Analysing the stakes of stakeholders in research and development project management: a systems approach

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Research and development (R&D) project management involves managing multiple stakeholders with conflicting stakes. This article proposes a systems approach to capture such conflicting stakes of multiple stakeholders in controversial R&D projects. The approach is illustrated using a New Zealand case study related to the use of 1080 chemical for pest management. Initially, the problem situation was structured systemically by analysing the behaviour of the main variables and by conducting a stakeholder analysis. Further, a participative systems model related to the problem situation was developed using a group model-building process. The analysis of the model revealed a set of feedback loops operating in the system identified as constituting and responsible for the complexity of the problem situation relating to 1080 use. In conclusion, the paper highlights some strategies suggested by the stakeholders to manage conflict.

1. Introduction

Stakeholders in research and development (R&D) projects can cover a spectrum representing economic, environmental and societal interests, with the potential for intense conflict between them (Elias et al., 2002). Some R&D projects can become what Hall and Martin (2005) refer to as controversial, disruptive and radical, because of such conflicting interests and perspectives among different stakeholders. The execution of such projects can be difficult as they affect multiple stakeholders (Freeman, 1984), and these stakeholders in turn have the ability to influence the project (Tipping et al., 1995).

A controversial R&D project to develop genetic technology in global agriculture markets by US firm Monsanto affected a wide range of stakeholders (Hall and Martin, 2005). For example, a New Zealand case of a controversial R&D project is the use of 1080 for pest management. 1080 is a chemical that is used both in ground and aerial pest management operations to protect New Zealand's flora and fauna. The use of 1080 is controversial with extremely polarised for and against views throughout New Zealand involving several stakeholders (PCE, 2011). Although those stakeholder accepters of 1080 use claim that they have tried to address and acknowledge the problems of those stakeholders against it, the controversy is still apparent in the media.

One of the problems faced by the organisations responsible for managing such controversial R&D projects is the lack of practical methodological frameworks that are helpful in addressing and acknowledging the concerns of multiple stakeholders. A review of R&D management literature also suggested that there was scope for more methodological illustrations to develop a shared mental model of conflicting stakeholders. Therefore, in this article, we apply an existing methodological framework, based on systems thinking, to develop a shared mental model of multiple stakeholders in a controversial R&D project. The application of this framework is illustrated using the New Zealand case study of 1080 use.

The paper begins with a review of the stakeholder concept in R&D management literature. This is followed by the application of this methodological framework to the 1080 case study. We conclude this article by highlighting some of the strategies suggested by the stakeholders to resolve the conflict between stakeholders.

2. A review of the stakeholder concept in R&D management literature

A review of R&D management literature found the stakeholder concept in a few different streams. To begin with, R&D management literature acknowledges that stakeholder management involves multiple stakeholders with conflicting stakes (Tipping et al., 1995). It also accepts that stakeholder management can become complex, because of the presence of many interacting stakeholders (Hall and Martin, 2005), and dynamic, when their saliences change over time (Davenport and Leitch, 2012).

A landmark book in stakeholder management belongs to Freeman (1984), in which he defines stakeholders as any group or individual who can affect or is affected by the achievement of a firm's objectives. Freeman developed a stakeholder map capturing the dyadic relationship between the stakeholders and a firm. His view is also supported by other authors who define stakeholders as those who can influence or be influenced by an organisation or a project (e.g. Achterkamp and Vos, 2007). Freeman's stakeholder management approach provides a structured approach for analysing stakeholders using three levels of analysis, namely, rational, process and transactional (Elias et al., 2002). In their latest book, Freeman et al. (2010) reviews and critiques stakeholder theory over the last 30 years, highlighting the applications of this theory in various fields and explaining how it helped in shaping and defining the two important areas of business ethics and corporate social responsibility.

An important aspect that contributes to the complexity and dynamicity in managing stakeholders is their changing positions, interests and importance over time. Mitchell et al. (1997) explained these dynamics using a stakeholder typology model that captures and reflects how the salience of stakeholders change when they possess or dispossess three attributes, namely, power, legitimacy and urgency. This model was found useful in understanding the relative positions of stakeholders in an R&D project examining road construction and road pricing (Elias et al., 2002).

Elias et al. (2002) conducted a comprehensive review of stakeholder literature by developing a literature map of the evolution of stakeholder concept in management literature from 1963 to 2002. They also developed a methodological framework for analysing stakeholders in R&D projects based on Freeman (1984) and Mitchell et al. (1997). They illustrated this framework by applying it to a New Zealand road pricing R&D project using an eight-step process (Elias et al., 2002).

