

# Chapter 1. Networks for manage change in international commercial organisations

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## Introduction

Competitive advantage and long-term survival requires commercial organisations to manage major change successfully. During periods of rapid global change, there is great potential in the use of networks to actively exploit as well as simply respond to major changes.

This chapter uses case studies from the commercial world to examine four questions:

1. For commercial organisations what defines major change or an extreme event?
2. Is it appropriate for management to rely on traditional mechanistic organisational controls and hierarchy during major change?
3. Are networks a practical concept for understanding managing change in the business world?
4. Can leadership use networks to deliver successful organisational responses to major change?

The chapter will demonstrate the insight provided by networks when studying major change. Furthermore the potential of networks is illustrated as a practical concept to help management identify options that will deliver rapid and sustainable change in traditional organisations

## Major change and extreme events

Much of organisational theory focuses on managing organisations during steady state conditions. Management develop systems to optimise and compete in stable or gradually evolving circumstances. Mechanistic models aid understanding of such systems. Application is often in the form of integrated data management, well defined metrics, tools such as balanced scorecards, clear responsibilities and key performance indicators based on a simple mechanistic premise.

Major organisational change is a large field of study, principally focused on the 'project management' of the change itself. This ignores the challenge of managing ongoing operations and improvement after major changes. Typical major organisational change theoretical models assume that the conventional management structures above the unit subject to re-organisation are effective to implement the necessary changes at the required speed.

Management initiates a small proportion of major change internally; however, the most difficult organisational change is a response to external extreme events. Organisations evolve and managers optimise them to cope with the steady state conditions, and ensure they return to stability after minor perturbations from the mean. Concern with the average, and minimising variability is embodied by the 'six sigma' methodologies widely expounded by General Electric and other US corporations in the 1990s. Six Sigma methodology not only includes focus on reducing variability assuming binomial type distributions, but it also focuses on structured management control using value based measurement of improvements and hierarchical reporting through a pyramid type organisational structure. This traditional paradigm relies on the premise that the world is satisfactorily understood using Gaussian binomial distributions.

In contrast, a study, of over 80 natural and social phenomena (Andriani and McKelvey 2006) ranging from earthquakes to sales of books on Amazon, clearly demonstrated that rarer events are better-modelled using power law distributions. Such systems are better-modelled using complexity and networks. The consequence is that extreme events are more significant, being larger and more frequent than predicted by Gaussian based statistics. The impact of the subtle but important difference between Gaussian distributions and power law distributions, particularly when considering rare events has been well explained and popularised in 'The Black Swan', (Taleb 2000) page 281. Taleb demonstrates the impact of ignoring the importance of extreme events and describes how this lead

to the collapse of the firm 'Long Term Capital Management' (LTCM) in 1998. The response of banks and governments, clearly accepted the potential for the collapse of LTCM to have an impact well beyond that which simple analysis of the company's direct contracts would predict.

More recently, the knock-on effects on the world's financial system of the US mortgage markets and lack of interbank lending has again dramatically demonstrated the importance of extreme events. Conventional regulatory and commercial mechanisms proved inadequate to respond in these circumstances. In mitigating the potential consequences of the collapse of LTCM, financial organisations and governments quickly determined measures were required which had an influenced across many extensive networks, operating with complex relationships. Individual actions, had consequences which could not be predicted using traditional economic analytical tools or concepts.

These financial collapses have many similarities to the circumstances experienced by organisations in managing major change. Following major internal or external changes traditional management controls, theories and metrics are ineffective. Understanding and management theory is generally lacking in guidance of actions and interventions, which are effective across complex networks as required in these circumstances.

Theory does not recognise that the existing traditional formal organisational structures and systems are no longer effective. A simple and important characteristic of an extreme event is that it is outside the control capabilities of existing systems. Many organisational major changes take place in a situation, where it is vital to explicitly challenge the assumption that existing systems provide adequate control.

## **Organisational Complexity or Complication**

Managers aim routinely state a desire to simplify their organisations, reduce bureaucracy, deliver clear reporting lines and delayer. Essentially this is eliminating complication of unnecessary interactions, controls and components. In contrast, most organisations also invest heavily in encouraging healthy 'complexity', supporting non-linear interaction of multiple systems. Examples include knowledge management, peer reviews, data-mining tools, staff-rotation and cross-postings. In the commercial world, authors often described such systems as networks, but the academic concepts associated with complexity are also powerful.

