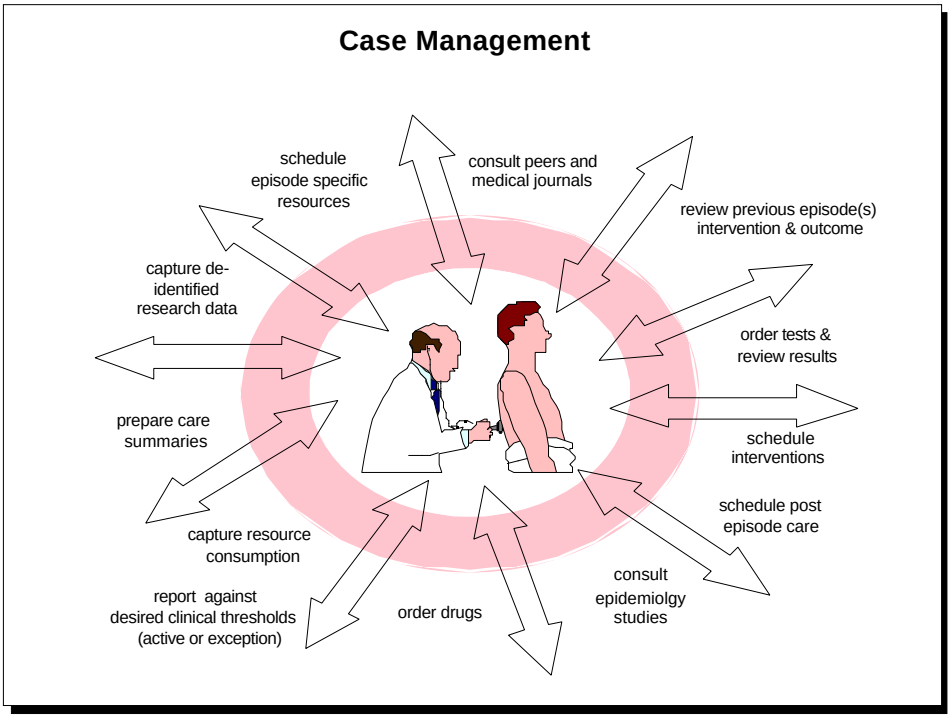
Department of Human Services

Information, Information Technology & Telecommunication Strategy for Victorian Public Hospitals

Final Report



December 1996

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Figure 1: Change Drivers of Victoria's Public Hospitals

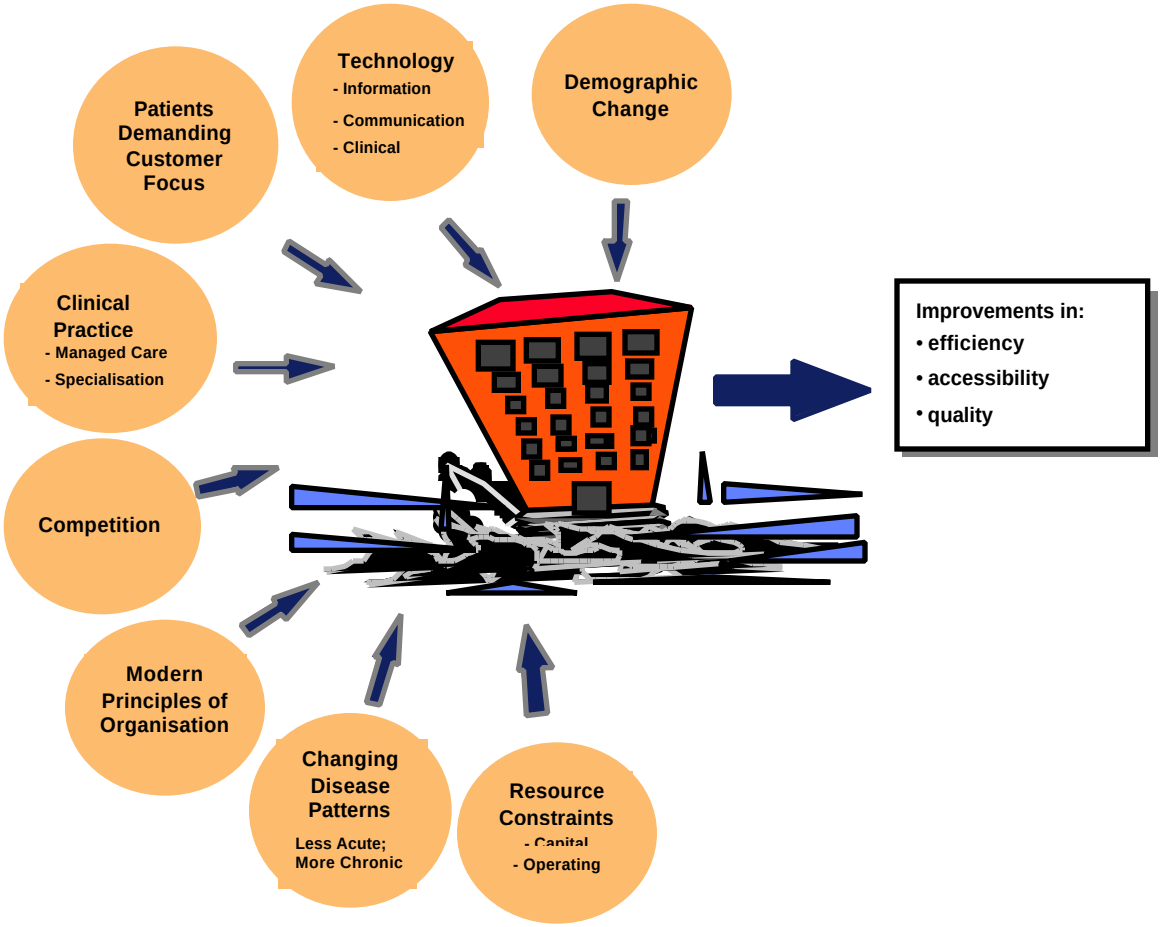
This 'observation', taken from Victoria's Health to 2050 represents the policy framework and economic environment within the Information, Information Technology and Telecommunic Strategy was developed and will be implemented.

