

A Framework for Analyzing Change Management in Geomatics Development Projects

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SUMMARY

Geomatics development projects tend to be administered by individuals with a high level of training and experience in technical operations of geomatics but who, on the whole, seldom have tertiary qualifications in management, leadership, and particularly in organizational change. This paper develops a conceptual framework relating to the management of effective change in geomatics development projects. Such a framework should increase the effectiveness and sustainability of project-led change by analyzing the driving forces in an environment of pervasive and complex social, political and institutional transformation, such as is found in South Africa.

Change in such situations tends to be largely reactive and driven by societal, political, technological and legislative imperatives. The eight-stage model of Kotter (1996) is confirmed as a suitable model for addressing change. Further, this model is adapted for the South African context, drawing in particular from the experiences of Dolny (2001) in the Land Bank, and observation of the transformation of the fiscal cadastre through a case study of the City of Cape Town's General Valuation Project 2000 (GV2000).

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1. INTRODUCTION

Geomatics practitioners are often tasked with managing a change process without having the necessary background in management, leadership, and particularly in organizational change and the complex challenges that this involves. Consequently, there may be time and budget overruns, failure to achieve the original objectives, dissatisfied employees and customers and so forth. Geomatics managers will often view management of change from a project perspective i.e. having initial, transitory and closure stages, defined budgets and timeframes, measurable interim goals etc. The danger of this approach is that transformation processes seldom fit simple, linear, closed system models which ignore the cyclic and complex nature of change. In addition, the effectiveness of transformation is often measured by assessing performance in relation to the achievement of goals stated *a priori*. Because the objectives themselves are likely to change, this is not necessarily the most appropriate method of assessment in complex and dynamic environments, such as those commonly found in geomatics development projects, particularly in the context of the developing world.

This paper explores current theory on change management and proposes a multifaceted conceptual framework for managing change in such projects. In general, development addresses poverty, inequality, unemployment or any combination thereof (Seers: 1997). Poverty is usually addressed through the provision of land and housing, and geomatics projects tend to provide services which partially address these outcomes. In our case study of fiscal cadastral reform in Cape Town, poverty as well as inequality are addressed through reforming the system of property valuation and taxation.

The paper proceeds as follows. Firstly, we examine the dimensions of change and the structure of the forces that drive or impede change. This framework is informed by the literature and by the GV2000 case study, which deals with a case of fiscal cadastral reform within the broader context of complex change. We then present a framework for analyzing and managing change based on Kotter's (1996) eight-stage method as modified by Dolny (2001) for managing complex change under South African conditions. Finally, we examine the suitability of the conceptual framework for analysis of change management in geomatics development projects.

2. CHANGE MANAGEMENT DEFINED

Most change is complex and cyclic rather than simple and linear. It therefore does not yield easily to division into simple cause and effect scenarios and discrete elements or objects, nor into neat information-flow diagrams. Organizational change theory is useful in informing the management of the change process (OECD 1995). Change processes and structures are

analyzed, and the effectiveness of change is measured, in order to inform their management in the following aspects: the nature of the problem, the forces involved, the key stakeholders, the complexities of implementation, the problems that have occurred and the lessons learned. The overall objective is to provide feedback to inform, rather than to prescribe, further change management in a cyclic or feedback-loop process. While it is tempting and easy to move from the description of process, to the prescription of process, this must be avoided if one is to give true recognition to the complexity of the organization, and particularly to the complexity of the change problem.

2.1 Change, Transformation, or Change Control?

The terms change, transformation and change control are used often interchangeably but, for our purposes, we have assigned different meanings to them. Change is the difference in state as compared between two or more stages separated by some time period (Bridges 1991). In the case of the GV2000 Project, the tax base, prior to the implementation in mid 2002 of the new valuation roll, omitted many areas of the City due to apartheid practices, whereas now these areas are included. Thus the tax base has changed, as have a number of other related structures within the City. On the other hand, transformation, and thus managing transformation, concerns itself with the process of change and how that process is steered in order to arrive at the desired state at the end of the process. The phrase “change control” should not be used glibly when referring to the process of complex change as many aspects of the transformation process are not controllable, but can be managed with greater or lesser effect (Beckhard and Harris 1987).