Elizabeth McMillan (McMillan 2002) compares classical science and complexity science models as:

<b>Classical</b>		<b>Complexity</b>
Linear		Non-linear
Hierarchical	Vs	Non-hierarchical
Reductionist	Vs	Holistic
Controlling	Vs	Self organising
Inflexible	Vs	Flexible
Uniform	Vs	Diverse
Centralised	Vs	Networked

Conventional management science paradigms and suggested approaches concentrate on optimisation and exploitation of the classical aspects. In practice, any real large organisation displays characteristics of both models, and practitioners should consider both paradigms. A recent study (Hirota et al. 2008) identified the degree to which many successful large organisations demonstrate the constructive reconciliation of apparently contradictory characteristics. A case study of Toyota showed that it:

- Moves slowly, yet takes big leaps
- Long term steady growth, yet paranoid
- Highly efficient, yet uses employees time in seemingly wasteful ways
- Frugal, yet splurges on key areas
- Insists on simple communications yet builds complex social networks
- Strict hierarchy yet encourages all employees to ‘push back’

In a mechanistic organisational model, these characteristics appear conflicting and contradictory. A network organisational model helps understand, develop or exploit the apparent conflicting characteristics.

Further examination of these apparently contradictory characteristics exposes contrasting situations for application.

1. The former of each pair above is entirely appropriate for control in steady state conditions; the world of Six Sigma, limiting variability and controlled optimisation. Such an approach will be characteristic of a strict hierarchy.
2. The latter of each pair is required for helping the organisation to initially detect and then responding to extreme events, those which outside the control of the routine management systems. For example paranoid consideration of potential new technology or long term development, encouraging all staff to push back and devoting large amounts of time to ensuring rich communications across all levels.

It is also interesting to compare these characteristics with those of ‘high reliability organisations’, such as air-craft carriers, nuclear power stations and air traffic control. A study by Weick et al identified organisational culture and behavioural characteristics that increase propensity to disasters.

These included, ‘accuracy rather than plausibility, advocacy rather than active listening, constant rather than periodic exchange of information, complete consensus rather than partial working consensus’. (Weick et al. 1999)

The latter desirable characteristics identified by Weick aid the effective operation of networks as a vital complement to formal explicit control mechanisms. It is illuminating to consider these characteristics in the context of NASA’s organisational culture, which is widely recognised to have contributed to both Space Shuttle disasters. On January 28, 1986 O-ring damage, exacerbated by low temperatures on the launch pad, destroyed the Challenger. This followed a decision to launch which was against the clear advice of the relevant expert from Morton Thiokol who produced the booster rockets. On February 1, 2003, foam damage to a wing leading edge destroyed Columbia. Experts in ceramic tile damage assessed the foam damage, although the damaged area of the wing was not tiled.

Both disasters demonstrated poor active listening by leadership, an inability to act on the knowledge of a small group of experts. Decisions by senior managers were supported by a majority of staff that lacked relevant expertise. All these factors meant that NASA did not detect that circumstances had moved beyond the norms of prior experience and existing conceptual models. Leadership ignored widespread concerns within the support team, which engineers could not quantify. Tragically, poor management of networks can cause extreme events, as well as hinder organisational response to them.

Case studies now describe look at practical actions which leadership used to exploit networks and organisational ‘complexity’ to successfully major change.

### **Research challenges in the hydrocarbon exploration industry: Shell case study**

This case study examines the response to a fundamental change in the nature of competition and technology control. To survive the research function leadership had to initiate new blue-sky research aligned with long-term strategy and redirect traditional research whilst continuing routine technical support activities.

In the mid 1990’s, Shell’s upstream business was facing some major challenges. The 4,000 central staff supported a profitable but highly cyclical production of oil and gas. In addition, Shell was making a lower rate of return on capital when compared to its competitors. The research

function paradigm was that smaller companies and countries with major hydrocarbon resources could not do what the company and its direct multinational competitors could manage.

Fundamental changes had occurred which meant that countries and smaller competitors had direct access to sources of long-term capital and advanced technology. Furthermore, some aspects of hydrocarbon exploration and development technology had become so extreme that international specialist technical companies were better suited to deliver the technology in the field rather than small departments within traditional oil companies. Improvements in capital and technology markets had transformed the competitive market traditional oil companies faced.