excerpt and adapted from Victoria's Health to 2050

Observation # 6 The role of public hospitals in the near and long term must be reassessed as part of the change process.

"...the existing structure of the principal organisation which delivers health care is coming to an end...Over the past century the development of the hospital has involved cramming more and more services into the one location....But will hospital development continue in this direction? We think not. We believe the hospital of the future has reache evolutionary branch."

Braithwaite,J., Vining, R.F. and Lazarus., "The Boundaryless Hospital", Australian and New Zealand Journa Medicine, 1994, 24, pp.565-571



Adapted from *"Victoria's Health to 2050"*

1.0 Introduction

1.1 The Imperative for Change

The Health Industry, and public hospitals especially, have experienced considerable change over the past decade. The dynamics and trends in health care globally indicate that the pace of change will not decrease. Hospitals will be required to be more flexible, responsive, and customer focused, provide care in a range of physical hospital settings and link more closely with health care providers outside of the public hospital domain.

Integrated health care capability is the central theme of transformation agenda.

Victoria's Health to 2050 outlines the future direction of the health industry for Victoria. [Figure 1] To achieve this vision of a long term sustainable transformation, considerable investment in the supporting information, technology, people and processes will be required. There will be a growing interdependency among traditionally separate health care providers. Clinicians will need to be able to manage care longitudinally and through a series of providers, across health care settings, and episodes of care.

The vision of an integrated health care model requires an integrated information resource.

Future information needs for effective and efficient integrated clinical care will require major shifts in access to information:

- from *single point of use* to instant access by multiple users at multiple sites;
- from *retrospective review* to single point access to integrated information from multiple sources;
- from *one episode at a time* to integration of patient problems and clinical information across episodes; and.
- *an increasing demand* for access to concurrent and interactive use of clinical information, decision support and protocols

Information technology will be critical to the provision of integrated effective & efficient health care.

All of these changes require an ability to consistently and intentionally manage patient and service information in a manner that is far more complex than has been the practice in the past. The linkages will be critical. [Figure 2]

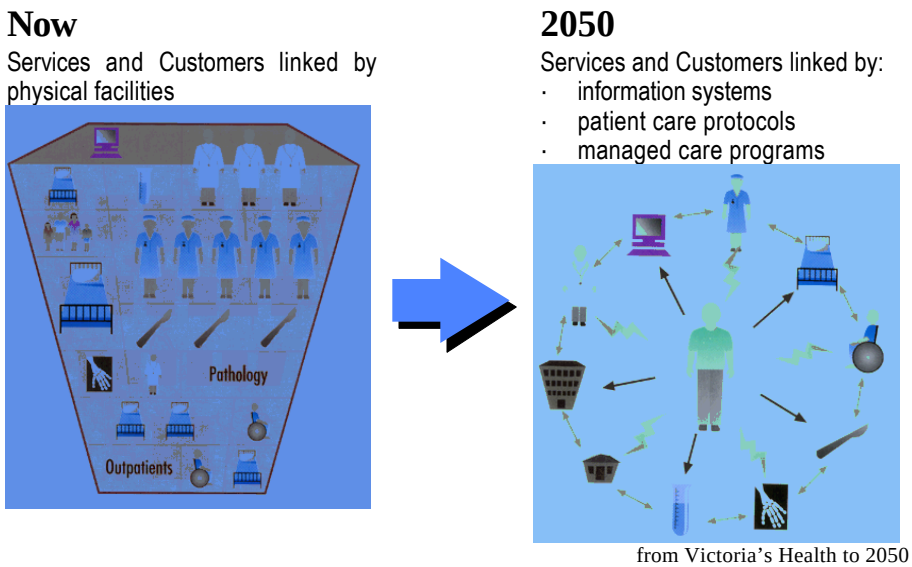
> *'There needs to be strong linkages between the core and the peripheral units.. .The transition from a self-contained and well-defined hospital to an elastic, boundary-less, loosely networked, diffuse health care arrangement....'*
>
> excerpt from *Victoria's Health to 2050*
> Braithwaite.J., ibid

In simple terms, hospitals face the challenge of continuing to do more with less.

Critical factors driving industry change within Victoria's public hospitals are quality, access and efficiency of patient care. Sustainable effectiveness and efficiency will be achieved through a combination of improved decision making capability, the use of effective and integrated information, and work practice change. These will improve the ability to deliver quality health care in a way which makes it more accessible and 'user friendly'.