Since the literature review of Elias et al. (2002), the stakeholder concept in R&D management literature has followed a number of themes. Some articles on process management in R&D used the stakeholder concept for six sigma quality management (Carleysmith et al., 2009), technology road mapping (Lee et al., 2011) and for constructing validation points to determine R&D effectiveness (Garcia-Valderrama and Mulero-Mendigorri, 2005). Some other authors referenced the use of entrepreneurs in R&D management as well as utilising intangible resources for value creation in innovation using stakeholders (Pike et al., 2005; Lettl et al., 2006). The process of research institutions or knowledge networks being transformed into commercial innovative opportunities was also identified by a number of authors (Collinson and Gregson, 2003; Davenport et al., 2003; Ball and Butler, 2004; Simpson, 2004; Leung and Isaacs, 2008; Ebner et al., 2009; McAdam et al., 2010; Barker et al., 2012). Finally, corporate social responsibility and sustainability were linked to stakeholders in R&D projects by some other authors (Hayton, 2005; Yawson et al., 2006; Holmes and Smart, 2009; Schiederig et al., 2012; Seebode et al., 2012).

This review also found another stream of literature involving stakeholders in controversial and radical research and development. Davenport and Leitch (2005, 2009, 2012) have published a number of articles on the controversies surrounding genetic modification (GM) in New Zealand.

They analysed the dilemmas faced by organisations responsible for managing a diverse range of stakeholders and came up with an ‘Issue-Impact-Action’ framework for identifying, understanding and following stakeholders responses to an issue that can be both complex and dynamic.

In another major work on radical technology development, Hall and Martin (2005) analysed the stakeholders of a controversial matter related to Monsanto’s development of agricultural biotechnology, where Monsanto was able to satisfy regulatory demand and most stakeholders within the value chain, but encountered considerable opposition with disruptive effects from secondary stakeholders. Based on this study, they argue that in addition to technological, commercial and organisational challenges, the developers of such technology need to resolve social uncertainties. They warn that this can be a particularly difficult activity because of the added complexities and often conflicting concerns from secondary stakeholders.

For analysing radical R&D, different approaches were used by authors in the R&D management literature. For example, Davenport and Leitch (2009) analysed discourse strategies and practises deployed by competing actors in a controversy surrounding genetic modification in New Zealand. Hall and Martin (2005) used Popper’s conjecture–refutation approach and Popper’s piecemeal engineering approach to evaluate the controversy related to Monsanto’s development of agricultural biotechnology. Although these approaches are useful in analysing some aspects of controversial R&D projects, they have limitations. Popper’s conjecture–refutation approach is only useful when relatively few stakeholders and little or no stakeholder ambiguity is involved. Popper’s piecemeal engineering approach is only valid if appropriate error-elimination criteria are applicable, which becomes increasingly unlikely under high degrees of complexity and stakeholder ambiguity (Hall and Martin, 2005).

In summary, the R&D management literature has acknowledged that stakeholder management involves multiple stakeholders with conflicting stakes. It also provides examples and cases of controversial R&D projects relating to genetic modification and radical technology development. In addition, it acknowledges the difficulty of managing stakeholders in such projects as they affect multiple stakeholders with conflicting stakes, which change over time. However, R&D management literature related to the application of methodological approaches for managing such stakeholder conflicts and for developing an accommodation among conflicting stakeholders is limited.

3. Background of the 1080 case

Possums, rats and stoats were introduced to the predator-free environment of New Zealand in the early-European settlement of the country. Their populations have now grown, uninhibited, to a pest status with their vast numbers eating young birds and destroying New Zealand’s forest (PCE, 1994; PCE, 2000). 1080 is a chemical that has continued to be used, both in ground and aerial operations, as a part of pest management since the 1950s (PCE, 2000). The 1080 project management has evolved from possum hunting and trapping activities, to use of a variety of different pest management chemicals and chemical formulations that are suited for use in New Zealand’s rugged landscape, and to researching alternatives based on public complaints and controversy surrounding the 1080 use (PCE, 2011).

Following public complaints about the inhumane deaths of non-target animals, the Parliamentary Commissioner for the Environment (PCE) started reviewing 1080 use in 1994 (PCE, 1994; PCE, 1998). In 2000, the PCE used reference groups to research the impacts of 1080, identifying, for example, scientific mistrust by the public. In 2007, the Environmental Risk Management Authority (ERMA) reviewed the health and safety of 1080 in relation to public submissions (ERMA, 2007). In 2011, the PCE compared 1080 against other pest management options (PCE, 2011).