The research function, supporting the two parts of Shell's, upstream and downstream took very different approaches to managing this change within their research functions. The downstream business, supporting refining and large-scale process plants, reduced costs and numbers in conjunction with a focus on providing chargeable services to internal and external customers. This created a cost-neutral base for the staff, which retained and developed the company's technical capability. In the short-term, it did not offer a clear competitive advantage to the core business.

The technical function of the upstream business took a radically different approach. Leadership recognised that changes in the commercial environment and speed of technical evolution in the industry meant they could not produce long-term success with top down directives and hierarchical controls. Instead, it responded to the evolving new industry structure by creating an environment that stimulated networks right across the company and exploited links with external networks to direct and deliver successful research. Interestingly Shell recognizes its long history of managing change in a sustainable and creative way, based on a sophisticated and durable culture as a basis for competitive advantage (de Guess 1997). Shell's technical experts recognised that they did not have the understanding of emerging technology that would allow them to select research projects in isolation. Internally senior managers had no experience or the required approaches to research management, whilst available external experience was in very different industries. Leadership recognised that organizational learning in many areas would be required to develop solutions to new and evolving challenges.

Changes eliminated the formal hierarchy of the research function, and staff allocated to small teams of typically 15 staff. A simplified three-element structure was developed, which covered allocation of resources as well as individual and team inventive programmes. All technical teams within Shell's upstream research function, had to deliver in three areas of service, research and 'game-changer' work. End-users in worldwide

operating units paid for service work at commercial rates, removing the incentive to use central group staff.

As important as the positive creation of networks, were leadership actions, designed to weaken traditional control mechanisms in the organisational culture. For example, disincentives for staff to provide simple services capped provision, unless aligned to long-term strategic priorities including supporting major projects, new regions or clear technology themes. This offset the natural tendency of the organisation to focus resources and attention on the needs of the traditional major operating companies, which dominated the current business but not future growth and profit opportunities.

Shell Upstream took an innovative approach to developing detailed research programmes. Directors communicated strategic imperatives based on quantified long-term business opportunities for each area of the business. Technical teams put together research proposals to obtain funding allocated using a simulated market place, proposals purchased by parts of the business, which 'owned' the opportunity. These energetic market places took place over intensive three-day sessions involving staff from Shell's operations around the world. Research teams sold projects passionately re-defined scope and agreed new deliverables, to attract required funding and promises of trial locations. Management evaluated subsequent projects based on successful delivery of benefits to trial operating units. This required the combination of research teams delivering the technology and the business sponsors providing successful pilots, trials and demonstrations that did actually deliver the claimed potential business impact. The approach exploited global communities of technical experts within the company from research and operating units. Successful teams focused projects on strategic value creating areas and business benefits with defined timescales.

Whilst the bulk of research could be managed using artificial markets and global technical networks, leadership recognised that this approach would not support radical high risk, high gain research, vital to give Shell the edge over specialist technical service companies. Leadership delegated control of this part of the portfolio to an approach known as Gamechanger (Hamel 1999). Every technical team had metrics to ensure full involvement in radical research. Targets included submitting at least one proposal per team member and at least 10% of total team time on approved 'Gamechanger' projects. Whilst not all staff were comfortable with this program, it created a strong incentive for teams to recruit innovative and risk taking individuals, who would not have been welcome in a service or more controlled research environment. The 'Gamechanger' process was



set up to encourage seeking technology from outside the industry. Potential projects often came from connections with new fields or sources of ideas including mathematics, physics or aerospace academic research. These have since delivered successful and commercialised technology.

The change program adopted by Shell Research leadership can be tested against the key elements proposed by Jennings and Dooley for ‘the re-conceptualization of organisation for the 21<sup>st</sup> information era and knowledge economy’ which compared a mechanistic bureaucratic system with a complex adaptive system. (Jennings and Dooley 2007). The actions taken by Shell leadership in this case study can be assessed against the structure proposed by Jennings and Dooley which is shown in italics below:

### ***Mechanistic Bureaucratic System***

***Machine Metaphor:*** *Static states, Rigid structure, inert mechanisms.* Shell removed the formal organisation, and eliminated barriers that allocated individuals into particular teams.