Figure 2: Target Health Care Linkages

The flow of information must follow the flow of patient care.



from Victoria's Health to 2050

1.2 The Current Information Environment

Information technology is not adequately exploited as a performance enabler.

The review of the information environment during Stage One determined that current I, IT & T capabilities in most public hospitals provide sub-optimal support for many hospital activities. In fact IT usage in most hospitals appears to be at least a decade behind many commercially oriented organisations. Furthermore, current capabilities would provide negligible support for the anticipated clinical care and business processes inherent in an integrated health care model.

The primary contributing factors to this current position include:

- past under investment over an extended period of time;
- changed focus of service delivery and management from functions to cross-functional processes or pathways;
- a perceived shortage of vendor offerings aligning to the process view of hospital functions, yet offering patient-focused access to integrated information;
- a lack of understanding of the critical role that effective and efficient use of information and IT can play within the hospital;
- an absence of clear and articulated IT plans aligned with clinical and business objectives;
- relatively few examples of successfully integrated IT in hospitals;

- unsophisticated management of IT at many levels in hospitals; and a lack of IT expertise specific to the health care industry.

The right information is not available at the right time at the right place

The Stage One review found an information environment where:

- information technology is outdated, fragmented and not oriented to achieving current and future business and clinical objectives of hospitals;
- extensive data exists but is not available in ways, at places and in formats that support business and clinical objectives;
- diverse sources of data exist which nominally use common data elements, but the lack of data standards means that they are not semantically equivalent, and are therefore not comparable or able to be linked through technology;
- data is not easily accessible and therefore, contributes to inhibited decision making and potentially slower improvement programs for both patients (length of stay) and the hospital business management;
- the accuracy of data is often questioned and therefore reviewed, leading to major process inefficiencies;
- acquisition of information technology seems to be largely on an *ad hoc* basis and does not enable integration of information or systems;
- users are generally unhappy with existing systems, but are enthusiastic and willing to rethink business and clinical processes and the role of IT in facilitating change;
- users are not the major drivers of information systems projects

Hospitals and Government see IT playing a critical role in achieving gthe transformation agends. Low IT capabilities mean that there is a large gap to close.

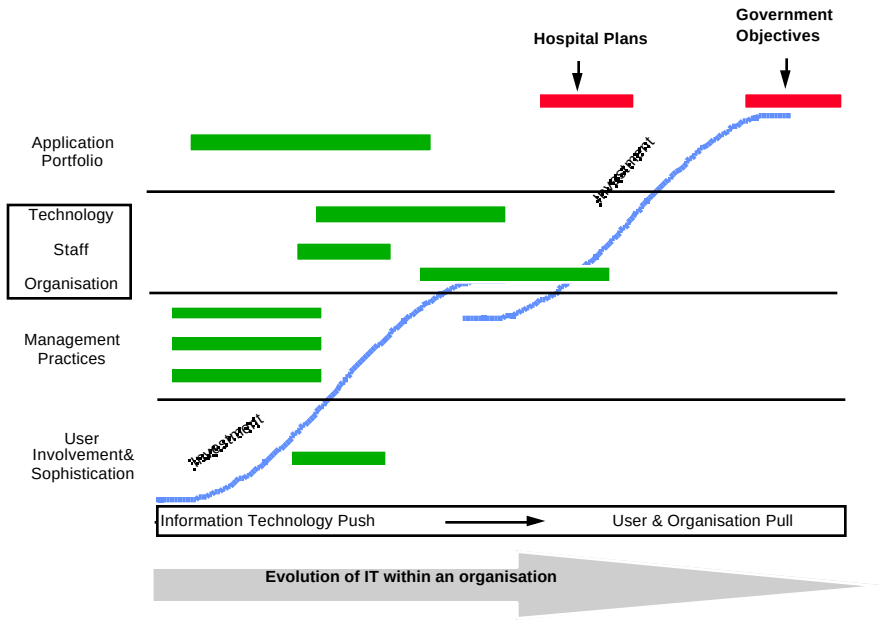
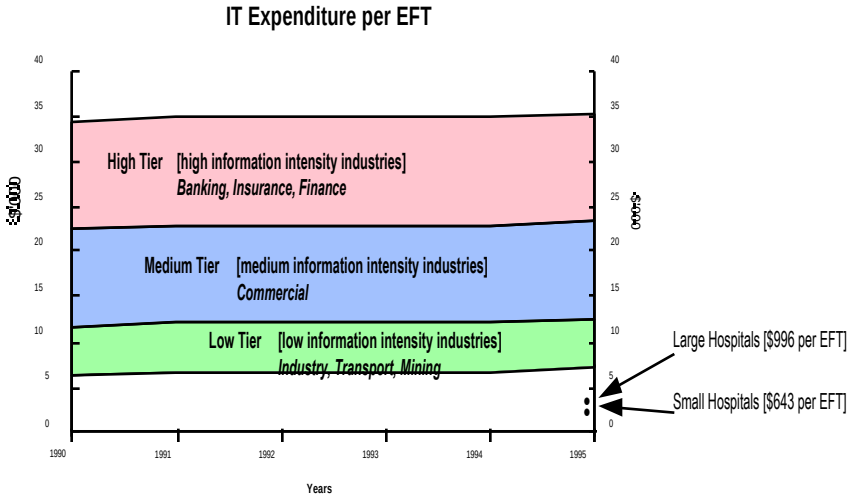


Figure 3: Evolutionary Positioning of Victorian Public Hospitals

This low baseline, and the high targets set by the vision for health care means that a significant gap needs to be traversed on the path toward the highly integrated health care environment. A multi-dimensional investment program, phased over several years, will be required to close this gap. The critical success factor is the commitment of senior management and financial resources.

