Using System Dynamics to Influence and Interpret Health and Social Care Policy in the UK

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Abstract

Over the past two years OLM Consulting, initially in partnership with Cognitus, have used System Dynamics (SD) modelling in a wide range of health and social care settings to shed light on a number of difficult and complex issues.

At the national level we would claim to have used models to moderate legislation significantly, by influencing national agencies and the upper house of parliament. At a local level we have used SD to help health communities interpret legislation in a meaningful and shared way to achieve a more balanced and sustainable consensus for change. Modelling was the means to review investment decisions from a "whole systems" and multiple agency perspective. We have also helped communities to own models and to work towards consolidating the modelling process into regular planning activities.

This paper describes the work carried out and its achievements with particular reference to the role of models and the process of application. It describes:

- The current state of the health field, including the challenges created by the legislative agenda
- Experiences in creating a whole systems view of hospital discharge and exploring various elements of the mental health system. These are described in more detail in the accompanying papers presented at this conference

Health and Social Care: the Structures, Drivers and Performance Dilemmas

SD work in the UK health and social care field has been gaining momentum since the mid 1990s. Early work (Wolstenholme, 1993) laid the foundations for the creation of the concept of "whole systems thinking", a term which now has widespread use throughout the National Health Service (NHS). Although the early manifestation of whole systems thinking was somewhat qualitative, it subsequently paved the way for more rigorous SD modeling (Wolstenholme, 1996 and 1999; Roysten, 1999, van Ackere, 1999; Lane, 2000; Dangerfield et al, 1999 and 2001). To date the method is being extensively used by the economics and operational research section of the Department of Health (DoH) as well as by a number of private health and social care consultants and academics.

This paper charts the experience of OLM Consulting and Cognitus in using SD to assist strategy and policy development at both national and local levels in the UK health and

social care field. The general issues of delayed discharge from hospital and whole systems joint working across health and social care, are similarly important across the whole of the UK. The specific legislation, policy framework and organisational arrangements described in this paper apply only in England.

Health and social care in England are at the centre of a modernisation agenda whereby the government sets out a programme of change and targets against which the public may judge improved services. The government has made reform of public services a key plank in its legislative programme and pressure to achieve these targets is therefore immense and can be "career-defining" for the heads of the various agencies concerned.

The modernisation agenda is rooted in the NHS Plan, a ten-year milestone plan for health and social care which was initially published in July 2000 and is revised and extended as each new planning period is entered. Figure 1 describes the scope of this ten-year plan, with additional details of government investments (see figure 2) and targets (see figure 3). For instance, a key initiative of the NHS Plan is to take the pressure off acute hospitals by providing new community services, such as diagnostic and treatment centres and intermediate care. In Mental Health (MH), there are other progressive initiatives, such as early intervention, crisis resolution, assertive outreach and graduate-level primary care workers.

Fig 1: NHS Plan 2000

- 10 year plan; Health Authority (HA) funding over 3 year cycle (not annually)
- New resources for intermediate care and MH
- Implementation by Modernisation Agency - to be set up by autumn 2000
- A new relationship with the DoH based on subsidiarity (earned autonomy)
- New "concordat" with private sector (includes buying capacity to ensure wait times targets are met)
- Rationalisation of health regulation
- New processes for health complaints/suspensions
- More patient representation
- Appointments to boards no longer in hands of government
- NHS to buy capacity from private sector
- NHS Plus to sell occupational health services to employers
- NHS Lift to upgrade primary care buildings (cleaning, catering)
- National Treatment Agency (NTA) to pool resources for drug misuse
- Rationalisation of health training

Increased funding tied to targets

No change to status of Social Services - unless fail to achieve joint working (and can then be forced into a Care Trust with Health)

Fig 2: Investment

- £30M for clean-up of patient areas/Accident and Emergency (A&E)
- £5M development funds for trusts and HAs that are in top quartile ("earned autonomy") – total £500M. Under-performers will have to show improvement plans to earn their share
- £300M for equipment cancer, kidney and heart disease, including 50 Magnetic Resonance Imaging (MRI) scanners and 200 Computed Tomography (CT) scanners)
- 20 diagnostic and treatment centres by 2004 (day or short-stay surgery)
- 500 one-stop primary care centres
- £900M for intermediate care (hospitals to be kept for acute services) – includes 5000 rehab beds and 1700 non-residential rehab places
- 100 on-site nurseries in hospitals

MH Funding

- £300M by 2003/4 to introduce MH service framework (in addition to £700M already announced)
- 50 early intervention teams to support young people and families
- 335 crisis teams
- 50 more assertive outreach teams over next 3 years (in addition to 170 planned for April 2001)
- 1000 graduate-level primary care workers to support General Practitioners and Primary Care Groups (PGCs)[1] and provide brief therapy (e.g. for depression)
- 300 staff to improve prison health services

Fig 3: NHS Targets

"A key message…..in formulating this Plan was that it needs a small focused set of targets to drive change. Too many targets simply overwhelm the service"

