Getting to Implementation: Towards a System Dynamics Change Management Framework

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The literature tends to suggest that system dynamics has long suffered a low rate of implementation of recommendations. This paper explores two different (but closely related) modelling exercises within one large Australian organisation which were initiated by the same executive. Although the problems being investigated essentially concerned the same area within the organisation, one recommendation was acted upon whilst it was still in a draft form and the model in an early phase of validation. The second modelling exercise was eventually abandoned, after considerably more work than the first, due to increasing resistance to what was perceived as the likely recommendations.

The two modelling exercises are retrospectively reviewed in an attempt to elicit characteristics that impacted on acceptance or rejection of recommendations. Consistent with previous research, the composition of the modelling teams (although identical in both cases) was undoubtedly a factor. However, other issues were also important, including: perceptions of the nature of the problems; the match between recommendations and both organisation culture and the (deep structure) power source distribution; the organisation span impacted by the recommendations; and, perhaps most significantly (in this instance at least), the extent of change required to implement recommendations. We believe that our findings have substantial external validity and argue that system dynamics practitioners and researchers should adopt a much more holistic view and endeavour to take advantage of the substantial body of change management research undertaken outside our own narrow discipline.

Introduction

The work described in this paper is part of a three year collaborative research project jointly funded by the Australian government and a large Australian high technology company, Gigante (a pseudonym), which is operating in the telecommunications industry.

Gigante has adopted a product differentiation strategy (Porter 1985) in the past few years as a response to increased competition. This strategy has meant that its product mix is rapidly changing, making it difficult for systems and customer services representatives (CSR's) to keep pace. Each time a new product is introduced, or a minor change made to an existing product, a new product code to identify the product is generated. There are currently in excess of 40,000 product codes.

Gigante also has separate, and incompatible, systems for service provisioning and customer billing with a number of front ends used at the user interface. Often, different products require slightly different procedures to enter data into the

provisioning system. Each of these variations is documented and CSR's are expected to know how to enter orders for each product type into the provisioning system. Incorrect entry of the product code into the provisioning system results in service records, generated as customers use a service, dropping to an "error bucket". CSR's must correct the initial product code entry before service records in the error bucket can be re-introduced to the billing system and the customer billed for the service. Gigante has a policy that excludes charging for services provided more than 12 months earlier. As a result of this policy, and the difficulties encountered in correcting errors, many service records are deleted from the error bucket before errors are corrected. This results in loss of revenue to Gigante, estimated to be in the order of AUD$80,000 per day in 1993 (Booz, Allen & Hamilton 1993).

The problem observed by Gigante is that a new service provisioning process maintains its integrity for about 3 months and then starts to deteriorate with ever more data entry errors being made. The objective of this research was to find out why and to recommend corrective action. The research was to be limited to processes within the CSC's as it was felt that it was in this area that most problems were occurring.

Background

The previous report of Booz Allen and Hamilton (1993) had indicated that the root cause of the unacceptable error rate occurring during data entry within the CSC's was lack of training. However, a training regime put in place as a result of this report did not affect the error rate in the long term and has since been abandoned. Training is now primarily on-the-job with a number of employees receiving additional training to become subject matter experts. The latter employees are co-located with other CSR's to assist them when needed.

Since the earlier report, Gigante has undergone a number of re-organisations and, like many other businesses, has downsized to reduce costs, and reduced the number of levels of management. This has left little opportunity for advancement for CSR's who are among the most poorly paid employees of Gigante. In spite of this, the turnover rate of staff has actually dropped from the 200% reported earlier (Booz, Allen & Hamilton 1993). This is most likely due to: the less favourable economic conditions which are makes finding other employment problematic; a staff freeze which has been in force for some time and prevents staff transferring to other sections within Gigante; and the introduction of personnel policies that make it more attractive to employees to remain for a given period before leaving. However, discussions with CSR's indicated that morale and motivation is low and that staff are very dissatisfied with the situation.