The Animal Health Board (AHB) and the Department of Conservation (DOC), which are responsible for these operations, both agree that 1080 is the most effective pest management option available at the moment (PCE, 2011). AHB use 1080 to eradicate possum-originating *bovine tuberculosis* (Tb) infecting cattle, which affects New Zealand’s exports in the long term (AHB, 2011). DOC use 1080 to eradicate possums, stoats and rats to prevent them from destroying New Zealand’s native flora and fauna, and to protect New Zealand’s tourism image (Green, 2004). Both AHB and DOC have become more confident when they see the positive results of 1080 use, resulting in more actual use of 1080.

On the other side, there are stakeholders who oppose 1080 use. They include independent groups, like the Deerstalkers Association, either affected directly through reduced deer-hunting numbers (from secondary 1080 poisoning), or emotionally through having experience of 1080’s apparent inhumane destruction of animals (Wilson, 2012). These stakeholders utilise media stakeholders to get their points heard and regularly keep 1080 use exposed to the public.

Although regulators and accepters of 1080 have tried to address and acknowledge the problems of those against 1080 use, the controversy is still apparent in the media. The level of conflict between these stakeholders is on the rise (Watson, 2010). But, there has been a lack of a methodological framework for the likes of DOC and AHB to address and acknowledge the concerns of the multiple stakeholders in relation to this controversial project.

4. Methodological framework

The methodological framework used in this study is based on systems thinking and modelling (Maani and Cavana, 2007). Systems thinking and modelling is a methodological framework based on the System Dynamics approach. The framework used in this study consists of two phases: problem structuring and group model building (Table 1).

In the first phase, the problem was structured systemically. For this, first, a 'Behaviour over time' (BOT) graph was developed. This was followed by a systematic stakeholder analysis (see section 4.1). In the second phase, a process called group model building (Vennix, 1996) was employed. Group model building is a 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? Among the different methods available for group model building, this study used hexagons for systems thinking. Maani and Cavana (2007) have provided a detailed explanation, drawing on Hodgson's (1994) use of hexagons for issue conceptualisation and Kreutzer's FASTbreakTM process (Kreutzer, 1995) using hexagons to develop causal loop diagrams. Due to the complexity and controversial nature of the 1080 project, this methodological approach was deemed suitable for capturing the conflicting stakes of stakeholders and also for developing a shared mental model of these stakeholders.

Table 2 exhibits the characteristics of stakeholders chosen for conducting interviews and group model building.

Table 1. Methodological framework

Phases	Steps
Problem structuring	Behaviour over time chart development
	Stakeholder analysis
Group model building	Hexagon generation
	Cluster formation
	Variable identification
	Causal loop model development
	Causal loop model analysis

4.1 *Problem structuring*

The first part of problem structuring involved the development of a BOT graph, a tool used in systems thinking (Figure 1). A BOT graph shows how the key variables in a system change over time (Maani and Cavana, 2007). Information for the development of this BOT graph was collected through preliminary interviews with key stakeholders such as regulators,

Table 2. Data sources

Stakeholder group	Specific stakeholder	Interviews	Group model building
Government	Department of Conservation	2	1
	Environmental Risk Management Authority	2	1
Economic	Regional Chamber of Commerce	1	1
Researchers	Victoria University	2	1
	Massey University	2	
	Canterbury University	1	
Pro-1080 groups	Animal Health Board	2	1
Community	Farmers	2	1
	Land owners	2	
Media	The Dominion Post	2	
	TV NZ		
Anti-1080 groups	Deerstalkers Association	1	1
Special interest groups	Forest and Bird	1	1

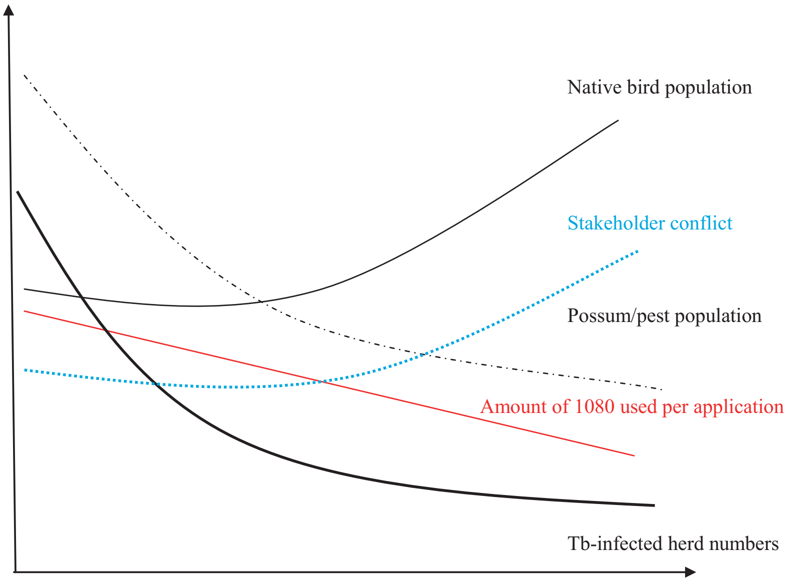

Figure 1. Behaviour over time graph.

operators, media, anti-1080 groups and pro-1080 groups. Secondary data (PCE, 2011) were also collected for this purpose.