2.2 Change and Complexity

Beckhard and Harris (1987) identify the following areas where change may occur in organizations:

- in the external/macro environment
- in organizational priorities
- in organizational structures
- in the way work is done
- in personnel policies
- in roles
- in organizational culture

Furthermore, complexity increases when a combination of different types of change occurs simultaneously.

In complex situations it is often difficult to keep the transformation process on course. The best one can often do in terms of managing complex change is to steer the process so as to maintain the course. However, with: (i) an awareness of the need for constant feedback and new input to the system; (ii) a recognition that the process is cyclic rather than linear; (iii) an understanding of the organizational system including its environment; (iv) knowledge of how

to optimize system performance; and, more importantly (v) a knowledge of the vision, or destination, change management can be continually adapted so that the goals are reached and the vision realized (Beckhard and Harris 1987).

3. FORCES DRIVING CHANGE

To propel change a motive force, or a combination of forces, is required, acting on a system to achieve the transformation from the current state to some desired future state. In some cases change is undertaken proactively in anticipation of future needs and, in other cases, it is undertaken reactively in order to address current needs. Fahey (1994) cites the conflict between these forces driving change as the essence of strategic management in a business setting. The set of choices emanating from this tension is, according to Fahey (1994), synonymous with strategy, with change being the central focus.

The conceptual framework developed here to categorize these forces is drawn from organizational change theory and from the case study of the GV 2000 Project. Fahey's (1994) framework is followed closely, except for the separation of the legal aspects which, in the context of the developing world, are in the authors' opinion, a more faithful reflection of reality when considered a separate entity. In addition, our conceptual framework is extended to analyze internal organizational driving forces for change. The conceptual framework provides the means to analyze change in a holistic approach, however, the analysis itself is not the subject of this paper, nor is a discussion of methodology, methods or techniques.

It has been observed that forces need to be internal as well as external to the organization or system in order to have sufficient impetus to drive effective change. Internal (endogenous) forces are identified as those occurring predominantly within the organization or system and, for the most part, controlled by elements within. External (exogenous) forces are those considered to be occurring outside of the organizational environment or system and outside the control thereof. These forces are seldom independent, not always clearly distinguishable as endogenous or exogenous, and may also not remain static. In fact, the presence of a particular force may often cause the addition of another force to the total e.g. a political force can lead to a legislative force for change. An analysis of the forces driving change is observed to lead a change management team to a deeper understanding of the context of change, alignment of goals with the driving forces, and management of these forces throughout the change process. The manner in which these forces interact is portrayed in Figure 1.

FORCES DRIVING SYSTEM CHANGE

EXTERNAL ORGANIZATIONAL/SYSTEM ENVIRONMENT

Social Forces: changes in service delivery demanded by client base

Political Forces: • change in political leadership/political climate may drive change
• retention of mandate by public organizations
• proactive or reactive change

Technological Forces: delivery format and speed may demand new solutions

Legislative Forces: • legislative changes may force change, but in non-linear processes
• change can also force legislative reform

Economic Forces: • goals of economic change can be drivers of change
e.g. poverty relief, creation of favorable business environments