***Control Dynamics:*** *Specified ends; causal certainty, exogenous forces, Hierarchical relations, Top-down flow. Alternating change and stability.* The legacy traditional research programs were cancelled. Leadership and central management control of technical content or allocation of budgets was cancelled.

***Equilibrium seeking:*** *Stability and coherence. Dampen feedback loops. Converge on norms.* Traditional methods of matching research programs to available resources were removed. Senior managers who had built up large teams or researchers lost their line and budget responsibility to provide long term funding and technical program continuity.

### ***Complex Adaptive System***

***Living organism metaphor:*** *organized complexity, dissipative structure, co-evolving system.* Management was in the form of simple processes, such as clear market places for research projects to identify and elevate effective programs aligned to business objectives. Leadership focused on balancing multiple processes to ensure that diverse networks could develop for service, research, innovative and external research scouting.

***Emergent Dynamics:*** *Causal uncertainty, unspecified ends, endogenous agents, heterogeneous agents, bottom-up flow, self organizing emergent structuring.* Objectives were limited to business objectives and filed types, without any defined technology approaches. Strong incentives ensured that resources clustered to exciting and credible ideas developed by anyone, at



any level of the company, including those outside research. Initial funding for ideas from outside the company from academics, specialist contractors or other industries was subject to very rapid approval and simplified controls.

***Adaptive Striving:*** *Dynamism and complexity, amplify feedback loops, deviate from norms.* Incentives for all levels from individual upwards including teams and senior management ensured a minimum allocation of resources to innovative and new research areas. Where a high risk, high reward program was identified, this was funded and participation championed by leadership.

At a practical level, transforming an organisation in this way clearly provided severe challenges for individual leaders, financial systems and a organisational culture generally. Despite these challenges, it would have been impossible to energise such connections using traditional directive management mechanisms. The research tradition of providing a tolerated subsidy for a low percentage of ‘behind the fume cupboards’ personal research time had not worked for Shell’s research staff, with the bulk being used simply to cross-subsidise existing service work or hide over-spends on traditional research budgets. The approach led to a series of very productive networks developing, which rapidly provided real benefits for the company.

For example: In the critical area of technical services to support ongoing operations two networks developed. Firstly catalysed by the need to demonstrate high value for work, rather than simple time based support on routine problems research based staff moved to spending more of their time supporting high gain innovative work in the field, with particular focus on problems that could potentially provide further research programmes. This helped identify technically advanced and very staff based in operating businesses and engaged them in the advanced research team networks. Secondly to provide assistance to routine queries and share best practice across remote global operations a small investment was made in community support IT infrastructure, followed by launch events designed to ensure effective social ties between participants. This led to the development of many specialist global communities, which rapidly responded to hundreds of queries every month. Although many central research staff were active participants in many of these specialist communities, it quickly became apparent that global communities had been created with staff based within local operating companies providing the majority of solutions. In addition, analysis of these operating support networks demonstrated that once they reached a level of maturity where participants were prepared to use advice as well as provide knowledge, the

number of queries posted to the networks accelerated leading to significant improvements in operational performance.

Traditional research programmes change was initially dominated by the disruption caused by radical changes in funding levels after the market place allocation of funding. The first effect of this was that a significant minority of staff had to move out of their traditional specialism's to work on new programmes, where the funding had been allocated by the market. Management continuing to support the professional development of staff irrespective of their 'home team' facilitated a beneficial effect of the distribution of specialists. The non-line functional networks quickly found new and innovative applications of their traditional technology in new team areas. In addition, because the senior staff lost their budgetary and programme responsibility they were freed to devote time to identifying new and profitable applications for their specialist skills which in some cases resulted in new valuable research programmes. Perhaps most valuable were the networks created around each research programme of the operating units, which were nominal funders but more importantly were committed to demonstrating business benefit if the research was technically successful. These early adopter networks provided real benefits to the research directly such as identifying improved trial sites or advice and assistance during trials. In addition they led to very strong communities around particular business opportunities which improved sharing of other advanced technology available in the market but also accelerated adoption of new techniques after initial trials were successful.