The BOT graph for the 1080 project shows that the amount of 1080 used per hectare is decreasing over time, with pest/possum population numbers and Tb-infected herd numbers dropping (AHB, 2011; PCE, 2011). It also shows an increase in the native bird population and native species (PCE, 2011). However, the stakeholder conflict between anti-1080 and pro-1080 stakeholders is still present and growing (ERMA, 2007; PCE, 2011).

The second part of the problem structuring involved the identification and analysis of the stakeholders related to the problem situation. Based on Elias et al. (2002), an eight-step stakeholder analysis method was applied to the1080 problem. The steps included (1) developing a generic stakeholder map of the problem, (2) preparing a chart of the specific stakeholders, (3) identifying the stakes of stakeholders, (4) preparing a power versus stake grid, (5) conducting a process-level stakeholder analysis, (6) conducting a transactional-level analysis, (7) determining the stakeholder management capability of the R&D problem and (8) analysing the dynamics of stakeholders. A stakeholder map developed in this analysis is shown in Figure 2. Discussion of all the eight steps is not included because it is beyond the scope of this article. It is worth mentioning that the application of these eight steps helped in gaining a better understanding about the different stakeholders involved in the 1080 project and their conflicting stakes.

4.2 Group model building

In the second phase of this methodological framework, stakeholders were brought together to participate in a group model-building session. The group model-building exercises allowed the stakeholders to voice their individual perceptions about the project. This exercise also helped them to develop a shared mental model of their perceptions as a group.

Despite the controversy surrounding the 1080 project, at least one stakeholder representative from most of the stakeholder groups included in the stakeholder map (Figure 2) participated in the group model-building exercise. Four steps were involved in the group model-building exercise, generation of hexagons, formation of clusters, identification of variables and the development of a causal loop model.

4.2.1 Hexagon generation

To start the group model-building session, an organising question, ‘What are the factors involved in the 1080 project?’, was posed to the stakeholders. Each participant responded to this question, voicing his/her perception. When they did so, it was written on to a hexagonally shaped post-it note and attached to the wall. The group model-building session used several

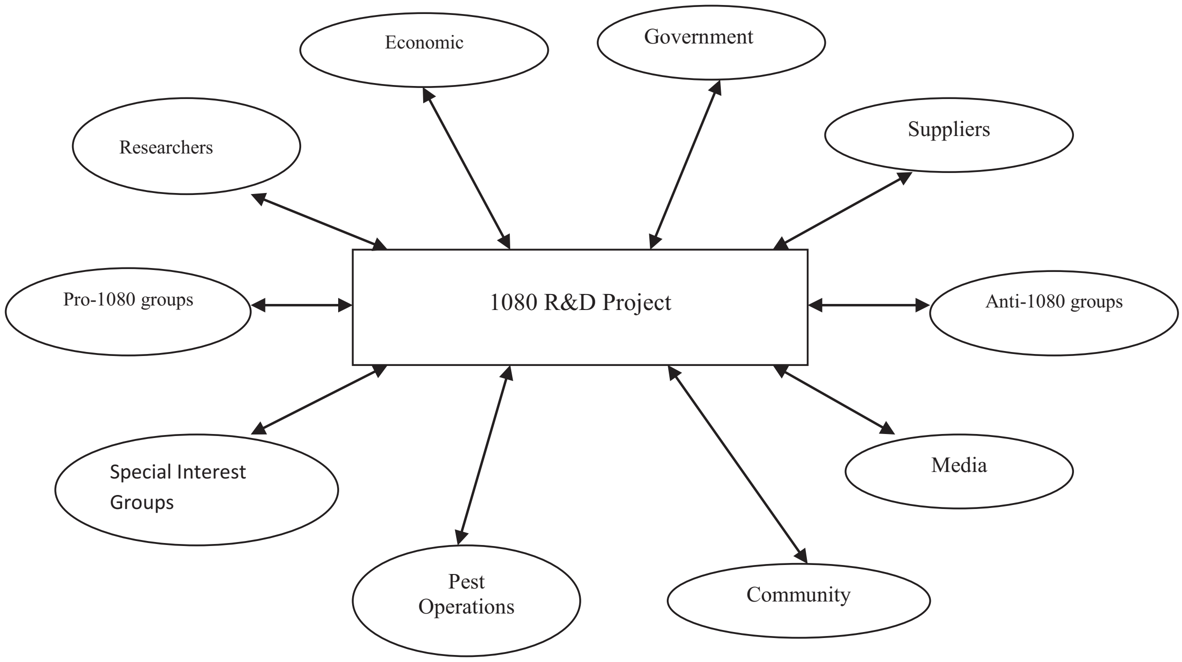

Figure 2. Stakeholder map.

rounds of hexagon generation, and a total of 52 hexagons were generated by the participants.