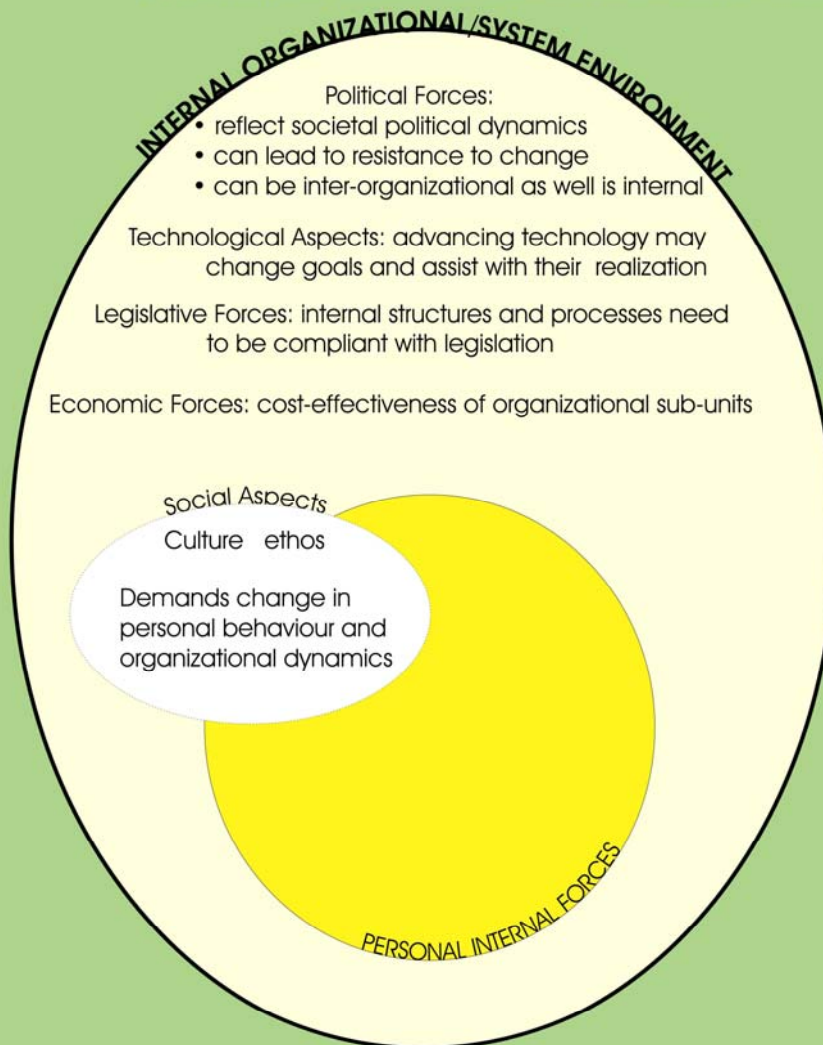


Figure 1: Forces Driving System Change

3.1 External Organization/System Environment:

3.1.1 Social Forces

The social milieu consists of demographics, lifestyle and social values (Fahey 1994). In development projects, a client subset of a society (often colloquially termed “the community”) will constitute a driving force in their expectation of service. The nature and level of service demanded and the technology required by the client society will vary depending on its needs, education, class, political activation and awareness, and knowledge. Societal driving forces will generally lag behind the forefront of technology and the required level of service delivery will be the norm expected by the client society.

3.1.2 Political Forces

Fahey (1994) identifies the political milieu as the formal institutions of government (the executive branch, legislatures, judiciary, and the regulatory agencies), as well as the informal institutions of the media and local community arenas. The framework presented here considers the legislature as a separate aspect in the categorization of driving forces.

A change in political leadership or political climate at national, regional or local levels may initialize change in organisations (particularly public administration organizations). In the case of public organizations change is necessary in order for them to retain their mandate and to respond to new policies and goals. In private organizations political forces of change may cause reactive or proactive action i.e. change effected voluntarily in response to a changing political climate, or as required by legislation (e.g. affirmative action in South Africa).

It may well be the case that substantial political reform in society requires reform at both group and individual levels, such as in reform of a capitalist economy, reform and acceptance of democratic institutions etc. If such a comprehensive reform is required, it is often necessary to reform the culture - not only of the organization, but also of the groups, and the individuals (represented as the yolk in Figure 1) within an organization. Effective transformation in this environment is difficult to achieve, to measure, and to maintain (Dolny 2001).

3.1.3 Technological Forces

Technological aspects may drive change due to the requirements of end-users and clients of the product of the organization e.g. digital access to data, integration and data sharing, internet access. The speed of delivery required by consumers may demand a partly technological solution.

3.1.4 Legislative Forces

Legislative reform has profound effects and can often drive change; however, it has a long innovation cycle and is predicated on change in advance of enabling legislation. In this case,

the converse order is observed and change may precede and lead legislative reform. Change processes in such environments are at far greater risk of failure: the process of enacting legislation is a democratic and political one and is, by its nature, unpredictable. If one considers the change process to be cyclic rather than linear, one can view change in the operational environment as a key input to change in the legislative framework.