The Gamechanger program in its first phase operated by funding pre-existing ideas, accelerating their development or enabling research which would not have been funded in the old model. As the process matured it became necessary to provide stimulus to facilitate identification of new ideas. The visible mechanism for this were workshops focused on particular problems, science or apparently unmatched teams. Although initial results from these workshops were encouraging, sustained long term value was created by the secondary networks that resulted. For example new post-graduate recruits provided links to academic research of value to other teams, which lead to productive sources of innovative ideas. The workshops and resultant initial projects created more durable multi-discipline communities, which generated new solutions to traditional problems. These networks operated outside research and traditional academic links, with some of the most productive relationships developing with specialist service contractors, who provided knowledge and approaches to complement Shell's fundamental understanding of the businesses problems and opportunities.

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**Changing a consultancy from partnership to public company:  
Scott Wilson case study**

This case study describes the rapid delivery of improved risk control and financial reports that new capital sources required. The company faced rapidly change in many parts of its environment, which rendered existing control and management systems ineffective. Success had created a scale of operation beyond managerial experience and capability of formal systems. Diversity of services meant that senior managers could not remain familiar with operational details required for success. Client expectations for a complex service adapted to each business sector went far beyond simple the provision of individual expertise. Capital funding sources required formal reporting and risk management that had previously been exercised by the working owner's intimate involvement with operations and strong personal relationships. Required degree and pace of change was outside the capabilities of existing formal systems. Leadership chose to exploit informal organisational networks and simple tools rather than traditional investment in computing systems and formal management structures.

Scott Wilson is an international engineering consultancy that had grown rapidly changing into a private company from a traditional partnership, after having double in size to over 2000 staff in less than three years. A diverse range of services, projects and international locations delivering rapid growth; the company expected to reach 4000 staff by the end of 2006. To support this growth leadership decided to take the company public, as it provided the benefit of access to further funds, a clear value for shares and increased profile. In addition, public listing required a number of changes to the business in particular better risk management with improved financial reporting and controls. Public listing required consistent business processes across all the activities.

The challenges for Scott Wilson included a diverse range of weak financial management systems in use, management expertise in engineering and project management rather than business controls. Strengths included ongoing rapid growth with underlying profitability, a highly professional and autonomous workforce and support from a small community of commercial experts.

Traditional options were for management to exploit mechanistic controls, change targets for existing metrics, implement new financial systems, formalise procedures and recruit new managers with experience of such controls. These options would have been costly, disruptive and take at least two years to implement. Scott Wilson instead focused on

using networks to strengthening current systems, delivering the same results. For success staff at all levels would need new business skills and solutions quickly. Although management science and service providers offered a range of model answers, the application of such solutions in Scott Wilson was impracticable without serious disruption to ongoing business operations. The organisation needed to exploit external and internal expertise, learning to deliver required functionality with existing business systems.

Actions to increase the effectiveness of existing networks were simple, and had very rapid impact. A team with representatives from main developed a very simple projects process, with management control focused on only four gateway decision points, avoiding the need to formalise controls and use a conventional computerised financial management system. In developing the model, discussions created a community of champions who had ownership of the shared model but more importantly understood the strengths and weaknesses of their Division's approach combined with potential learning from other Divisions. The team did not have to change the wide range of project management models, which had evolved to match specific client sector requirements. Analysis identified gateways to deliver maximum business value, with minimum impact on client service or working project teams. The simple process focused limited commercial and senior management resources where they would have maximum impact, without destroying the effectiveness of existing managers. Early in the application of the simple project management approach, there was rapid sharing and adoption of very specific local changes. The combination of a locally based team-members and a simple vehicle to support the adoption of new practices within local operations quickly led to the application of simple and powerful new practices. Example benefits included more consistent financial reporting, improved profitability by better selection of potential bid opportunities and focusing marketing resource on high return work of increased revenue from existing clients and sectors, rather than long shot development with potential new clients. In addition, by sharing experience internationally, on a shared project model the existing commercial team produced simple tests to quantify commercial and project risks, applying these rapidly across all projects across the entire company.