4.2.2 Cluster formation

As the second step in group model building, participants were asked to cluster the hexagons they generated into groups and title them. As a result of this step, seven clusters were formed with the titles, stakeholder perception, decision-making process, analysis of alternatives, operational consideration, technical research on 1080, research process and drivers for use. An example of a cluster is shown in Figure 3.

4.2.3 Variable identification

As the third step, participants were asked to identify measurable variables for each cluster. Participants were able to identify two to three variables for each cluster, and the facilitator wrote them onto a new hexagon in different colour and placed it near the associated cluster. The variables developed during the session include *amount of media attention*, *level of stakeholder conflict*, *number of resource consents for pest control*, *number of appeals against resource consents for pest control*, *number of public meetings about 1080*, *amount of funding for research alternatives*, *1080 use per hectare*, *number of safety incidents (animal and human)*, *number of Tb-infected herds*, *number of peer-reviewed articles on 1080 research*, *amount of funding for research*, *amount of media attention*, *number of possums/pests*, *number of Tb-infected herds and amount of affected land.*

4.2.4 Causal loop model

As the final step, the stakeholders tried to establish the links between variables identified in step 3. They first identified two variables that were related and provided a directed arrow between each pair of related variables. To generate a directed arrow, they placed a positive (+) sign near the head of the arrow if an increase (or decrease) in a variable at the tail of an arrow caused a corresponding increase (or decrease) in a variable at the head of the arrow. If an increase in the causal variable caused a decrease in the affected variable, a negative (–) sign was placed near the head of the arrow. An initial version of the causal loop diagram was thus developed. At the end of the group model-building exercise, a general agreement that this model represented their shared view was obtained from the stakeholders who participated in this exercise. This diagram was later refined by the facilitators and is presented in Figure 4.

5. Analysis of the causal loop model

The causal loop model was analysed to identify and understand the feedback loops operating in the