3.1.4 Economic Forces

Fahey (1994) identifies the economic aspects as patterns and levels of industrial and agricultural outputs, productivity, consumption, income, and savings. Economic aspects relating to a client society in geomatics development projects may well be significant forces driving change. An example is the provision of housing and land for the poor, in which the driving force for change in settlement patterns, housing, and land tenure options can be poverty and/or its reduction.

3.2 Internal Organization/System Environment

3.2.1 Social Forces

Social forces will generally overlap with the underlying principles that affect employees such as: gender equity, empowerment, affirmative action, etc. They will generally relate to the cultural aspects of interaction between individuals within the organization, but may also demand changes in the structure of the organization in order to meet societal needs e.g. changes in human resource management procedures, remuneration and benefits.

3.2.2 Political Forces

Internal political factors generally reflect the external political climate of the day, but may potentially comprise resistance to it. In other words the internal political sentiment may not be in line with the external political demands of society. This causes resistance to change and can cause conflict to develop if not dealt with sensitively.

In the case of geomatics development projects in which many organizational entities are collaborating to effect change, political differences between these organizations can impose considerable influence on the change process and, thus, need to be taken into account from project inception.

3.2.3 Technological Forces

Advancing technology may offer opportunities for an organization to more efficiently realize its goals and thus become a catalyst for change. Technological advances may make possible the expansion of goals, which requires change in strategy and policy.

3.2.4 Legislative Forces

The need for the internal structures and processes of an organization to comply with current legislation may be a driving force for organizational change. Individual areas impacted may include human resource management, affirmative action and equity, health and safety, etc., with pervasive changes requiring more comprehensive approaches and resources.

3.2.5 Economic Forces

Internal economic aspects can be significant drivers for change, particularly in the business environment in which the entire operation (possibly as well as sub-sections) need to be profitable. This can also be indirectly measured through, say, the cost of employment of a section against its deliverables.

This framework for categorization of the forces driving change in a system has been tested against data derived thus far from the case study of Cape Town's GV 2000 Project. Apart from the economic forces which were initially excluded, particular forces have been identified in that case study and it has proven a useful framework for analysis (Whittal and Barry 2004). The economic aspects of the framework have been tested and found essential for inclusion. The driving force of national policies in favour of the poor was very important in the political motivation for the change process of the GV 2000 Project. These found expression in the argument towards a system of progressive taxation (in which the poor pay proportionately less) and away from the initial state of a regressive taxation system (in which the rich are favoured).

4. PRINCIPLES UNDERLYING TRANSFORMATION

In many organizations there is a general ethos underpinning transformation (the process of change). This can be seen as the "bottom line" or set of (often unstated) rules by which the transformation game must be played. These principles are more often explicitly stated in public organizations than in private organizations. In the former, the communication of the rules of the game with the electoral base is critical, and must be considered in all decision making processes. Sometimes these principles are legislated.

Principles underlying change will normally consist of certain moral codes, some of which may be included in the overall mission statement of the organization, in the goals of the transition, and may even find expression in the vision statement. Examples of such principles include: fairness and justice, transparency, equity, capacity building, consultation, and sustainable transformation. Identification, review and communication of these principles are important parts of understanding and managing the transformation process.

5. RESISTANCE TO CHANGE

Resistance to change takes on two main forms Kotter (1996):

- *Systemic resistance: cognitive* in nature and due to a lack of knowledge, information, or skills. It can be addressed through communication and information.
- *Behavioural resistance: emotional* in nature and derives from reactions, perceptions, and assumptions. It can be dealt with through the natural, individual and group processes to address prejudice, assumptions, perceptions, and conclusion formulation. Beckhard and Harris (1987) recommend creating neutral ground in which attitudes are not challenged. Dolny (2001) found it was necessary and very beneficial to bring in personal counselors to assist individuals in managing the changes in their behaviour and the stress associated with organizational transformation.

Both systemic and behavioural change may be required not only at the individual level, but also at the group or section and corporate levels (Dolny 2001). The need for consolidating change (see Section 0) is very important if transformation is to be sustainable; otherwise there is likely to be reversion back to old and life-entrenched patterns, norms, values and behaviour (Dolny 2001).