Traditional improvement in this area would have been delivered in the form of new financial tools, project management software and strong directives to ensure consistent utilisation. Inevitably such a change would have had high direct costs and caused a large amount of disruption. Often such formal systems in a diverse operating environment result in much duplication and even reduced quality of service to clients. In this approach,

a very small team and a simple model created powerful networking. The initial collaboration was the formal part of the change project itself. In the second phase of work this core network moved on to drive adoption of a small number of changes across a wide range of projects and divisions. The team members viewed the role as improving divisional projects rather than implementing central directives and approaches. In the mature phase, the project model delivered a shared business model and language across the company. This shared business model enabled functional experts in a single Division to assist and apply tools across the entire company. Support function experts that had previously been isolated in a single division with no exploitation of their skills more widely included finance, risk management, marketing and project management specialists.

Clearly, in addition to the formal controls of each piece of work or project, there existing a large volume of formal documentation and less controlled guidance. , Instead of issuing new equivalents, Scott Wilson concentrated on ensuring better understanding and application of existing policies, procedures and technical standards. The traditional approach would have been to identify corporate leads, to write a new top-level document. Often this leads to unhelpful debate of precise wording then followed by slow or reluctant adoption. At its worst the new documents is not drafted by the person with most knowledge and are less helpful than existing material. The approach breaks provides the appearance of control, but can destroy working relationships and trust between distributed experts at an operating level. Scott Wilson did not have the central resource to deliver a top-down approach, and there was a tradition of respecting working consultants across the company. Consequently leadership was determined to maximise the use of existing material and distributed expertise. Before any discussion of new material was considered an extended debate was created on proposed knowledge management solutions, this helped to develop a clear understanding of the existing huge range of material. The discussion focused on staff at all levels of the company, but most importantly those with many years experience in their positions. The outcome of this process was a clear model, which recognised information status and applicability. Leadership then formalised the results of this debate by launching a simple document management system on the company intranet system. The intranet clearly positioned all information within three levels of company level policy, functional procedures and project specific material. The structure put a huge range of material into a structure that meant specialists could locate and utilise material from peers in other divisions. Historically Scott Wilson had invested time and effort in creating communities of particular

technical disciplines with little success. By providing visibility to working material, initially there was increased sharing of the information, but this quickly and more powerfully enabled increase sharing of the experts themselves. Rapid improvement in understanding and information application occurred, without a major investment in communication or re-drafting manuals. Most importantly working teams retained ownership their own work methods adapted for specific business needs. The created visibility of material across all levels of the company greatly reduced the number of company wide policies that management had to issue. In addition, typically a company policy was limited to a one page statement of intent, as existing divisional and project procedures already delivered the intent in a form adapted to local conditions. The high level policies catalysed sharing or best practice and between experts themselves.

The approach taken by Scott Wilson focused on simple interventions to increase the capability of existing systems and maximise effect of specialists across a wide range of business projects. By exploiting the organisation's traditions, leadership delivered a short-term improvement without disrupting ongoing business or client relationships.

In traditional terms, the confluence of business environmental changes and rapid growth meant senior management lacked the resources to deliver adaptation of the organisation with directive controls. Using a complex organisations paradigm, integrative influence by leadership delivered change. 'When the discrepancy between the contextual requirements in the external competitive environment and the actual resources of a team to perform the tasks reaches a certain threshold of adaptive tensions the team may produce creative responses that have the potential to increase the order within the system as a whole.' (Panzar et al 2007).

### **Effective medium term responses to a major event in an International energy company: BP case study**

This case study looks at how changes of formal organisation focus and exploiting informal networks was use to apply best practice to improve management of high impact risks.

Based on high commercial performance and successful deal-making BP had grown rapidly into a world-class entrepreneurial energy company. A series of major mergers had underpinned growth, resulting in a wide range of diverse businesses and cultures within the company. On 23<sup>rd</sup> March 2005 a major explosion occurred at BP's Texas City refinery near Houston in the USA leading to the tragic loss of 15 lives and many serious injuries. The company quickly recognised the need for major change in the



company and the ability to demonstrate to all stakeholders commitment to manage its operations to the highest standards of safety and environmental performance. BP had a history of successfully using networks to deliver business transformation, having transformed its exploration function with the use of ‘amplifying devices to evoke disequilibrium and move an organisation to edge of chaos’. (Pascale et al. 2000).