Industry comparisons show that information technology capabilty in most public hospitals is at least a decade behing most commercially oriented organisations.

Figure 4: Victorian Public Hospital IT expenditure per EFT compared to other information intensive industries.



Source: NNC Benchmark Data

Many diagnostic tools were used in Stage One to determine the level of maturity of public hospitals in their deployment of information technology. One such tool is a comparison of annual information technology expenditure per equivalent full time staff member against international benchmarks for other industries.

The analysis of this diagnostic supports the conclusion that hospital management in Victorian public hospitals does not perceive information, information technology and telecommunications to be an important resource, related to other capital investment opportunities.

IT spending has remained historically low and restricted in coverage. Although clinicians work in an information intensive environment, there is scepticism that IT leads to performance improvement, as has been demonstrated in other industries. A major contributor to this belief has been the lack of integration of IT implementation with improvements in the clinical and business processes, and subsequent measurement of benefits.

IT may make the work of health professionals easier, and reduce "nuisance" work, but may not significantly reduce the need for the level of staffing. IT investments will only yield enough benefit, when implemented within a framework of performance improvement incorporating hospital care process redesign.

1.3 As a result of the findings of Stage One..

The work plan for Stage Two was adjusted to focus on the following themes:

- develop and/or adopt health industry information standards;
- improve information exchange and communication capabilities supporting patient care;
- improve the management of information and information technology within public hospitals;
- develop a model of best practice for a public hospital applications portfolio;
- develop an approach for discovering innovation;
- develop a framework for testing feasibility and transferability of initiatives;
- introduce a more systematic approach to the funding of information, information technology and telecommunications.

2. Key Issues for the Strategy

2.1 Linking to community-based care

The scope of the current strategy is limited to public hospitals. Within a framework of integrated care, this represents an artificial boundary. The strategy was required to allow for expansion to cover the broader health care sector in the future. Implementation of the strategy without addressing this expansion of scope to the broader parameters encompassing community-based providers, General Practitioners and the private sector, may impede the progress of the evolving integrated health care model of service delivery.

Information must be linked across care providers and settings to achieve an integrated health care service.

There is a strong recognition that a significant and critical portion of patient information exists outside the current scope. This information must be linked to achieve a record of the profile of care of the individual over time, and to facilitate the provision of seamless care between providers and care settings.

This will become increasingly important as the policy objectives move more care outside of public hospitals, diminishing their dominance in health care provision.

A key outcome of the I, IT & T Strategy is the ability to electronically transfer information between hospitals and other providers. It is critical that the evolution of IT capability, and development of information and technical standards in the community-based and private health sectors be synchronised with the phasing of the hospital I, IT & T Strategy to enable this transfer of information.

The existing scope must be expanded to include these providers, or ensure that information resource planning activities of other programs, providers or health sectors reconcile with the public hospital information resource standards and directions.

2.2 Privacy and Confidentiality

As hospitals, and the health care industry in general, progress towards a model of integrated health care, the issue of protecting privacy and confidentially becomes paramount.

Integrated health care must be delivered in an environment which safeguards the confidentiality of patient information,

Furthermore, the National Health Information Forum held in November 1994 identified "the linkage of identified records of individuals as the single most cost-effective method for enhancing national health information" over the next decade.

2.2 Privacy and Confidentiality (Cont'd.)

As hospitals move through each phase of the strategy, the issues of privacy and confidentiality must be addressed before linkage, and hence integration, can be undertaken at each the various levels. Comprehensive, effective and enforceable privacy legislation is essential to lessen the

concern of patients and clinicians about the data linking, security and access.

Ownership or custodianship of data is also an issue which needs clarification. Advances in technology and information management will eventually enable patients to control access to their own records.

2.3 Telemedicine

Telemedicine must be integrated within the infrastructure to optimise benefits.

At the time of initiation of the strategy, pilots were already underway to explore telemedicine as an option to improve access to health care services. It is important that any strategy for telemedicine be linked to the public hospital Information, Information Technology and Telecommunications (I, IT & T) Strategy. Telemedicine will be more efficiently and effectively provided if it exists within the integrated information infrastructure designed for public hospitals and other care providers.

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2.4 Clinical Technology

Interface standards are critical for clinical technology to directly transfer clinical information to information technology.

Increasingly, a variety of clinical technologies are growing in importance to clinical decision makers as a primary source of data. These clinical technologies were held to be too varied and complex to be adequately addressed within the timeframe, and were determined to be outside the scope of the strategy.

Clinical technologies, as sources of critical, and increasingly digital, information, are now beginning to interface with other more broadly focused information technologies. It is therefore vital that interface standards between information and clinical technologies be addressed during the development of information definitions and standards (eg HL7, CorbaMed, Edifact, etc).