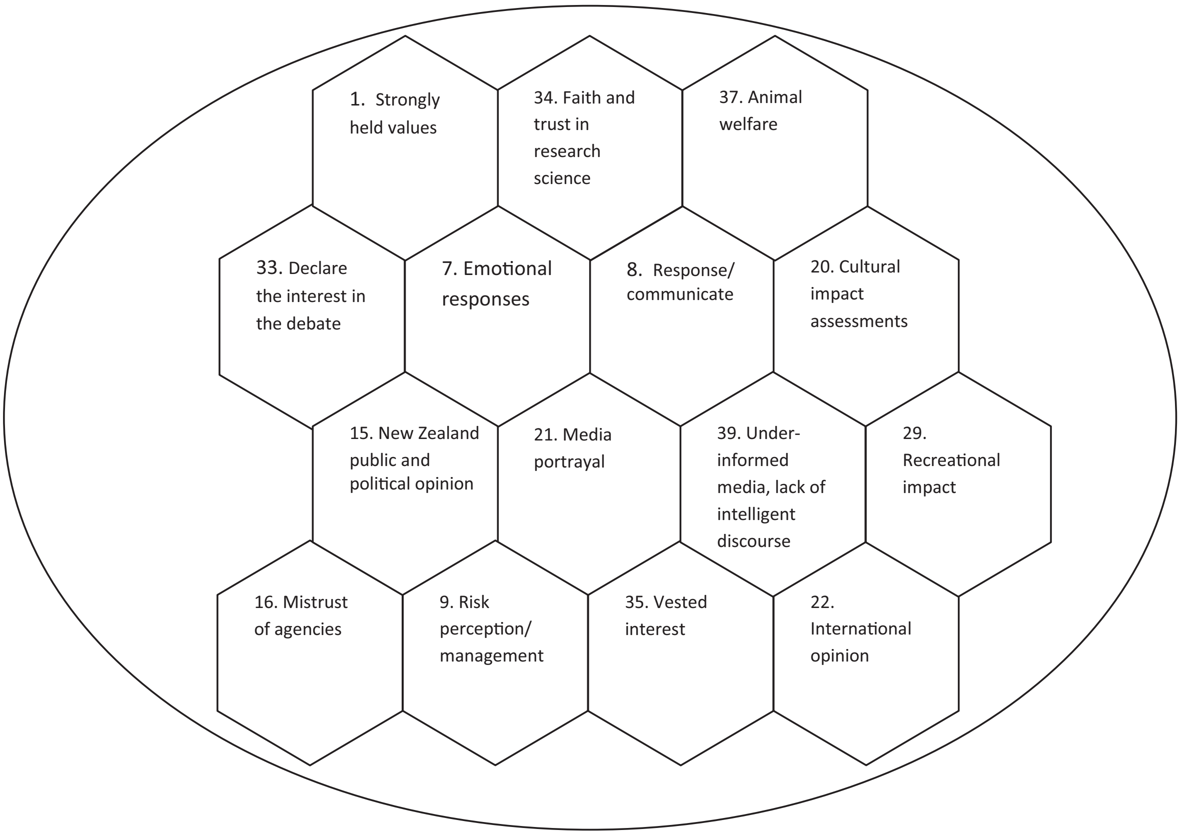

Figure 3. Example of a cluster.

system. Feedback loops can be reinforcing/positive or balancing/ negative (Sterman, 2000). An analysis of the causal loop diagram identified five reinforcing loops and three balancing loops operating in this system. The behaviour of the system, as captured in the BOT graph (Figure 1), can be explained using these eight feedback loops.

5.1 *Reinforcing loop 1 (R1): possum/pest loop*

A good place to start this analysis is the use of 1080 in New Zealand. When the use of 1080 per hectare increases, the number of possums and pests will start decreasing. This positive result will boost the confidence of using 1080 as an effective pest control mechanism, resulting in more 1080 use. This forms the first feedback loop named 'possum/pest loop', which is technically a reinforcing/positive feedback loop. It is worth noting at this stage that it is not the only positive feedback loop operating in this system.

To explain this loop further, possums were introduced as a species to New Zealand, but have increased to a level where they are harming the New Zealand natural environment. 1080 as a form of pest control was used from the 1950s, because it was deemed suitable for use in the rugged New Zealand landscape.

It was found that 1080 use per hectare results in a decrease in the number of possums/pests, anywhere between 75 and 100% (PCE, 2011). 1080 is used in a series of operations, over a long period of time, to destroy possum and pests, and these operations occur regularly as 1080 does not completely eradicate possum and pests.

5.2 *Reinforcing loop 2 (R2): Tb-infected herd loop*

When the numbers of possums/pests starts decreasing due to the 1080 use, the number of Tb-infected herds also decreases, as possums are known vectors of Tb infection to herds. The AHB in New Zealand is committed to the eradication of Tb-infected herds, and this positive result will further boost their confidence to use 1080. So, AHB continues to use more 1080 per hectare resulting in the reduction of Tb-infected herd numbers in New Zealand (AHB, 2011). This forms the second feedback loop, which is another reinforcing/positive feedback loop named