A detailed independent investigation by the previous US secretary of state James Baker identified serious organisational failures including a lack of technical skills, adequate formal standards, and cultural factors (Baker et al. 2007). These organisational weaknesses precluded an effective short-term traditional mechanistic response relying on just existing robust command and control systems focused on the safety of operations. Satisfactory response to the findings of the Baker report required new skills and understanding of highly complex facilities and business operations at all levels of the organisation. The extent to which expertise can be imported is very limited. Leadership teams needed to increase understanding of managing operations and risk management, whilst continuing to run and develop the company. Operations teams needed to develop new skills in risk applying these in conjunction with their expertise in running the existing large and complex process units. For survival, individuals and the organisation as a whole required rapid learning, which conventional training models alone would not deliver.

After the tragedy, management immediately took all practicable actions to improve formal control systems. This case study focuses on the additional actions were taken to improve the effectiveness of existing networks and less direct control systems, which contributed to rapid improvement of standards across the company’s diverse range of operations. In addition to focusing on building new systems from scratch, leadership took simple measures that energized existing networks and capabilities. Leadership made these changes to improve management of operational risks at the same time as a high profile initiative to simplify the company, which effected all functions and staff, not just those within high-risk operations. Harter’s paper ‘Leadership and the promise of simplification’ describes the common challenge that leadership faces to maintain a balance between order and complexity as organisations evolve cycling between degrees of the two (Harter 2007). The Baker Report identified that BP’s growth had created organisational complexity, which had led to breakdown in effective communications and application of the company’s resources at the Texas City refinery. In this situation BP’s leadership faced the challenge of improved control of major risks whilst delivering the desired organisational simplification.



To improve capability of operations staff at all levels, leadership started an 'operations academy'. This introduced parallel training programmes for company leadership, senior management and front line supervision. The programme used existing relationships with external academics that BP had already used to build skills in the area of project management. Part of the training was communication of formal concepts and techniques. The programme also provided structured sharing between participants, in particular improving understanding and application of existing business tools and the skills already within BP. A large part of the academy's benefits derives from the way in which it energised existing networks. Directly the training provided core skills for all participants, but in addition it created a common language for non-technical issues, a forum for sharing best practice and clear indication for staff at all levels that their supervision were committed to achieving excellence in this area. Consequently, the academy generated energy and motivation across many staff within to share and apply best practice although the number of staff who were directly involved in early phases was small. Best practice sharing is straightforward, when the techniques are straightforward and not context specific. The operations academy extended the focus of operations networks to more conceptually challenging areas including leadership styles, organisational culture, risk management and leading indicators.

'Quantitative Risk Assessment' (QRA) is a conventional and widely used tool in high-risk industries for managing technical risks on complex process plants. Although commonly used on some facilities and decisions QRA is expensive with many different methods in use. BP experts had already developed standardised approaches, which businesses could apply to assess risks more quickly but management had not mandated application of these techniques. After the Texas City tragedy, BP leadership took the simple measure to mandate all significant hazard sites to assess operational risks using a simple consistent approach, reporting any major issues. The objective was to ensure that all high risks were visible to leadership and introduce an incentive for local business management to implement practicable measures to mitigate hazards where practicable. Although the tools used were not ideal for every facility or operation, the consistent simple methodology, company expectation was that clear timescale for completion, coverage and direct reporting to company leadership would create powerful improvement momentum. Simple assessment tools and linked to senior management reports should improve understanding and accelerate practical action across the diverse business portfolio.

In practice, the action achieved the expected benefits in the challenging area of low probability, high consequence events that are notoriously hard to manage using conventional metrics. The mechanisms for delivery of the

benefits are of interest. To complete initial application of the standard techniques, each operation had to seek the assistance and approval from the central team of experts. To prevent duplication of effort, the central team could share approaches and results for similar units, this started with ensuring a shared understanding of risks, quickly moving on to groups of experts that developed common solutions. In addition to the predictable internal company communities, the focus helped link the entire company into networks operating in the region or specialist industry of a particular site. Because of the diverse focus and background of internal and external networks associated with high-risk activities, the focus of improving risk management systems encouraged was similarly diverse. Activities that the networks focused on included simple operations procedures, competency, knowledge management, inspection techniques, plant design and fundamental risk assessment techniques.