2.5 Implications for Metropolitan and Rural Hospitals

Another key observation of Stage One was that metropolitan and rural public hospitals had a different set of requirements and issues to address in meeting their business and clinical requirements, and integrated health information policy objectives. As result, the strategy addresses metropolitan Health Care Networks and rural hospital requirements separately.

2.5 Implications for Metropolitan and Rural Hospitals *(Cont'd.)*

In Stage One, it was determined that most hospitals do not have the resource base to implement the full requirements of the I, IT & T Strategy on their own. The establishment of metropolitan Health Care Networks has provided a broadened resource base for the metropolitan hospitals under a formal organisational structure. This resource base does not exist for rural hospitals.

Many rural hospitals have expressed considerable interest in working together to solve their collective requirements. It will be important to determine how rural hospitals can optimise the deployment of information technology. Stage One recommended the formation of 'Hub and Spoke' relationships to broaden the resource base of the rural hospitals, while still ensuring individual hospitals management autonomy. This report further explores the implications of this recommendation.

3. Approach for Stage Two

The strategy focuses on a cross-functional "patient pathway" view of health care.

The learning experiences of Stage One, argued for modification of the original approach proposed for Stage Two. The business model was adjusted to focus on a logistics or patient pathway view of health care activities and placed relatively greater emphasis on clinical information systems and their appropriate pre-requisites.

The key streams of activity in Stage Two therefore included:

- creation of a system of public hospital, industry and DHS reference groups to review and comment on findings; conclusions and directions as they were developed;
- clarifying relevant operating assumptions and philosophies underpinning the strategy and relationships within the industry;
- customising a conceptual framework to stage implementation of the strategy;
- adjusting the functionally-oriented Business Model created in Stage One to a cross-functional pathways or logistics view of the public Hospital;
- developing a high level suite of public hospital information systems appropriate to the new business model and review their functionality with key groups;
- determining the pre-requisites and infrastructures required to support the successful implementation of these information systems;
- estimating the qualitative and quantitative risks, benefits and returns of strategy implementation; and

- given the low resource base of individual rural hospitals, developing a structure to exploit the limited resources available and leverage them to as many hospitals as possible.

- plotting a path forward.

3.1 Health Industry Collaboration

Active health industry involvement helped determine the directions and shape the solutions

Engagement of the health industry in identifying the problems, and developing of solutions was seen as a critical factor in the project. To achieve this, consultation with, and communication to clinicians, managers and other information users in hospitals had to be maximised

A successful collaborative framework was established between the hospitals and DHS during this process. This framework should be maintained as a foundation for a partnership to achieve the strategic intent of the project: *to raise the level of information resource capability in hospitals to ensure sustainable effectiveness and efficiency in health care provision.*

A wide range of key groups was established to work with the project team, in varying degrees, to determine the directions and shape the solutions for the strategy. Figure 5 identifies the consultation framework for Stage Two, and the key groups involved. [Appendix 1 contains the names of those involved.]

In order to add value to the final stages of the strategy development, Simsion Bowles & Associates were contracted as an independent consultancy to review the assumptions, directions, findings and recommendations. This review, in general, validated all areas of the strategy.

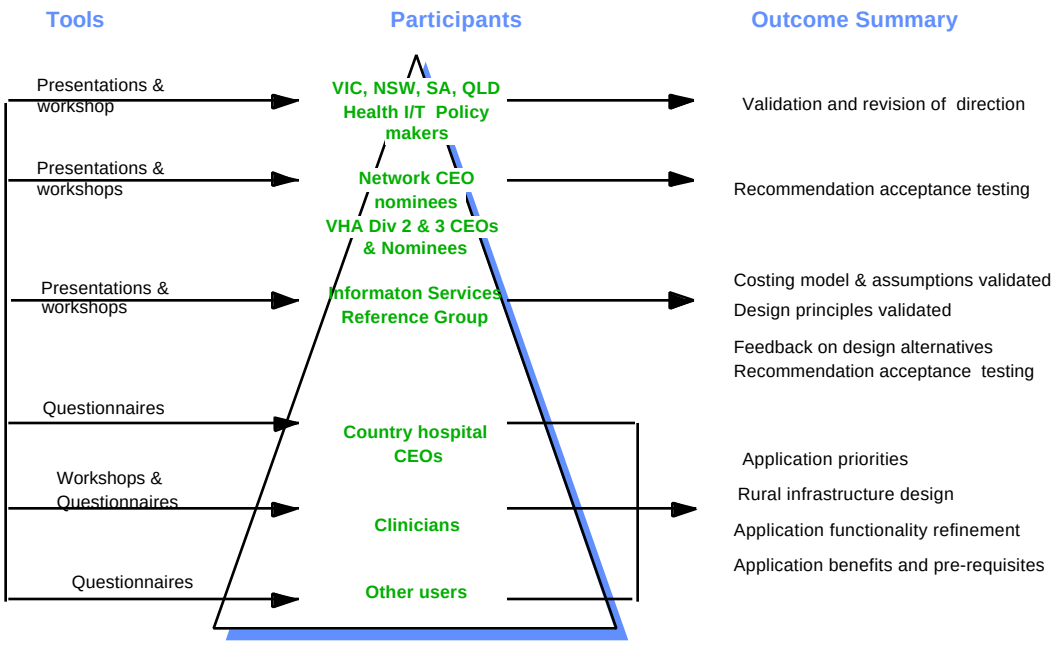
In addition to these formalised feedback groups, several presentations and workshops were conducted with interest groups. These groups also were asked to comment, and test assumptions used in developing the strategy and its' implications. These groups are listed in Appendix 1.1a.