6. LEADERSHIP AND CHANGE MANAGEMENT

Good leadership (as well as good management) is identified by Kotter (1996) as a key ingredient in the change management process. The notion of leadership compared to management is often unclear:

“Management is a set of processes that can keep a complicated system of people and technology running smoothly” Kotter (1996). Management involves: budgeting, organizing, staffing, controlling, and problem solving; in other words, head thinking. Management produces predictability and order and concentrates on short-term successes.

“Leadership is a set of processes that creates organizations in the first place or adapts them to significantly changing circumstances” Kotter (1996). Leadership involves defining the future vision of the organization, aligning people with that vision, and motivating and inspiring people to make the necessary changes to attain the vision; this involves heart thinking. Leadership produces change and has a longer term to success.

In the conceptual framework for analysis of change, the identification and use of the managerial and leadership structure occurs in the formulation of the guiding coalition (see section 0).

7. CREATING CHANGE USING KOTTER’S EIGHT-STAGE PROCESS

Kotter (1996) identifies eight stages in the process of creating major change. The first four stages involve creating the climate in which change can take place; stages five to seven involve the introduction of new practices into the organization; and stage eight involves

changing the organizational culture. Much of the following section is summarized from Kotter (1996) whose methods were also used by the change management consultants for the Land Bank transformation process and endorsed by Dolny (2001) in her narrative text. This theory has been augmented by the authors in the light of their experiences.

The eight stages of Kotter (1996) should not be interpreted as restricting the process of change to a linear model, although Kotter (1996) and Dolny (2001) both identify the importance of initially tackling the issues identified in the eight stages in a linear process. In the first pass, it is unlikely, and undesirable, for each stage to be completed before the next is begun. Some of the “stages” subsist throughout the entire change process and others have a much shorter duration. The change process therefore cannot be described as purely linear. On the other hand, it is also not easily described as cyclic, as a cyclic process would retain the order and inclusivity of the first pass. Some stages may never be repeated, and the repeating of certain stages may not occur in the original order. An easily visualized and graphically represented model is difficult to come by. Probably the most effective representation would be a purely cyclic initial pass through the change management process of Kotter (1996), followed by various feedback loops, at different times, to different stages, as required by the individual circumstances.

7.1 Establishing a Sense of Urgency - Stage 1

A sense of urgency is crucial in the initial stages of the process. It must primarily overcome any sense of complacency within the organization, even if this entails creating a crisis (Kotter 1986). Beckhard and Harris (1987) suggest a diagnosis of the current state of the organization at the initial stage of embarking on a change process. This may be necessary in terms of identifying what requires change and what is currently functioning in line with the vision. In terms of Kotter’s (1996) process, definition the vision is not attempted at this initial stage. Beckhard and Harris (1987) also identified that the analysis should treat the organization as a system and so as to identify any “domino effect”.

7.2 Creating the Guiding Coalition - Stage 2

A core group with enough power to lead the change through the transition state is required to drive the process (Kotter 1996). The team should consist of individuals with positions of power, especially those who possess the power block the process if not included at an early stage. These individuals need to have the required expertise and should be credible so that decisions are respected. Thus, leadership and management skills are imperative individual competencies, as well as the establishment of trust, a common objective, and an overall team mentality.

7.3 Developing a Vision and a Strategy - Stage 3

A vision needs to be created in order to direct the course of change. In conjunction with the vision should be a strategy designed to achieve the vision. An effective vision should be imaginable, desirable, feasible, focused, flexible and communicable (Kotter 1996). An

effectively communicated vision diverts concentration on the problems to enthusiasm and optimism for the future (Beckhard and Harris 1987). In the development of the strategy, Dolny (2001) emphasizes the need to identify change priorities and to set timeframes by which various changes should occur, and required feedback be delivered, which may result in changing the targets.

Kotter (1996) does not mention the correct stage for the transformation budget to be proposed and approved, but this would most likely fall under the development of the transformation strategy. The process of obtaining budget approval would require adequate motivation, which is included in the next section on communicating the vision.

7.4 Communicating the Vision - Stage 4

The new vision and strategies for implementation of the change process need to be continually communicated using all practical means. In addition, it is necessary for the guiding coalition to lead by example and to model the behaviour expected of the employees (Kotter 1996). Vertical (between different levels of the organization e.g. production/operational groups and management) and horizontal (across divisions) dimensions of communication need to be considered internally within the organization or system.