The above indicates that the situation being investigated fell into the category of a problem defined by Vennix (1996) as "messy". These problems are characterised by complexity, uncertainty, interrelated sub-problems, recursive dependencies and multiple interpretations of the problem's essence (Vennix 1992, McGrath et al. forthcoming). Because of this it was decided to develop a system dynamics model using a group modelling approach. Three people from the university were involved, one of whom had extensive knowledge of Gigante, together with another three people from Gigante. The latter were all from the same section and included the executive

who had originally requested the investigation. Access to other members of Gigante was available if required, and additional people from Gigante were involved in the development of the various sections of the model.

During early modelling sessions the causal loop diagram at Figure 1 showing the provisioning process within a CSC was developed (Campbell 1998).

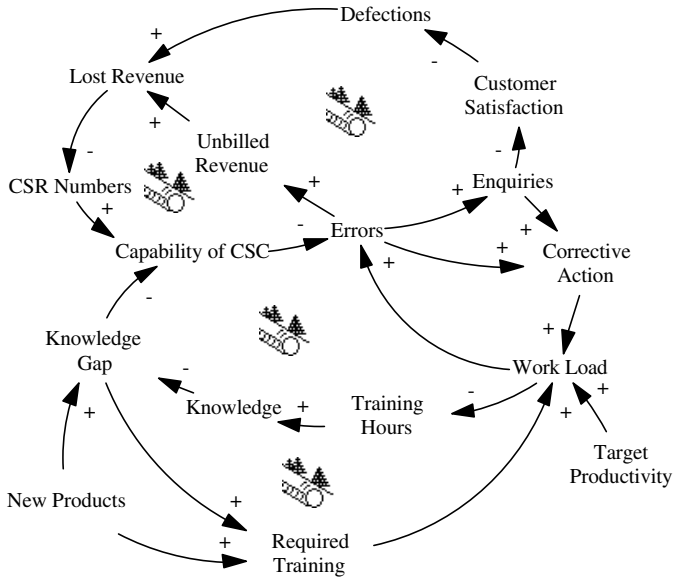

Figure 1. A high level causal loop diagram showing factors affecting the provisioning system within a customer service centre within Gigante.

The causal loop diagram (CLD) at Fig. 1 indicates the complexity of inter-related variables within a CSC affecting the provisioning process.

Once the CLD had been accepted by all persons involved in the modelling process a quantitative SD model was commenced. As will be explained, this was not completed, but sufficient work was completed to show why the training program instigated at Gigante had not been successful. The high rate of staff turnover, combined with an inability to replace staff rapidly, meant that Gigante was continually training new staff. In effect, as soon as staff were trained, they were walking out of the CSC doors. The findings were similar to those reported by Senge (1992) when he was discussing the problems of Hanover Insurance.

A concurrent SD model also explained, in part, the observation that the provisioning process for a new product maintained its integrity for a number of months then slowly deteriorated. The model indicated that the elapsed time between product introductions was critical, as was the availability of sufficient numbers of trained staff. Gigante is walking a tightrope in both areas.

A Related Problem

Part way through the above modelling exercise our client at Gigante presented us with a related problem. There was sufficient overlap with the main thrust of the research to allow much of the existing modelling of the system to be utilised. Most of Gigante's information services are provided via electronic voice and other telecommunications facilities. The organisation's policy (for a certain class of product) had been to not charge for connection times less than 6 seconds. Gigante's accounting department had analysed this product and found that many calls lasted between 2 and 5 seconds. A proposal made by a marketing manager was that Gigante start billing for these calls. It appeared, on the surface, that income could be greatly increased with little cost to Gigante (McGrath et al. forthcoming).

However, our client, who had been given a copy of the proposal for comment, was concerned that the proposal could increase billing enquiries and so increase the workload of CSR's. This could then have an impact on the existing provisioning processes as the same CSR's were responsible for both billing enquiries and provisioning. This became known colloquially as the "Six Second Problem".