Finally, copies of the Stage One Report were forwarded to key clinical colleges and professional associations for comment.

Figure 5: Stage Two Consultative Groups and Activities

Metropolitan Health Care Network Chief Executive Nominees: During Stage One several presentations of findings and conclusions were made to Network CEOs and key senior management teams. In recognition of the fact that successful implementation of the strategy would require senior management commitment from the teams managing over 70% of Victoria's public hospital costs, a reference group of CEO nominees from six of the seven Networks met three times as a group to review findings, conclusions and financial implications of strategy recommendations. Feedback and comment was invaluable.

Information Services Reference Group: During Stage One it was concluded that IT management practices within areas and generally throughout hospital management required focused enhancement. It was also identified t many hospitals had little or no IT specific management expertise. These facts influenced the formation of an Information Services Reference Group. This group me four times formally, and several times informally to vali assumptions, adjust direction, offer advice, review find & assess the viability of recommendations. This group significant influence over the strategy.



Clinical System User Workshops: During Stage One, a series of 15 workshops, involving 180 clinical and non-clinical users, and extensive interviews were conducted in Networks and in 12 representative hospitals. During Stage Two, nine multidisciplinary workshops, focussing on clinical activity, were conducted to develop and identify information system functionality, benefits and pre-requisites, and to review preliminary directions and recommendations.

Victorian Hospitals Association Division 3 Advisory Grou Many small hospitals (Division Three) cannot cost justify many of the information systems intended to support integrated care. Presentations and workshops were con with both Division 2 and 3 representatives several times during development of the strategy. Rural Base hospitals (Division 2) are as large and complex as many city hospi but often have a different relationship with community providers. The Steering Committee included the CEO of large rural Base hospital.

Non-Clinical Information System User Groups: Stage Two used questionnaires with non-clinical information system users from the representative hospitals to receive comment on information system functionality, benefits and pre-requisites.

Interstate Health IT Strategy Manage In recognition that Victoria has been slower to develop and implement an I strategy for health services than South Australia and N South Wales, representatives from these two states we to review recommendations and rationale. Input from tl representatives provided a comprehensive review of exp in Queensland, New South Wales and South Australia. advice shaped several recommendations.

DHS Cross-Program Reference Group: DHS manages health care activities through several divisions ranging from public health and primary care through to acute and aged care programs. Several presentations of interim findings and directions to this reference group ensured that opportunity for input was given to these programs.

Rural Hospital CEOs: CEOs of all rural hospitals were aske to prioritise their perceived issues and requirements for information systems implementation, and indicate any willingness to share information resources with other ho

3.2 Lessons learned from other States.

Valuable lessons have been learned from reflecting on the experiences of other States in the development and implementation of similar strategies.

Specifically, consultation with other States validated the approach being taken in the strategy, and re-enforced the direction of key areas such as:

- funding access contingent upon rigorous business cases;
- single-site piloting of integrated systems;
- 'proof of concept' testing to scope work practice changes and identify cost/benefit analysis for leveraging to industry;
- the importance of staged implementation of infrastructure consistent with supporting applications development;
- the critical nature of risk management in the long term;
- education of all staff to raise the level of user sophistication and involvement in the strategy implementation;
- early and ongoing communication of the strategy to the industry and the vendor community;
- high level IT expertise and IT management practice in hospitals;
- importance of clinicians in supporting and driving the change;
- inappropriateness of a single common solution for the Victorian health industry environment;
- the importance of achieving early visible results which provide demonstrable benefits and feedback to the change program.

3.3 Strategy Operating Assumptions, Principals, And Foundations

Rather than a centralist approach, the strategy is outcomes-based, focusing on supporting an integrated health care model

In line with the philosophy of the purchaser-provider model of service provision in Victoria, rural hospitals and Networks will be given management autonomy, but information outcomes will be non-negotiable.

The strategy does not mandate specific common applications, but rather targets an outcomes-based approach focusing on information standards and exchange, and clinical and business process improvement

The path for I,IT&T implementation in public hospitals must mesh with the existing autonomous management structure, while managing the risks of a large scale and multi-year industry development program.

The strategy is based on a set of shared assumptions.