- By 2002, anyone with operation cancelled on the day for non-clinical reason will get new appointment in the same month or payment to go private
- By 2004 max wait times in A&E 4 hours; to see GP 48 hours (or primary care professional within 24 hours)
- By 2004, 7000 extra beds (2100 in general/acute wards, 4900 in intermediate care)
- By 2005 – wait times for operations down to 6 months, outpatient appt to 3 months
- Reduced mortality rates for major diseases by 2010
- Reduced health inequalities (targets TBA 2001)
- Benchmarking cost of quality care (milestones 2003/4)
- By 2010, 100 new hospitals under Private Finance Initiatives (PFIs)
- Year on year improvement in patient satisfaction (including cleanliness and food)

[1] PCGs have developed since 2000 into Primary Care Trusts

The NHS Plan represents a determination to ensure that the New Labour government will go down in history for "saving" the NHS by providing record levels of investment, underpinned by radical policies and a robust performance management framework. Insert 1 provides updated guidance for the current planning period (2003-6). The emphasis is on growth (increased levels of facilities and staff) and transforming the patient experience (flexibility, choice, standards). ***It implies that there are known answers to current issues*** and all that is needed is focus, perseverance and attention to value for money**.**

Insert 1

The extra money coming into health and social services gives us the opportunity to make real improvements. We can expand through recruiting new staff, developing new services and creating new facilities. Even more importantly we can transform the quality of services by raising standards, tackling inequality, becoming more accessible and flexible and designing our services around the needs and choices of the people we serve.

This is about both quality and growth. The real test for success will be whether people can feel the difference and believe the services they receive are truly designed around them.

These are hugely ambitious goals. They will take time to deliver. Making progress over the next three years will be demanding and difficult and require real determination and discipline. It will need us to:

- Focus on priorities, we cannot make progress at the same pace in every area
- Extract the maximum value from every pound
- Be prepared to change old practices, be creative and take uncomfortable and difficult decisions in the drive to improve quality and respond to people using services

Priorities and Planning Framework 2003-6. Foreword by Nigel Crisp

In order to implement the modernisation programme, the government has set up various task forces, described below with excerpts from their website literature:

- The NHS Modernisation Agency was set up in 2001 to assist with modernisation by improving access, increasing local support, raising standards of care, and capturing and sharing knowledge widely
- DoH Change Agent Team (CAT) was set up in 2002 to offer targeted help to health and social care communities in reducing delayed transfers of care; to support implementation of the key aspects of the National Service Framework (NSF) for Older People that impact on delayed transfers of care; and to assist with development of a more integrated approach to commissioning and provision of services
- Office of the Deputy Prime Minister (ODPM) was set up in 2002 and includes special groups like the Social Exclusion Unit, and some programmes connected with modernising services (such as the Supporting People programme)

- The office of the e-envoy aims to improve the delivery of public services and achieve long-term cost savings by joining-up online government services around the needs of customers (target of fully available electronic services by 2005)
- Workforce Development Confederations were set up in 2001, with a central role in enabling the delivery of Strategic Health Authority (SHA) franchise plans through planning and development of the healthcare workforce, working with Postgraduate Deaneries to commission education and training, and managing the DoH annual investment in training of almost £3 billion

In order to ensure the new policies are providing the required results, the government has also strengthened the inspection and regulation framework:

- Commission for Healthcare Audit and Inspection (CHAI) will inspect all health care providers in the NHS and the independent and voluntary sectors to common national standards, set by the Secretary of State for Health. To end the current fragmentation of healthcare inspection, subject to legislation, CHAI will bring together, into a single organisation, the work of CHI, the national NHS value for money work of the Audit Commission and the private healthcare role of the National Care Standards Commission (NCSC)
- From April 2004, the Commission for Social Care Inspection (CSCI) will be the single inspectorate for social care. It will combine the work of the Social Services Inspectorate (SSI), the SSI/Audit Commission joint review team and the National Care Standards Commission (NCSC)
- The National Institute for Clinical Excellence (NICE) was set up in 1999 to provide patients, health professionals and the public with authoritative, robust and reliable guidance on current "best practice"
- The Social Care Institute for Excellence (SCIE) was set up in 2001 and gathers and publicises knowledge about how to make social care services better

In order to secure efficient development of resources, the government has introduced some national programmes:

- The National Programme for Information Technology (IT) in the NHS focuses on the key developments that will make a significant difference to improving the patient experience and the delivery of care and services. There are four key deliverables: electronic appointment booking, an electronic care records service, electronic transmission of prescriptions and an underpinning IT infrastructure with sufficient connectivity and broadband capacity to support the critical national applications and local systems
- The Information for Health programme began in 1998 and covers infrastructure issues (NHS net, security, tracing service etc) and the electronic health record
- The Information for Social Care programme aims to improve quality and performance in social services through better use of information and IT. It includes work on data sets, process-mapping and the electronic social care record

In order to provide incentives, the government has introduced the idea of Foundation Hospitals which (conditional on achieving outstanding performance) can have the

"earned autonomy" to operate with a "lighter hand" from Whitehall (including some latitude to borrow funds on the open market).

Current timescales for roll-out of key programmes are:

April 2004

Subject to legislation, first wave NHS Foundation Trusts, CHAI and national standards in place.

April 2005

Payment by results in place for most in-patient, out-patient and day cases and start of transition to the national tariff (from April 2004 for NHS Foundation Trusts).

December 2005

All patients offered choice of four or five providers at referral

April 2008

Payment by results fully operational; all hospital trusts should have reached high standards and be able to apply to become NHS Foundation Trusts.

