surface their concerns.

At this stage, it appears that the effectiveness of the transactions between the project managers and stakeholders is relatively low. Due to the very nature of the project, different stakeholders have conflicting interests. But these conflicts have not yet been satisfactorily resolved and this has resulted in a delay of the project.

Determine the Stakeholder Management Capability Index of the Project

Stakeholder management capability of a project can be defined as its understanding or conceptual map of its stakeholders, the processes for dealing with these stakeholders and the transactions which it uses to carry out the achievement of project purpose with its stakeholders (Freeman, 1984). To determine the stakeholder management capability we have to first judge whether the project management understands its stakeholder map or not. Then, we have to rate this project for its organisatonal process and transactions for dealing with its stakeholders.

According to our analysis, the project managers understand their stakeholder map. Our process level analysis gave a high rating for the processes with which they deal with their stakeholders. But according to us, the effectiveness of the transactions and bargains between the project managers and stakeholders is relatively low. Based on this analysis, we present the stakeholder management capability of the project in Figure 8.

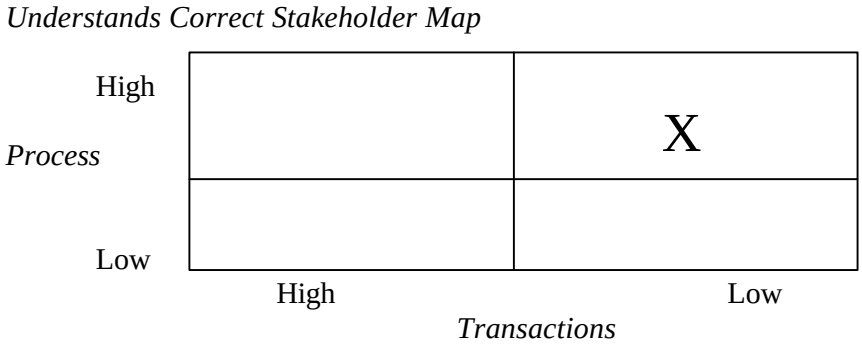


Fig. 8. Stakeholder Management Capability of the Transportation Infrastructure Project

Analyse the Dynamics of Stakeholders

The attitudes of stakeholders towards the project and the salience of the stakeholders in the eyes of the project managers change with respect to time. Capturing this dynamics of stakeholders will enrich the stakeholder analysis of any project.

Dormant (Power only)	Discretionary (*Legitimacy only)* Booz. Allen & Hamilton Consultants McDermott Miller Consultants Commercial banks Private funding companies	Demanding (*Urgency only)*	Dominant *(Power & Legitimacy)* The Treasury Inland Revenue Department
Dangerous (Power & Urgency)	*Dependent (Legitimacy & Urgency)* Transmission Gully Action Council Iwi group – Ngati Toa Transport 2000 Evening post newspaper	*Definitive (Power, Legitimacy & Urgency)* Regional Land Transport Committee Transit New Zealand Transfund New Zealand Wellington Regional Chamber of Commerce	*Non-stakeholder (No Power, Legitimacy or Urgency)*

Fig. 9. Stakeholder Typology of Selected Stakeholders of the Transportation Infrastructure Project

The stakeholder typology model developed by Mitchell *et al* (1997) can be used for this purpose. The salience of stakeholders will change as their power, legitimacy and urgency changes. Project managers should continuously update this typology model to capture the changing salience of stakeholders. A stakeholder typology model developed during the planning phase of the transportation infrastructure project, consisting of some selected stakeholders, is shown in Figure 9. This typology was made according to the typology model discussed in section 2.3.

6. Conclusions

Stakeholder literature is in a state of explosion. In this paper, we explored the different stages through which this literature developed, explaining three phases in particular, namely, classical stakeholder literature, strategic management: a stakeholder approach and the dynamics of stakeholders. As the next step we briefly surveyed the system dynamics literature to understand the links between system dynamics literature and stakeholders. We found that the concept of stakeholder was taken into consideration by some system dynamicists in their work. But, in our opinion there is considerable scope for improvement for systematically incorporating the stakeholder concept into system dynamics, which could benefit both the system dynamics and stakeholder literature.

The systems thinking and modelling process consists of five phases: problem structuring, causal loop modelling, dynamic modelling, scenario planning & modelling, and implementation & organisational learning. In this paper we emphasised the importance of stakeholder analysis in the problem structuring and scenario planning & modelling phases. We believe that a systematic stakeholder analysis would enrich the problem structuring phase by helping to define the problem using multiple stakeholder perspectives. Using a New Zealand transportation infrastructure case study, we demonstrated a systematic method for stakeholder analysis to capture multiple stakeholder perspectives.

In the scenario planning and modelling phase, it is important to understand the stakeholder behaviour it terms of their role, interest and power positions**.** The methodology that we illustrated in this paper takes into account all these three aspects. It helps to identify and analyse multiple stakeholders with respect to their roles, interests and power positions.

To summarise, in this paper we presented a systematic methodology to analyse multiple stakeholders. This methodology could be used to incorporate stakeholders into Systems Thinking and Modelling framework, thus enriching this methodology.

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[4] All references in Classical Stakeholder literature section can be obtained from Freeman (1984).