Key working assumptions, principles and philosophies have evolved to guide the development of the strategy. These foundations are designed to make explicit a number of facts about the industry:

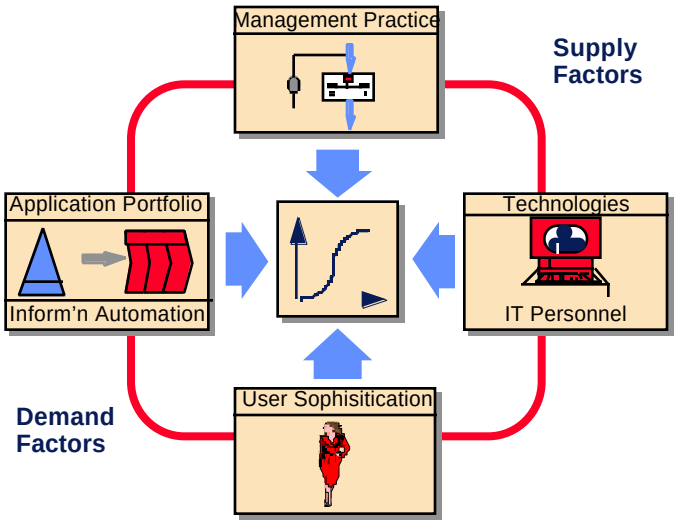
- all hospitals are starting from different levels, with some advancing rapidly toward the vision of integrated and information intensive health care;
- linkages to health care providers outside of the current public hospital domain will be a future requirement;
- few hospitals will be able to assemble the skills and resources to implement the planned I,IT&T capabilities on their own;
- many hospitals lack the financial resources to undertake the investments required to implement the strategy;
- investment risk can be managed through appropriate & co-ordinated management practice and skilled senior IT management personnel;
- hospital management teams are likely to take a greater interest in successful implementation if they are accountable for success, share funding, and are able to re-invest financial benefits above a reasonable threshold of expected benefit;
- integrated health care initiatives depend on information capabilities that span any one hospital;
- I,IT&T management practice within the industry is less sophisticated than desirable;
- the Department will describe desired 'outcomes' or targets of successful implementation of the strategy. Since many hospitals are beginning from different levels of capability, the outcomes are intended to give hospital management a target. There are no mandatory time frames for achieving the targets capabilities, however, the opportunity for funding access will not be open-ended.

3.4 Strategic Framework

The framework is based on a holistic organisational model along five dimensions.

The conceptual approach used to develop the strategy is that I,IT&T initiatives must be viewed from both a supply and demand perspective [Figure 6]. These dimensions are inter-related and must be addressed equally to achieve the balanced and sustainable performance improvements which can be realised through I,IT&T.

Figure 6 : IT Supply and Demand Factors: Five Dimensions



The model is a useful framework to plot position and plan progress

This framework was developed by Dr Richard Nolan of the Harvard Business School. The premise is that an organisation, logically and predictably progresses through six stages of evolution, along each of the dimensions, in the efficient and effective deployment of I,IT&T resources.

This evolutionary approach is described as the Stages of IT Model [Figure 7a].

All dimensions must be explicitly managed and co-ordinated. Evolution should be synchronous.

Ideally, all the dimensions are explicitly managed and co-ordinated. When the dimensions evolve at different rates, resulting in misalignment, the benefits of IT are under-realised and, in fact, IT often becomes a barrier to organisational performance improvement. Actionable initiatives are described in terms of the major phases of improvement which in sum will result in implementation of an I, IT & T strategy.

The extent of capability gap, and the current misalignment of the critical dimensions is evident.

Figure 7b identifies the position of the existing I,IT&T capability in Victoria's public hospitals along the five dimensions in the evolutionary path. The targets for the hospital service plans and the transformation agenda of Government are also highlighted.