To summarise, health and social care in the UK are part of a complex political and social context. Their origins are in 19th century movements of social reform, brought together in the 1948 National Health Service Act, to provide universal free health treatment at point of need. The NHS is highly valued by the British public but has become the focus for rhetoric between the political parties, who variously aim to safeguard its public sector status, improve its delivery, control its costs and manage the interests of consultants, General Practitioners (GPs), the pharmaceutical sector, private investors (through PFI programmes) and other players.

New Labour (elected for the first time in 1997 and again in 2001) has placed investment in the NHS (linked to radical reforms) high on its agenda, employing a number of managerialist approaches (strategy frameworks, standards, task forces, performance indicators, league tables etc). This has led to a number of performance dilemmas:

- Organisations are required to deliver to several separate strategies at the same time (e.g. national service frameworks, performance frameworks, national initiatives, local strategies): if there are conflicts between the imperatives of these programmes, how should they respond?
- The emphasis is on conformance to strategic imperatives (although with exhortation to be innovative as well): if the imperatives are wrong for the local situation, what should they do?
- The sheer volume of initiatives consumes a large amount of management time: how should managers also ensure they understand the drivers of their "business" so that they can carry out critical appraisal of courses of action?

The Potential for System Dynamics to Equip Ministers and Managers in Improving Health and Social Care

The current management of health and social care (described in the previous section) is not inclined to the principles of SD. As figure 4 shows, there is a potential conflict between managerialist approaches and the more reflective style of SD.

Fig 4: Managerialism versus System Dynamics

Issue	***Managerialism***	***System Dynamics***
Defining the problem	May be taken as self-evident (as shown by "symptoms")	Approached with caution: source of problem not seen as self-evident in complex systems
Defining the solution	Chosen as the course of action which appears the most cost-effective response to the problem	Chosen after experimenting with alternatives (checking likely responses in a complex system)
Type of solution	Framed in terms of management by objectives and targets	Focused on management of real operational processes
Reviewing outcomes	Tendency to simplistic cause/effect reasoning: e.g. X did not happen due to insufficient resources	Rigorous analysis of the behaviour of the whole system: X began to happen but caused a response in another part of the system….
Underlying principles	***Linear*** thinking, managers define actions and ensure ***compliance***, re-plan for next initiative. Tends to focus on organisation ***structure and boundaries***	***Systems thinking***, ***quantified*** view of dynamics and ***interdependency*** leading to (***innovative***) shared solutions devised by participants and ***iterative*** development of plans. Focus is on ***process and flows***

The different approaches can be characterised by responses to a key issue which first came onto the legislative agenda in late 2001 - delayed discharge. The issue is that large numbers of patients may be occupying hospital beds, although they have been declared "medically fit". In March 2002, 4,258 people were "stuck" in hospital and some were staying a long time, pushing up the number of bed days and constituting significant lost capacity.

The ***managerialist approach*** (government) was to find who was supposed to "get the patients out" and threaten them with fines if they did not improve their performance

The ***SD approach*** was to model the whole patient pathway and consider the (many) factors affecting the discharge process. Hence there was a range of interventions that might improve the patient flow – and not all of them were targeted at the discharge point.

The government approach to delayed discharge adopts a simple "solution" in which one organisation is "at fault" and is to be fined. Although the policy was modified to the extent that social services was given funding to address capacity issues, the concept of blame still clung to them (and for their partners, the risk of identifying with the guilty party). Introducing blame (and fear of reprisals) is not a good way to foster joint working.

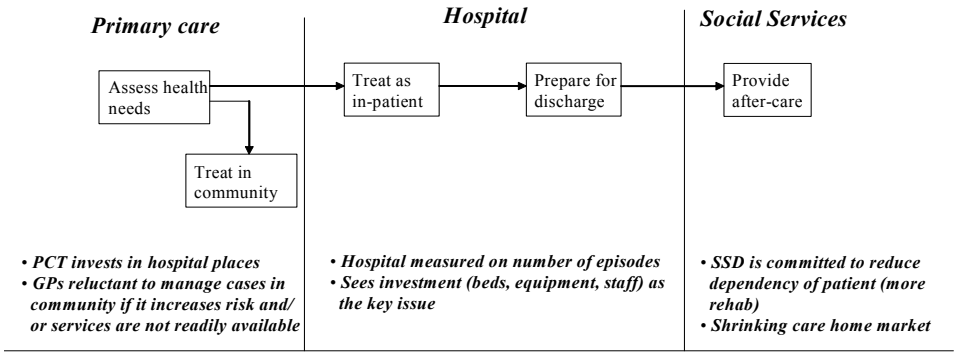
It is difficult for a government with a pressing agenda for change to take the time to experiment with alternative policies, particularly if the "solutions" indicate courses of action which conflict with previous ministerial statements or manifesto commitments. SD requires a long time-frame for considered action and an openness to alternative ideas. However, the development of the delayed discharge policy, and the manner in which it was introduced, attracted a significant amount of criticism.

The government's approach to enforcing its policies is also a cause for concern. A considerable "industry" in performance targets has built up over past years, and each new policy is likely to attract more measures on the statutory returns. The larger the number of (piecemeal) targets, the more difficult it is to keep a perspective on overall performance and interpret why X has gone up while Y has not (and even if this is a good or bad thing). At best, this causes an obsession with "making the numbers" and distracts organisations from a proper focus on customers and, at worst, it creates a dependency culture where organisations look to the government to define what "success" should look like. In contrast, SD emphasises the role of stakeholders in learning together about the factors that influence performance and selecting targets based on modelling their own local situation.