Outcomes

Considerable effort was spent over some months developing an SD quantitative model of the provisioning system and in model validation (Barlas 1996; Forrester 1961; Forrester & Senge 1980). This reached a point where, although the model was not complete nor completely validated, the modelling team was comfortable with the behaviour of the model. Simulation of the model indicated that Gigante should address some of its personnel policies as well as re-thinking its strategy of rapid product introduction. It became obvious over time, however, that our client was reluctant to compose a formal report and present it to management. Consequently, no decision was ever taken regarding the provisioning system problems.

In contrast, the model of the Six Second Problem was constructed in a matter of days and made some gross assumptions of suspect validity. For example, due to lack of any other data that could be collected within the time given to comment on the proposal, it was assumed that the only additional cost was that of having to employ more people to handle the additional billing enquiries. Sensitivity analysis was used to model various assumptions on the number of additional enquiries that could have been expected. This was done as the true effect was not known. The model structure was never validated. However, the model indicated that although billing for the additional few seconds could increase income and profits in the short term, a longer term effect was an overall loss of profits due to the increase in billing enquiries. This could have been up to USD$18 million over a 12 month period. The model did not take into account the effect of these additional enquiries on the provisioning system.

Due to the time constraints placed on the Six Second Problem, a very early draft report that included model output, as well as numerous spelling and grammatical errors, was given to our client. This was presented to the marketing manager, who had

the final decision, without our knowledge. A decision was made immediately not to proceed with the proposal.

Evaluation

These two modelling exercises were conducted by the same modelling team, were carried out within the same functional area of Gigante, and were championed by the same executive within Gigante. They had entirely different outcomes. It is therefore useful to evaluate the two problems to identify differences. This is particularly relevant considering the poor implementation rate of SD modelling exercises that has been a concern of SD practitioners and reported by other writers (Forrester 1994). For SD to be effective in the next millennium we must understand what is affecting the implementation of recommendations and address that problem.

The two modelling exercises previously described (The CSC Problem, and the Six Second Problem) are compared in Table 1, below.

The CSC Problem	The Six Second Problem
Decision could have impacted a number of functional areas.	Decision did not impact other functional areas
Many decision makers as a result of number of functional areas involved	A single decision maker
High risk to decision makers, as recommendation was contrary to long held managerial beliefs and policies	Little risk to decision maker
Problem was conceptually difficult	Problem was conceptually simple
Champion did not have credence with the decision makers	Champion had credence with the decision maker
Champion did not have strong vested interest in the decision. In fact, the champion would have been at risk presenting the recommendations	Champion had strong vested interest in the decision. If the proposal had gone ahead it would have resulted in a large increase in the champion's workload and that of his staff
A decision would have been to create change within a number of functional areas within Gigante	The decision did not create any change within Gigante
Decision would have been expensive to implement, although saving money in the long term.	Decision did not cost anything

Table 1. A comparison of the attributes of the two problems modelled at Gigante.

The SD literature is replete with exhortations to include soft social factors into our models (see, for example, Forrester 1961). However, as practitioners we seem unable to consider these factors in our own work, as distinct from our models. Table 1 would indicate that the majority of differences in attributes between the two problems are primarily social in origin. They deal with risk to both decision makers and to those affected by any change which may occur due to the implementation of the recommendations. It would appear that to improve our implementation rate we must learn to manage change and risk. Although both of these subjects have attracted considerable research in other areas, there appears to be little in the SD literature. One of the most critical activities in any change management initiative is dealing with politically-motivated resistance (Pfeffer 1981 and 1992). We now address this issue in more detail.