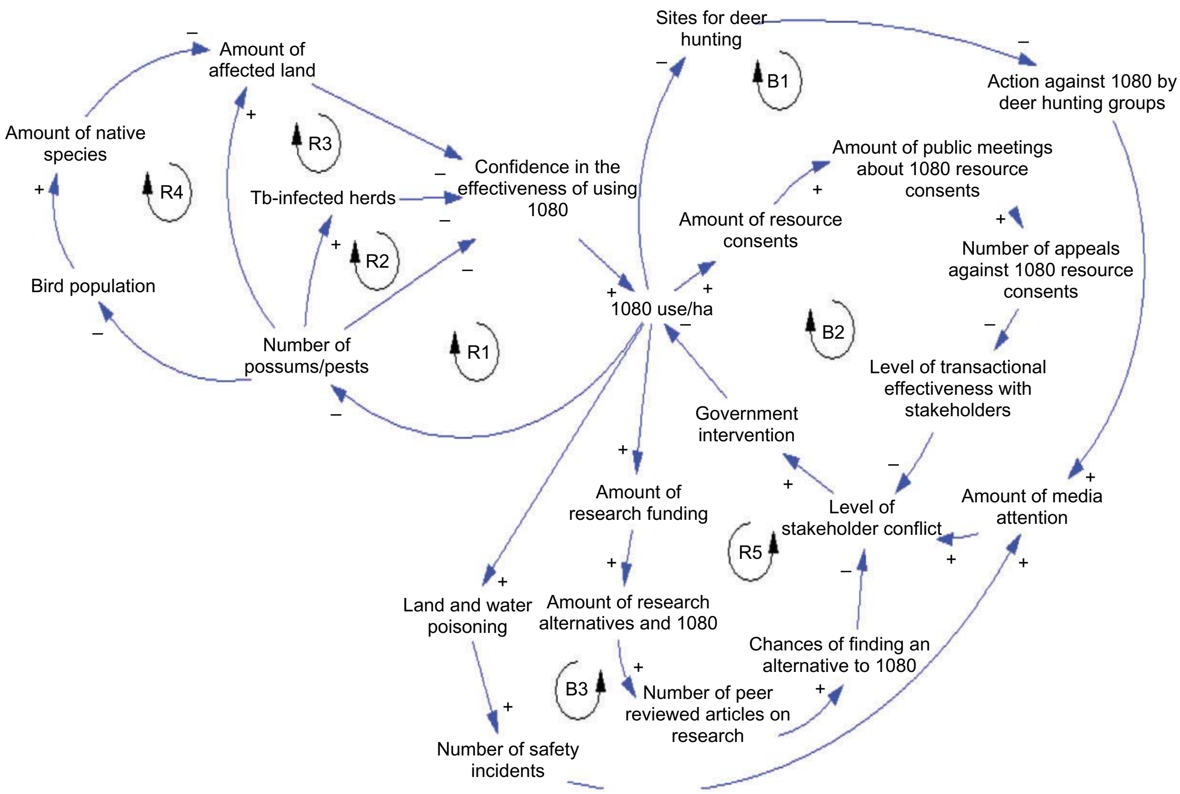

Figure 4. Causal loop model.

'Tb-infected herd loop'. A decrease in the number of Tb-infected herd numbers is a positive outcome for both the AHB and New Zealand cattle exports.

5.3 Reinforcing loop 3 (R3): affected land loop

Possums and other pests can affect the land as they destroy New Zealand's native flora and fauna. This is a concern for New Zealand's DOC, as it is required to protect the natural heritage of New Zealand. When the number of possums and pests diminish as a result of 1080 use, the land area affected by them also starts decreasing. This is good news for DOC, and their confidence in using 1080 will improve, resulting in more actual use of 1080 per hectare. This is the third loop, which is also a positive feedback loop, termed 'affected land loop'. This reduction in affected land is a positive outcome for DOC and New Zealand tourism.

5.4 Reinforcing loop 4 (R4): birds/native species loop

In the process of affecting the land, possums and pests also affect the birds and native species of New Zealand. Possums and pests eat bird eggs and chicks and also attack the insects and trees, diminishing the native species. This is also a concern for the DOC in New Zealand. In the causal loop model, when the 1080 use per hectare increases, the number of possums and pests deceases, resulting in an increase in bird population and also the native species in New Zealand. An increase in the amount of native species means a reduction in the amount of affected land. Such a positive result to the bird population, native species and affected land will once again boost the confidence of using 1080, resulting in more actual use of 1080 per hectare. This the fourth positive feedback loop and is named 'birds/native species loop'.

These first four loops operating in the system illustrate only one side of the coin in the case of the 1080 project. There are, however, a number of other feedback loops operating in the system, responsible for the complex behaviour of the system illustrated in the BOT graph (Figure 1).

5.5 Reinforcing loop 5 (R5): research loop

The group model-building session identified two clusters involving the research process of 1080 and its alternatives. Public safety concerns have warranted research to validate 1080 use as well as to review new alternatives to 1080. There is a recognised public mistrust in science when it comes to 1080 (PCE, 2011).

In the causal loop model, 1080 use during the years have led to an increase in the amount of funding available to conduct research on 1080 as well as on other alternatives of 1080. More research in this area will result in an increase in the number of research articles published about 1080 and alternatives, further increasing the chances of finding a possible alternative for 1080. If an alternative to 1080 were found, most of the stakeholder concerns about 1080 could be addressed, minimising the level of conflict between different stakeholders. This will also reduce the level of government intervention required because even DOC and AHB agree that 1080 is, at present, the best tool in the pest control toolbox until an alternative is available (PCE, 2011). When authentic alternatives are available, the use of 1080 can come down. This is the fifth positive loop operating in the system, termed 'research loop'.

5.6 Balancing loop 1 (B1): deer hunters loop

Deer hunters are a group of powerful stakeholders in this controversial project. The ability of deer hunters to hunt in recreational areas is impacted by the use of 1080. These recreational areas tend to be areas of affected land. An increase in the amount of 1080 use reduces the number of sites available for deer hunting, as 1080 operations restrict public usage for safety reasons. When deer hunters are unable to hunt, they indulge in protest actions against 1080. Any action against 1080 leads to greater media attention. An increase in media coverage on 1080 increases the amount of stakeholder conflict as seen in local protests and letters to the editor. This situation in turn demands government intervention to decrease the amount of 1080, through regulatory controls and budget constraints. This completes the first negative or balancing loop in this system, named 'deer hunters loop'.