Similarly, the government's emphasis on compliance rather than innovation (see figure 4) creates a paradox where government talks of citizen-centred services (with choice as a key determinant) but "solutions" devised at the centre are unlikely to reflect what customers at a local level really want, nor allow them the voice to influence local strategies. In contrast, SD promotes dialogue between all stakeholders and scenarios are chosen to test "how it looks" from every perspective.

At the local level there is more potential to adopt an SD approach, particularly in the current climate where joint working is at least an espoused theory (if not always the theory in action). Hence it is possible to demonstrate that "win-win" solutions are achievable in a health economy, consisting of a Primary Care Trust(s) (PCTs), acute hospital trust(s), social care organisation(s) and providers (private and voluntary). As figure 5 shows, the turning point is to move from a focus on single-organisation problems to a shared view of whole system possibilities.

Fig 5: Adopting a Whole System View in a Local Health Partnership



Whole Systems View

- ***Preventing people coming into hospital is good for all – it maintains people in their homes, reduces risk of acquired infections, allows hospital to focus on key strengths BUT primary care (and preventive social care services) must be in place***
- ***Managing discharge is a joint responsibility for all 3 sectors….and it needs joint planning so that the resources are balanced along the supply chain. Any change in capacity in one sector affects other sectors***

In particular, we have found that local health partnerships, grappling with the necessity to address delayed discharges, are amenable to the following attributes of SD:

- It provides a means to surface assumptions about the complex patient pathways which link the partner organisations so they can resolve tensions and agree common goals
- It increases understanding of "why things are happening the way they are" and the underlying causes of intractable issues
- It provides options for joint action which can be tested, so that each partner is clear about the implications and potential benefits (this includes the ability to provide more robust investment plans, backed up by quantified business cases)

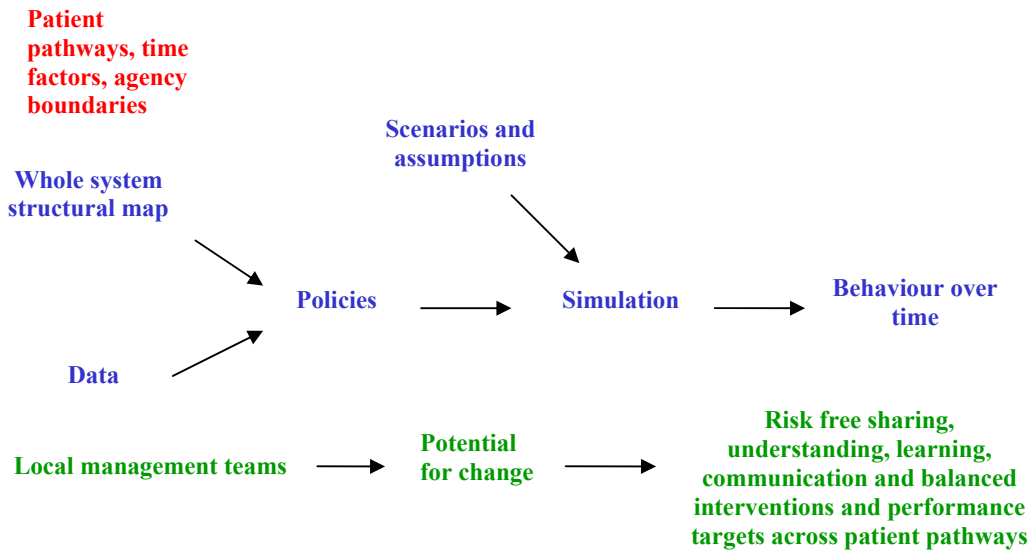
At the same time, we have found other groups of organisations (particularly in mental health) have been keen to apply a more quantified analysis to their own problems.

The following section describes the approach to applying SD in these situations. The paper then provides some insights gained in our work with delayed discharge, and goes on to describe some of the work with mental health organisations.

The Process of Building and Operationalising SD Models

The decision to work with OLM Consulting always follows a demonstration of SD models (using the **ithink©** simulation tool) and a discussion of the key components of the SD approach (see figure 6).

Fig 6: Components of the System Dynamics Approach



We make it clear from the outset that the work will be challenging:

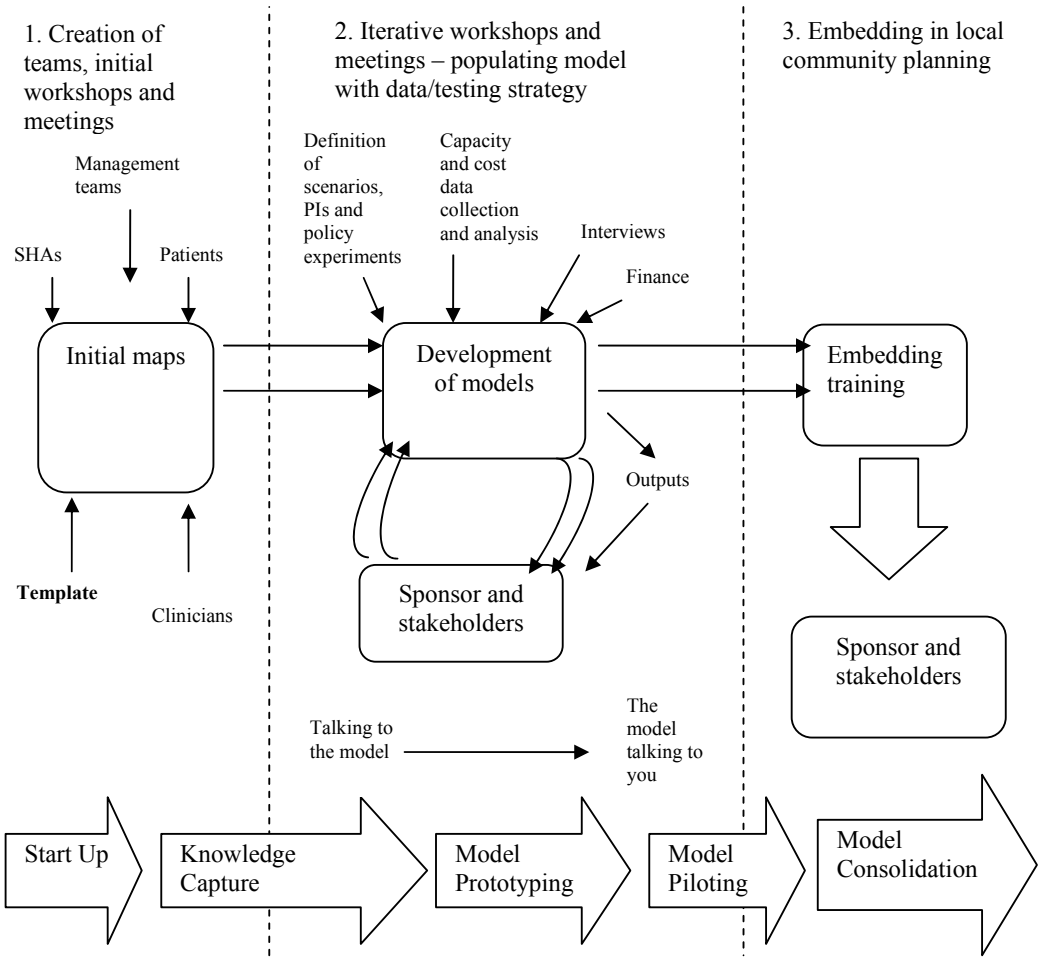
- It requires partners in a multi-agency context to declare their assumptions and share their mental models of how the "system" works. There is no room for narrow views or simplistic apportionment of "blame". Participants must be able to "stand back" from single agency issues and see the broader patterns of the whole system (causal loop mapping)
- It requires partners to agree the key issues they want to elucidate and address. These must be of significance to the behaviour of the whole system. It is important that they recognise the interdependence of their agencies, so that no policy or practice is considered "private" or "non-negotiable"
- It requires painstaking work to unravel the structure (process) in a complex system and agree how to represent it in stock-flow terms, to achieve the simplest representation which reflects current realities
- It requires significant effort to find the requisite data to animate the model. Organisations typically measure "snapshot" data (e.g. current usage of beds) rather than flows and participants may need to estimate proportions flowing through each route as well as lengths of stay
- Once an initial model has been constructed, there is a period of iterative testing. Participants must decide whether unexpected behaviours are faults in the structure

or data, or are revealing underlying logic in the complex system which has previously been undetected

- When the model is considered robust, there is a further period of testing which uses scenarios to identify the "sensitive" parts of the model (key leverage points) and constructs "experiments" to illustrate the relative merits of potential interventions
- A model is never finished. Participants must decide how to adopt the SD approach and embed it in their joint working protocols. This means acquiring the skills to frame issues, build models, facilitate problem diagnosis and agree joint interventions. It also means defining points in the joint working process where SD will be used – the planning cycle, definition of budgets, commissioning, service development, performance management and so on

In order to reinforce these points, we have adopted a phased approach to SD projects (see figure 7), adapted from the Cognitus approach to project management.

Fig 7: Phased Introduction of System Dynamics



The approach is participative, with OLM Consulting facilitating a series of meetings with a Steering Group (to provide direction) and an operational team (to work on the model). Care is taken to maximise the learning experience so that the transition from developing a model to owning and using a model is as smooth as possible. In some cases, there needs to be a formal training process to develop a centre of excellence within the partnership to support ongoing work. In other cases, we have found that we can incorporate the training in the model development process, particularly if we are working with a small group of people who are familiar with the general principles of modelling.

Delayed Hospital Discharges: an Issue-Specific Application for Joint Health and Social Care Agencies

Background

During 2002, OLM Consulting and Cognitus were requested to develop a model for the Local Government Association (LGA) and NHS Confederation to address the government's plans for a Community Care (Delayed Hospital Discharge) Bill. The purpose of the model was to underpin a national campaign to influence government policy and prevent the introduction of "fines" on social services.

The model was developed interactively with a group of NHS and Social Services Department (SSD) managers, using national data to simulate pressures in a sample health economy over a 3 year period. For demonstration purposes, the model was driven by variable demand (including three winter "peaks") and given barely sufficient capacity in each sector. When run, the simulation demonstrated the local economy "just coping" but the elective waiting list was lengthening. Hence it appeared obvious that the hospital needed more capacity. However, this had the unintended effect of unbalancing the supply chain so that the elective wait list came down slightly….but delayed discharges increased hugely (and would therefore undermine the benefit of the additional acute capacity over time). The model illustrated alternative strategies, such as re-balancing capacity across the sectors or reducing demand by diverting patients from the hospital.