Communication beyond the determined boundaries of the system (i.e. outside the organization) is essential if external individuals or groups (e.g. politicians, public representatives and shareholders) have a controlling influence over the change process. A large-scale communication strategy may be critical to the effectiveness of the change process for public concerns – i.e., where political backing is needed (Dolny 2001) – as well as for projects involving many and diverse constituencies, and particularly for those characterized by open and/or soft systems. Communication needs may require varied media exposure e.g. the press, radio, flyers, and billboards. The communication strategy may also require the communication of the urgent need for enabling legislation. This was the case both in the Land Bank transformation (Dolny 2001) and in our observation of the GV2000 Project which informs this research.

7.5 Empowering Broad-based Action - Stage 5

Knowledge of the desired changed state is not sufficient to cause change. It is necessary to bridge the “knowing-doing gap” (Pfeffer and Sutton 1999) through “doing”. The subject of stage 5 is how to create an environment in which the actions required for change can take place. Kotter (1996) lists the critical empowering actions which need to be taken to allow change to occur. Obstacles need to be removed by communicating the vision to employees, training to change behaviour, social skills and attitudes, training or removing troublesome supervisors to prevent the change being blocked and to act to hasten speedy inception of the legislation required to effect change. Systems and structures may also need to be changed so that they are in accord with the vision, and may include human resources systems such as: recruitment, performance appraisal, compensation, promotions, and succession planning.

Kotter (1996) emphasizes that risk taking and non-traditional ideas, activities, and actions should be encouraged.

Beckhard and Harris (1987) discuss the necessity for measuring commitment and managing the level of commitment by individuals and groups in the organization. Three kinds of commitment are identified: “let it happen, help it happen, and make it happen”. Intervention strategies used to overcome resistance are: problem finding, education, resistance management, role modeling, and changing reward systems. Collaboration can also be forced, although this is not recommended unless other methods fail. Forced collaboration can include rewriting job-descriptions, management decisions, or “independent expert” decisions directing compliance with the change process.

7.6 Generating Short-Term Wins - Stage 6

It has been recognized that positive feedback in the early stages of the project is critical to success and plays an important part in sustaining the vision. Such feedback is most often accomplished through the achievement of interim targets and is referred to as a “short-term win”. These need to be generated, planned and managed – the outcome is critical and cannot therefore be left to chance. Visible recognition and reward will provide encouragement when short-term goals are reached. In addition, short-term wins often encourage reflection on the vision and strategies, and may also help to bring resistors on board. Key characteristics of the short-term win are that they are visible, unambiguous and genuine achievements which are clearly related to the overall change effort (Kotter 1996). The “mid-point scenario” of Beckhard and Harris (1987) would have the effect of conveying an interim “win” situation to all involved in the change process. They state that it should be detailed and behaviourally oriented (relating to the senses), as well as “realistic and attainable”.

7.7 Consolidating Gains and Producing more Change - Stage 7

Short-term wins imbue the change process with credibility and robustness, which promote confidence for further change. Systems, structures, and policies may be further adapted to be in line with the vision. Hiring, promoting and developing people who can implement the changed vision may be undertaken; new projects, themes, and change agents serve to renew energy in the process (Kotter 1996).

7.8 Anchoring new approaches in the culture - Stage 8

Maintaining the results of change in organizational, group and individual culture is difficult. Consolidating change is important, as specific attention needs to be given to this often-ignored aspect of change management. Connections between new behaviours and organizational success need to be clearly articulated. If the change hinges on a particular leader or coalition, it may easily revert back to what it was if the organizational culture remains unchanged. Developing the means to ensure leadership development and succession is thus important. Change in organizational culture normally starts at the beginning of the process of change, but is only realized at the end (Kotter 1996).

8. ADDITIONAL CHANGE MANAGEMENT ISSUES

Dolny (2001), although a strong supporter of Kotter's (1996) eight-stage process, added four additional issues from her experience of the South African Land Bank transformation process. These are summarized below and augmented by personal experience in South Africa. These issues cannot be seen as part of the staged process of change put forward by Kotter, as they are overriding issues that are not addressed in any particular order in the process. Most of them are particularly relevant to current change management processes in South Africa, and all need to be identified and managed for effective transformation.