5.7 Balancing loop 2 (B2): decision-making process loop

The group model-building session identified concerns about the decision-making process in 1080 operations. As 1080 is a chemical, there is a regulatory requirement for resource consent, an authorisation given to certain activities or uses of natural and physical resources required under the New Zealand Resource Management Act, when it is used. When 1080 is used in different locations, the number of resource consent applications also increases. Such resource consent processes will result in an increase in the number of public meetings about 1080 operations. Due to the public concerns, and the feeling by some stakeholders that they are not being heard, and other negative perceptions about 1080 use, there is usually an increase in the number of appeals against 1080 resource consent. This situation, with several conflicting stakeholders trying to affect the resource consent process, can result in a low level of transactional effectiveness with stakeholders in the system. A low level of transactional effectiveness leads to increasing levels of stakeholder conflict, which in turn demands government intervention to reduce the amount of 1080 used. This loop is the second negative or balancing loop in this system named 'decision-making process loop'.

5.8 Balancing loop 3 (B3): safety loop

Public safety is another important factor that affects the 1080 project. It is concerning for many in the community to think of a poison being applied to land via an aerial drop, and how that is controlled. They feel that an increased amount of 1080 used results in an increase in the land area and water 'poisoned' with 1080. When such land and water poisoning increases, the potential for safety-related accidents also increases, including human operational safety accidents and secondary poisoning of animals like dogs and deer. Any safety incidents surrounding 1080 amplifies media attention. An increase in media coverage of safety accidents increases the level of stakeholder conflict, which can in turn encourage the government to intervene and reduce 1080 use. This loop is the third negative or balancing loop in this system named 'safety loop'.

The three balancing loops relating to deer hunters, decision-making process and safety highlight the opposite side of the coin in case of the 1080 project. Structurally, these three loops are responsible for the increasing levels of stakeholder conflict in this R&D project. The current process of research, as explained in the research loop is also unable to arrest the rising levels of this conflict because an authentic alternative to 1080 has not yet been found.

Thus, the BOT graph in Figure 1 can be explained using the eight feedback loops in the causal loop model. In other words, the interactions of these loops explain the complex problem situation presented in the BOT graph. In summary, the group model-building exercise enabled the different stakeholders within the controversial 1080 R&D project to come together and develop a shared mental model of the project, in the form of a causal loop model.

6. Conclusions

Managing R&D projects involves managing multiple stakeholders with conflicting stakes (Elias et al., 2002). This article presents an application of systems thinking methodology in analysing such stakes, so as to arrive at a shared mental model of these conflicting stakeholders. The application of this methodology is illustrated using a New Zealand case of 1080 chemical use for pest management. The aim of this paper is not to decide whether New Zealand should or should not use 1080, but to apply a methodological framework to identify strategies to minimise the level conflict between the stakeholders.

In this respect, after the group model-building sessions, some of the stakeholders involved in this study discussed implications arising from this model and were able to generate several structural initiatives to change the structure of the system. The first strategic initiative related to increasing research funding (R5) to find a suitable alternative for 1080. If 1080 is replaced by a suitable alternative, which is able to retain the positive benefits of high bird populations, high native species numbers and high Tb-free herds through reduced possum/pest numbers, then the conflict between stakeholders over safety and deer-hunting sites could be reduced. A suitable alternative to 1080 could result in deer-hunting sites not to be affected and in land free of 'poisoning'. But as of now, there is no suitable alternative, and the conflict between stakeholders continues. There is an opportunity to minimise this stakeholder conflict by increasing the research funding and enabling a wide range of alternatives to be tested and peer reviewed. Unfortunately, at this time, the level of research funding has decreased (PCE, 2011).

The second strategic initiative is related to improving the decision-making processes (B2) that are currently employed in this R&D project. The stakeholders felt that how the management engages stakeholders could be improved. There is potential to introduce efficient processes that are more appropriate to deal with the stakeholders involved. Such efficient stakeholder consultation processes could in turn improve the transactional-level effectiveness of stakeholder management in this R&D project. The stakeholders felt that if their concerns were addressed through efficient processes and effective transactions, the level of conflict would be reduced.

To summarise, the R&D management literature has acknowledged that some R&D projects can become controversial because of conflicting interests and perspectives among different stakeholders (e.g. Hall and Martin, 2005; Davenport and Leitch, 2012). However, methodological applications to deal with such conflicts are limited in this literature. This article tries to address this gap by proposing and illustrating a methodological approach, based on systems thinking, for analysing such conflicts holistically. To a practitioner in this field, it offers a participative process that can be used to reveal the mental models of multiple stakeholders involved in an R&D project. Finally, this study could encourage further empirical research, which will help build theory in understanding the complexities involved in managing controversial R&D projects.

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