This model was shown at the Labour Conference of 2002 and generated considerable interest. It was apparently instrumental in causing some re-thinking of the intended legislation, so that social services was provided with investment funding to address capacity issues, and the "fines" (re-titled "re-imbursement") were delayed for a year. Reference to the model was made in the House of Lords (see insert 2).

Insert 2

"Moving the main amendment, Liberal Democrat health spokesperson Lord Clement-Jones asked the House to agree that the Bill failed to tackle the causes of delayed discharges and would create perverse incentives which would undermine joint working between local authorities and the NHS and distort priorities for care of elderly people by placing the requirement to meet discharge targets ahead of measures to avoid hospital admission….. ***He referred to "ithink", the whole systems approach being put forward by the Local Government Association, health service managers and social services directors involving joint local protocols and local action plans prepared in co-operation"***

Developing the Delayed Discharge Model into an Operational Tool

In early 2003, OLM Consulting worked with CAT to refine the LGA model and create an operational tool that health economies could use for capacity planning. The transformation from demonstrator to operational tool involves a longer period of work, tapping into greater detail of care pathways and likely behaviours for a range of scenarios. The resultant model was more sophisticated and provided greater insight into the issues of delayed discharge. Although it is important to stress that there are no "right answers" in demonstrating alternative strategies for a complex issue, figure 8 shows the learning points that emerged from the model.

Fig 8: Learning Points from the Delayed Discharge Model

Common sense solutions can be misleading

- Adding capacity in the acute sector without re-balancing resources across the whole pathway can exacerbate the situation
- Adding capacity to stocks in a situation where demand is rising is not a sustainable solution: it is better to adjust flow variables

Fines may have unintended consequences

- They can cause the post-acute sector to cut services which exacerbates both delayed discharge and waiting lists
- The effects of service cuts may spill over into other areas
- If fines are levied they need to be re-invested from a whole systems perspective

There are some interventions that can help

- Re-balancing resources across all the sectors (NOT just adding to hospital capacity)
- Balancing flows through different routes/reducing lengths of stay (better than capacity)
- Addressing variation in flows (particularly loops like re-admission rates)
- Keeping people out of hospital is more effective than trying to get them out faster

The refined model was shown at a national conference run by CAT, and achieved a significant impact (as judged by follow-up enquiries which continued over the following 10 months). The impact was probably due to:

- Topicality – at that time, re-imbursement was still scheduled for autumn 2003 and people were anxious to find ways to understand the underlying issues and make useful interventions
- Novelty – health and social care managers were pleasantly surprised at seeing a "visual" way of demonstrating business issues. The dynamic nature of the model (where we could "go back and try again with a different set of parameters") was appealing
- Contribution to joint working – the "threat" of fines had possibly increased the determination of partner agencies to stand together and find "win-win" solutions. They liked the way in which modelling allowed partners to visualise each other's situation and share understanding of common issues
- Endorsement by CAT (official sanction undoubtedly influences behaviour in the public sector)

On completion of the work with CAT (April 2003), OLM Consulting and Cognitus sought a local economy where the refined model (now packaged as a template commissioning tool) could be put to use. In the event, two different opportunities arose:

- A London borough wanted to buy the model and apply it in their own way (with help, as required, from OLM Consulting)
- A shire county commissioned a participative project to build their own commissioning model, but using the template as a reference point

Using the Commissioning Template at a Local Level

We were unsure whether a model developed with managers on the "national stage" would have any relevance at a local level. Initially, there ***was*** a degree of scepticism, but it related to modelling in general rather than the concepts in this specific model. In both cases, participants quickly lost their doubt and became thoroughly engaged in scenario-testing and discussion of cause and effect.

The most important result was that staff from different agencies quickly developed a thorough understanding of how changes in one part impact on the whole system:

"If you do that, it will mean this for me. If I do this, it will mean that for you etc."

Use of the model also led to a more informed discussion about capacity planning. In particular, the model assisted members of health and social care joint planning arrangements to understand that:

"If we create more capacity here, we need to change behaviour there to generate the right number of referrals, and it will mean an increased number of referrals on to that other service a few weeks later."

In both cases, the participants agreed with the main concepts in the model but wanted to add additional care pathways and change the rules governing proportions using

particular services (and sometimes the sequence in which services were made available). This raises the question about the universality of a template, but it appears that:

- The template offers a useful introduction to the concepts of SD
- Groups prefer to see something first, rather than literally start with a blank sheet of paper. They are then better able to articulate their own assumptions about the local situation
- Groups may explore different concepts, but often return to the template and modify its structures rather than starting again
- The template can evolve through the contributions of each project

Based on this experience, and the advice from national agencies and local partnerships, our modelling approach has been very significantly redeveloped in the following ways:

- To allow different models of demand for hospital admission (e.g. the current seasonal pattern versus more random fluctuations)
- To allow different configurations of preventive service (e.g. extended primary care services, intermediate care, services attached to a Medical Admissions Unit)
- To reflect the choices involved in deploying community services such as domiciliary care (how much to use for preventive service versus post-acute needs)
- To allow a choice of patient characteristics governing pathways through medical beds (currently based on "fast" and "slow" treatment paths)
- To reflect a different mix of patient characteristics where additional capacity is created (e.g. additional intermediate care beds would allow less dependent patients to access the service)
- To add new pathways for surgical emergencies and older people with MH problems being admitted to medical beds
- To reflect the practice associated with medical patients being placed in surgical beds when acute medical beds are full (these patients are known as "medical outliers" - in some hospitals, they will remain in the "wrong" beds, in others they will be moved back to medical beds when space allows)
- To reflect the practice associated with discharge (in some hospitals, patients will remain in current beds, in others, they will be moved to "discharge beds")

A common observation during the local projects was that the data collected for government returns is ***not*** generally the data required to populate the model (and so, by definition, not the best data for managing a complex system). As mentioned in section 3, government returns have proliferated following each new policy or directive, and performance indicators are often chosen as proxy measures, more because they ***can*** be measured rather than because they are the ***right*** measures**.** The principal difficulty in the local projects was in collecting flow data – incidence rates, lengths of stay, proportions flowing down a particular route – and yet this is the key data for determining required capacities and measuring key performance criteria such as throughput and delays.

The experience of the two local projects confirms the main learning points (see figure 8) and reinforces the impression that managers need tools that will help them to understand their own operations in "flow" terms. Hence, capacities across the patient pathway are often out of balance. In particular, intermediate care has been introduced on the basis of government imperatives, but without any informed view of the required capacity and how it will affect other parts of the system. ***The issue of delayed discharge can therefore be seen as a symptom of general problems in joint commissioning.***

Mental Health: Specific Issues and a Growing Interest in Whole Systems

OLM Consulting was already involved in work with one of the regional centres of the National Institute for Mental Health in England (NIMHE) and decided to seek interest in developing a whole systems model for use by mental health managers. The focus of interest here is not delayed discharge, but rather the dynamics of managing cases in the community to avoid institutional care. A NSF for MH was published in 1999 and significant funding was promised in the NHS Plan (see figure 2). This created opportunities for innovation in mental health services, but services are currently fragmented and there are significant issues in seeing the "big picture".

In July 2003, two situations presented themselves:

- A prison was redeveloping its healthcare facilities and wanted to know how many beds it should plan for
- A PCT was reviewing its forensic strategy and wondering if there was sufficient challenge to current assumptions

These were different applications of SD, based on the need to provide evidence to underpin business cases that the organisations were developing. The same approach was taken: setting up multi-agency "expert groups", offering an initial model for discussion and building a consensus on structure and data through a series of meetings. In both cases, there were initial tensions between the commissioners (the PCT which was funding prison beds or forensic facilities) and the providers (the prison healthcare centre and the mental health trusts providing the forensic beds). However, the groups quickly engaged with the visual demonstration of "their world" and developed an informed dialogue on the potential for change:

"If we can transfer mental health patients from the prison more quickly, we can reduce dependency on beds and may want to invest in more flexible facilities in the new healthcare centre."

"Continuing to add forensic beds is not a sustainable option. If we decided on radical reductions in length of stay, we could reconfigure services and invest in more community options. The key factor is the assumptions made during assessment."

In both instances, the business cases were modified as a result of testing alternative scenarios with the SD models.

Meanwhile, OLM Consulting continued to talk to contacts about the possibility of developing a national template for MH, dealing with the breadth of commissioning issues explored in the delayed discharge template. The fragmented nature of mental

health services became apparent: most experts "saw" particular dimensions of the model, but few were in a position to "see" the whole picture. For instance, a forensic commissioning manager might want to explore aftercare services, whilst a public health manager would want to focus on predictors of mental illness and early detection/prevention. The Probation Service were interested in the debate over treatment versus punishment for mentally-disordered offenders and community services were struggling to find the best balance of primary care and specialist teams (given the prescriptive nature of new services announced in the NHS Plan).

We have developed an early version of a whole systems model for MH by integrating smaller models created for specific issues and, at the time of writing, opportunities are opening up for the possibility of a national project.

The Appeal of SD: Other Interest Expressed in the Approach

Since introducing the SD approach in health and social care, OLM Consulting has been asked how it might contribute in a number of areas. These include:

- Process redesign: We have advised that SD may be a good way to scope an area of interest and understand the leverage points before dropping down into the detail of constructing process maps. One weakness of current initiatives in process improvement is that there is no rigorous way of choosing the process which will yield most benefit from redesign, nor of anticipating how redesign will affect other parts of the process. SD can help with both these issues and complement lower level approaches to process mapping
- Workforce planning: The current practice of using spreadsheets to derive required numbers of recruits and training places is flawed where feedback loops operate (e.g. greater likelihood of qualified staff leaving to gain promotion). SD is able to model these behavioural issues
- Targeting of technology for addressing operational issues. As with process redesign, this enables organisations to identify the best leverage points before applying IT (and other technologies) in ways which may not repay the investment (and may, indeed, have unintended consequences)
- Predicting outcomes of a policy in order to set operational targets. SD provides a way to set more realistic expectations of what can be achieved by a policy, given current operational constraints and potential effects on other parts of a complex system
- Identifying appropriate performance indicators to give robust control of a business area. SD identifies leverage points in a complex system and these are the areas of operational practice which need close monitoring in order to provide early warnings of pressure building in the system. Examples for delayed discharge are demand at A&E, early discharges and medical outliers
- Reviewing spreadsheet-based business plans for large-scale investments. The key question here is to what extent an investment now will be affected by proposed changes in the whole system environment feeding the investment point.