8.1 Politics - Issue 1

8.1.1 Organizational Politics

Organizational politics refers to the sum of informal processes of gaining power other than by luck or merit (Du Brin 1997). A specific case of organizational politics occurs due to the inherent interests and demands that exist in an organization. Competition for resources will lead to political maneuvering. Another factor influencing organizational politics is the structure of the organization and the limited power available to managers and subordinates. Team structures (power sharing) lead to less focused power centers and greater competition for the power that remains. Personalized power needs more easily trigger the use of political behaviour than socialized power needs. Machiavellianism is the tendency to manipulate others for personal gain (Du Brin 1997) and is expressed in the manipulation of organizational politics to serve one's own ends. Political tactics can be ethical, but are often not so. Ethical internal organizational politics exist in any large organization, and can be used to the advantage of the organization in meeting its goals. It should go without saying that they can therefore also be used ethically as an instrument in effecting transformation.

8.1.2 Extra-organizational politics and public relations

Developing and nurturing power contacts was a powerful political tool which Dolny (2001) recognized as one she omitted to use in the Land Bank transformation. This tool involves cultivating relationships and fostering co-operation with persons in power, and maneuvering oneself into positions where this is likely to occur "naturally". In the case of the GV2000 Project, the changes in local political leadership during the course of the project were managed effectively through realignment of goals and communication (Whittal and Barry 2004).

8.2 Engage Your Adversaries - Issue 2

In her organizational change, Dolny (2001) specifically cites her lack of continuous engagement in dialogue with those with whom her relationship appeared (or was rumoured) to be souring. This continuous engagement in dialogue would have served to minimize differences and polarization, possibly even leading to the finding of some common ground. In

the case of the GV 2000 Project, the main adversary was the Rates Action Group (RAG), a ratepayer representative group. Most engagement between the City and the RAG occurred in the forum of court proceedings, at great cost to both parties (Whittal and Barry 2004).

8.3 Legalwise - Issue 3

Knowledge of the relevant statutes relating to the organization, its environment, and specifically change, needs to be a priority. The transformation of the Land Bank suffered through an insufficient understanding of the interrelationship between legislation and the process of change. This includes knowledge of labour law, trade union agreements, etc. Dolny (2001) reflects that the acquisition of this knowledge at Stage 1 of Kotter's (1996) process would have saved a lot of surprises down the line. She stressed the importance of a good legal adviser (which also would have led to financial savings). This issue is equally apparent in the case study of the GV2000 Project in which the legality of the transformation process was disputed in the courts (Whittal and Barry 2004).

8.4 Managing Racism And Issues Relating To Race And Gender - Issue 4:

Dolny (2001) identified issues relating to race and gender as critical to the successful transformation of her organization, the Land Bank in South Africa. These issues took on the form of cases of actual racism, alleged or perceived racism, attitudes of job entitlement held by individuals from previously marginalized races regardless of comparative ability, reverse racism (individuals from former privileged racial groups and/or of male gender are less favoured in employment decisions), affirmative action in order to redress racial and gender imbalances, and patriarchy favouring the male population over the female population for positions of authority and power, as well as differentiating the salary and perks received by staff on the basis of gender.

These elements add richness to the conceptual model of change, particularly in the context of South African national transformation to a non-racial society.

9. CONCLUSION

In conclusion, change in geomatics development projects is likely to be more sustainable over the long term if the process is construed systematically, as in the foregoing scheme. A theoretical framework is developed in order to facilitate analysis of change management for geomatics projects in the developing context. This framework incorporates a number of facets of change management with a view to promoting a holistic approach to analysis. Change management has been explored in terms of the context of complexity, resistance to change, and principles underlying transformation. The forces driving change are categorized as endogenous and exogenous to the organization or system. Further categorization of these forces into social, political, technological, legislative, and economic dimensions has been undertaken using a framework modified from Fahey (1994). The eight stage change management process of Kotter (1996) has been summarized and contextualized for use in geomatics development projects. The experiences of Dolny (2001) as well as observations of the GV 2000 Project have added valuable insight into the suitability of this framework for

analysis of change management for multifaceted and complex transformation processes, such as are found in geomatics development projects.

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