Change, Resistance, Power and Politics

Perhaps we could do a lot worse than revisit Machiavelli's highly-perceptive insight (Machiavelli 1993):

> *There is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institution and merely lukewarm defenders in those who would gain by the new one.*

Machiavelli's observations are as pertinent today as when they were first penned in 1513. Machiavelli's name is, of course, synonymous with power and politics. New systems must not only satisfy economic and technical criteria for success but be politically feasible as well. Much political activity is concerned with the development and protection of power and new systems change existing sources of power (Markus 1983; Markus and Bjorn-Andersen 1987; Pfeffer 1981 and 1992). In essence, new systems change the organisation. Changing responsibilities, or more pejoratively, changing power and influence, is the hard core of an activity with strong political overtones.

We believe that to successfully implement any new system, a thorough analysis is needed of where power lies in the organisation and what effect the new systems environment will have on redistributing that power. If this is done, those who will gain and lose power can be identified so that support and resistance based on political considerations alone can be anticipated. Except in the most liberal, fraternal and egalitarian organisation, resistance must be expected because some who need power will lose power. As change agents, SD practitioners should consider the results of power source redistribution analysis when challenged by adverse technical or economic argument. Such resistance may really derive from a threat to a power base. Power source redistribution analysis is also essential for organisation restructuring which often accompanies SD activity.

The aim of power source analysis is to systematically identify change to existing power in the organisation caused by new systems. By this process, potential sources of resistance can be recognised early. Depending on the culture of the organisation the

consequences can then be openly dealt with rather than becoming obscured in the mire of organisational politics.

As exhaustive analysis using manual means is very expensive, a systematic focused analysis method supported by an automated tool is more desirable. For corporate SD-based planning exercises, this means developing a model of the implementation domain and automating this as an advisory expert system. In an earlier paper (McGrath, Dampney and More 1995), a power source distribution model "MP/L1" (Model of Power in First-Order Logic) was presented. MP/L1 describes power sources, their distribution and their relationships with organisation parties and processes. Given details on policy implementation activities, MP/L1 can then be employed to predict likely areas of resistance resulting from changes to responsibilities, changes to authorities and challenges to well-established beliefs, values and organisational rules. Automated as an advisory expert system, MP/L1 has been used successfully, in the field, to assist an information systems planning team to implement their strategy.

Political influence on systems activities may appear as discordant to some IS managers as political influence on the application of economics was to traditionalists when political economy was first argued in the early 1970s (Galbraith 1972). Bowman and Asch (1987), however, have argued that no clear distinction should be made between rational and irrational strategic planning decisions. Decisions should be assessed only as more rational or less rational. Moreover, the degree of uncertainty is a major determinant of decision rationality and uncertainty leads to political activity (Pfeffer 1981). Decision making in SD work is made uncertain by the flimsy scientific base on which the immature discipline rests. Power and politics is therefore inevitable in SD work. MP/L1 is a strategic management tool that helps manage the total SD process by recognising likely resistance to change caused by threats to power sources.

Conclusion

The foregoing presented our experiences with two SD modelling exercises that involved the same people, but which had very different results. This presented a situation that was ideal for a comparative evaluation. The evaluation indicated that risk, change management and power politics may have a substantial influence on the implementation rate of SD modelling recommendations. The remainder of the paper introduced the concept of change management and power politics, as well as briefly describing an automated tool which has been used successfully in the past to identify resistance to change. However, at this stage we have not specifically incorporated change management practices within an SD modelling exercise even though this seems inevitable if we wish to improve our SD implementation rates.

Research is required to establish the effectiveness, or otherwise, of incorporating power political models, and change management practices, within an SD modelling exercise. SD is used in numerous ways. It may be used by an employee investigating a problem within his own organisation. It is also used by consultants who have no other dealings with their clients. However, it is felt that even in the latter situation inclusion of power political models and change management practices is still feasible.

At the very least, consultants should be making their clients aware of the effect of these issues on any recommendations that may be made.

Ideally, identification of resistance to change, and recommendations on likely courses of action, should be an integral part of the SD modelling exercise. If SD is to flourish in the next millennium we must address its historically poor implementation rate. This paper has suggested a way to improve this.

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