We feel that the work to date has been particularly successful for the following reasons:

Management Receptivity:

- The degree of complexity and flux in health and social care is causing managers actively to seek ways of gaining insights. They are recognizing that dynamic complexity (number of linkages) is often more critical than detailed complexity (number of elements)
- There is an increasing need to interpret at the local level the many national framework guidelines being generated
- There is a willingness to engage in the (often demanding) process of externalizing mental models with a range of partners and working through different perspectives of the whole system
- There is a recognition that local performance improvement will not come through collecting ever-increasing amounts of data and that today's data will always be inadequate to assist planning the future. Managers are realizing that the data they need actually comes from "what if?" scenarios which test what happens under different agency actions and counter actions over the medium term.

The Intrinsic Merits of SD, Illustrated through the ithink© Tool:

- Sound academic basis
- Ability to cope with sources of complexity (variable demand, capacities, proportions flowing through a pathway, lengths of stay, dynamic effects on onward pathways due to upstream interventions, feedback loops)
- Combination of strategic overview with appropriate detail (granular treatment of processes)
- Ability to change any variables or devise pre-set runs for training purposes
- Visual appeal of graphs and other output devices

The OLM Consulting Approach:

- Emphasis on using modeling to create a learning environment: participative approach and involvement of expert group at every stage. No "backroom" tours de force presenting a completed model to an astonished audience!
- A willingness to combine the use of relevant national (generic) templates with a flexible approach to the specific needs associated with local applications
- Careful discussion of management expectations and model development timescales
- A commitment (however time-consuming) to help local projects with the issue of data mining
- The use of moderately priced, stepwise project stages so that project risk is minimised for both client and consultant

Conclusions and Predictions for the Future

This paper has described two areas of work (patient pathways through hospital and mental health applications) where we have demonstrated the benefits of using SD in conjunction with **ithink©** to influence and interpret policy in a systemic way.

The experience has been very positive at both national and local levels in the English health and social care field. Although we have not yet been able to work directly with policy-makers at a national level, there are indications that SD has been noted and that its use by campaigning organisations (such as the LGA) has made a difference to the details (if not the substance) of emerging policy. Take-up for the delayed discharge template at a local level has been very promising, with two completed projects and a number just starting. Executives and senior managers have, on the whole, been quick to appreciate the potential of SD to provide a more rigorous approach to strategy, commissioning and performance management. The most rewarding experience, however, has been witnessing operational managers change from sceptics to enthusiastic converts. Modelling requires a high degree of commitment and ability to deal with abstract ideas, and the simulation tool (**ithink©**) has been instrumental in providing the visual link which engages people's interest and fires their imagination.

The uptake of any new technique follows a predictable course, with early users pioneering and others waiting to see results before they decide to follow. The results with delayed discharge have been sufficiently compelling to attract at least one significant adopter – a SHA. There are 28 SHAs in England and Wales, and they play a key role in managing performance of the primary care and acute sectors within their region. They can also play a part in developing centres of excellence in various strategic, management or operational skills. If other SHAs were to follow suit, the dissemination of SD within the health service would be greatly accelerated.

The use of SD within MH is at an earlier stage, but there is a chance that the relatively "new" institutions of mental health (e.g. NIMHE) may look to new techniques to capitalise on the government's investment through the NHS Plan. MH has a significant challenge in redressing the public image of patients as "mad and bad" and promoting informed public discussion about depression, cognitive disorders, psychosis, schizophrenia and the like as treatable conditions requiring, above all, support for living a normal life in the community. In order to create dramatic shifts in service (from institutional care to community support), there is an urgent need to provide rigorous quantified business cases for investment – and this is one of the strengths of SD.

Ultimately, the best chance for widening the reach of SD within health and social care is to create "communities of interest" at the manager and practitioner level, which will preach, practise and attract further members. OLM Consulting hopes, by making each customer self-sufficient, to establish independent user groups or learning sets who can fulfil this function.

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Glossary of Terms

Accident and Emergency – A&E

Change Agent Team (of the Department of Health) – CAT

Commission for Healthcare Audit and Inspection – CHAI

Commission for Health Improvement – CHI

Commission for Social Care Inspection – CSCI

Computed Tomography – CT

Department of Health – DoH

General Practitioner – GP

Health Authority – HA

Information Technology – IT

Local Government Association – LGA

Magnetic Resonance Imaging – MRI

Mental Health - MH

National Care Standards Commission - NCSC

National Health Service of the UK – NHS

National Institute for Clinical Excellence – NICE

National Institute for Mental Health in England - NIMHE

Office of the Deputy Prime Minister – ODPM

Primary Care Group – PGC

Primary Care Trust – PCT

Private Finance Initiative – PFI

Social Care Institute for Clinical Excellence – SCIE

Social Services Inspectorate - SSI

Social Services Department – SSD

Strategic Health Authority – SHA

System Dynamics – SD

For the benefit of non-UK readers, unless otherwise indicated the word "national" means "England-wide". The word "government" refers to the UK-government, which controls health policy for England only. A variety of devolved arrangements applies in Northern Ireland, Scotland and Wales.

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