At the time of the Texas City tragedy, BP had a series of management standards designed to control operational hazards. Standards had evolved over time and increased as BP grew through mergers. Traditionally audits within operating businesses monitored application against the standards using teams with local knowledge and experience of the particular business environment. This had led to a wide range of interpretations and approaches. Rather than waiting for the development of more explicit management standards, BP created a central audit group including external experience and clear protocols for managing the audits in a consistent manner. The function audited businesses with higher risks. Audit reporting was directly to a sub-committee of the main board and produced clear dated actions for local management.

As expected, this approach led to rapid improvement in a number simple ways. To avoid poor reports to senior leaders, local management took all possible measures to improve risk controls before audits. Where required the need for additional resources audits highlighted this enabling allocation of specific expertise. By identifying clear actions, which were then tracked to closure it catalysed a high level of discipline across the company on with risk mitigation actions which had no short term impact on business results. These benefits are interesting as they resulted from no explicit change in requirements or management activities. One model for describing these gains is simply that the approach to audit ensured that complete and effective management processes were in place, including identification of actions to rectify gaps and ensuring the actions are completed.

The approach to auditing had a more subtle and unexpected impact, which enabled the evident improvements of simply making management

systems work as intended. By judging operating units against a simple standard and enforcing resolution of gaps, leadership gave a large incentive for operational units to ask for and apply best practice from across the company. Inevitably many weaknesses were shared across many operations, in some cases it was straightforward to provide a site with an action, with a number of different solutions to the problem, which initiated dialogues between the various locations often leading to improvements and changes at all of the locations going well beyond the original narrow focus of the action. When solutions were less evident all the locations, which needed a solution, could work together, using internal and external expertise to develop a single and robust standard. The audit process also identified excellent sites, which assisted management to use these sites as a source for integrated and inclusive management practices.

Under extreme pressure to deliver rapid improvements leadership, in addition to direct mechanistic improvements, they applied three clear and simple approaches described here across the entire company. Shared operations training, consistent risk assessment and consistent auditing of existing management standards all complemented the traditional direct interventions by leadership. In addition to conventional improved controls, leadership focused the capabilities of the existing networks and energised existing capabilities to deliver a rapid improvement in risk management across a diverse international business without disrupting existing formal organisations and operations.

## **Conclusion**

Managers, researchers and students can consider major organisational change as an extreme event, which are by definition outside the capabilities or normal focus of business control systems. In this context, an organisation's leadership has to exploit internal and external opportunities to improve performance. Actions that will energise or re-focus capabilities of the company culture and range of existing networks, which inevitably exist in any company, will maximise the value delivered. As large interconnected systems, organisations can behave in unexpected ways with small changes triggering fundamental shifts. Considering the principals of complex systems, offers leadership a range of powerful actions to use in response to extreme events. The use of complexity science to understand the recent behaviour of the global financial markets is increasingly recognised (MacKenzie 2008). This chapter demonstrates that leadership

can exploit concepts from complexity science to manage change in large commercial organisations.

It has been demonstrated using complexity theory that economic systems stabilise in different sub-optimal conditions, depending on the sequence of events and route at which they have arrived at their state (Ormerod 1998). In the field of international development, 'the challenge of implementation' is that the sequence and relative strength of reforms can have a profound impact on the success and stability of countries and entire regions (Stiglitz 2006). Likewise in managing organisations the timing, sequence and conditions of simple management interventions has a major influence on their impact, success and durability. Application of complex organisations theory provides vital guidance to management, especially during periods of major which are outside the capabilities of conventional control systems. Theory provides models that management science can be use to describe techniques that excellent business leadership is already consciously applying as part of integrated change management programmes. Better guidance from complexity management theory for traditional organisations managing extreme events would provide great benefits.

The case studies in this chapter describe situations that provided completely new challenges to individuals in the organisation. Rapid and poorly understood environmental changes threatened company business models. Staff at all levels of the companies needed to develop new skills and understanding, including senior management and technical experts with international reputations. Adoption of advanced technology from other industries and new academic fields had to accelerate. To support the required rate of change, traditional models of organisational and individual learning were inadequate. In some cases expertise simply did not exist, in others the time and cost of acquisition would have been impracticable. Leadership created an environment that exploited and refocused networks on urgent business challenges. In the absence of simple sources of expertise and advice, networks provided unique mechanisms for both individual and organisational learning in the challenging environment of rapid change.

Commercial case studies in this chapter have described the potential of networks in conventional organisations to contribute to rapid, successful and sustainable change during major organisational change.

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