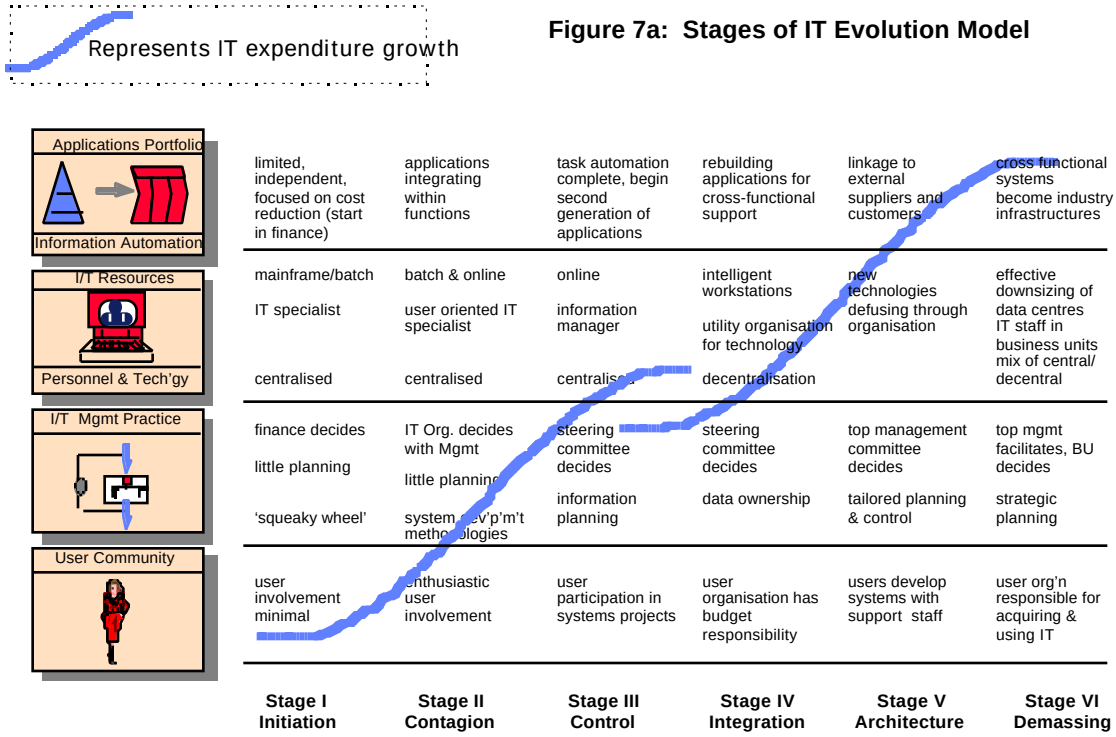


Figure 7a: Stages of IT Evolution Model

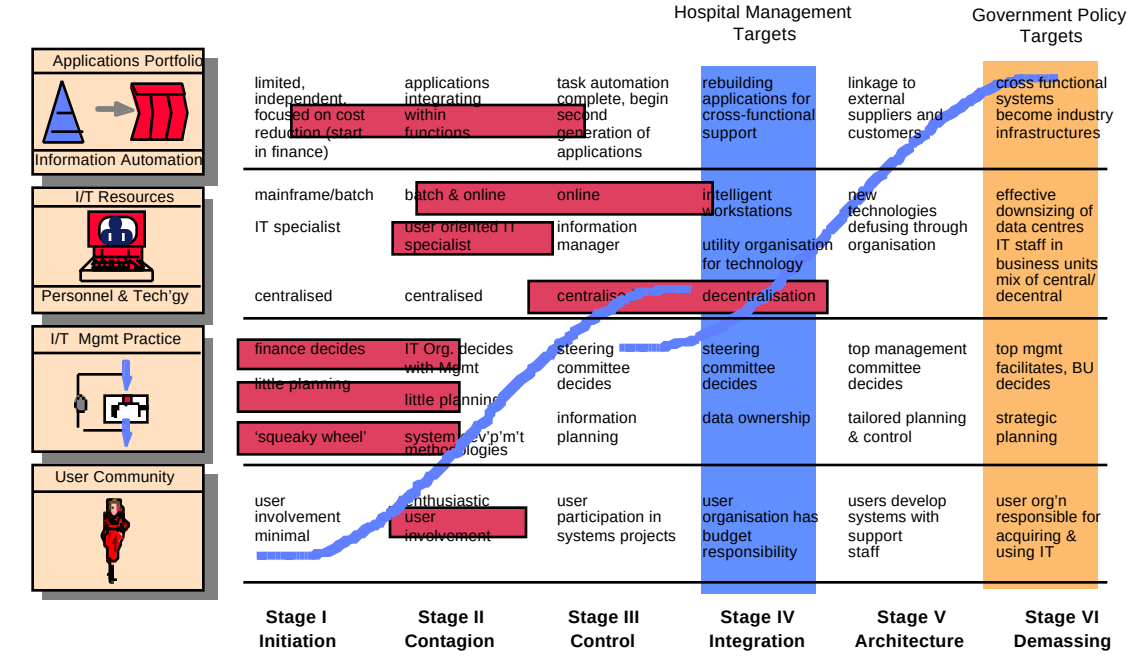


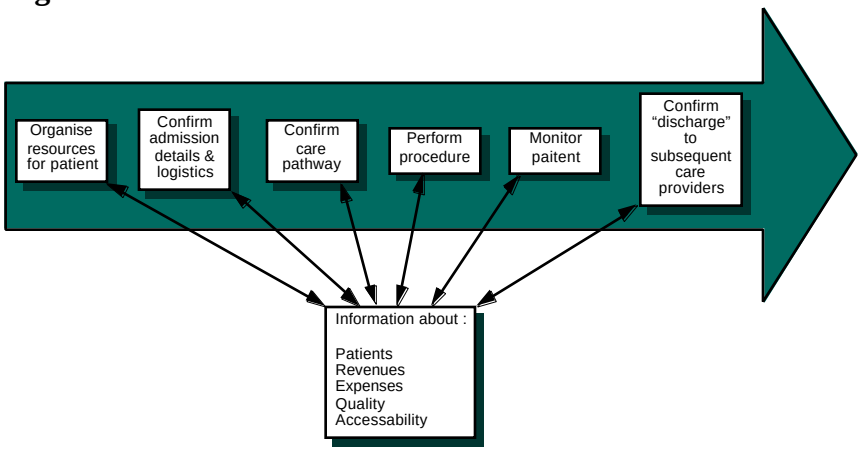
Figure 7b: Stages of IT Evolution Model Showing Current and Target Public Hospital Positioning (from Stage One)

3.5 Business Model

The business model is based on the concept of "patient flow" through care pathways.

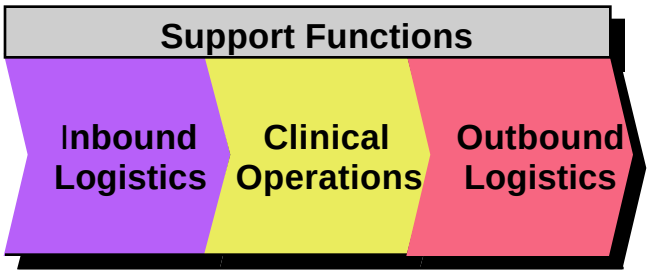
An important observation from Stage One was that most clinical and business personnel increasingly viewed the hospital as the physical location where patients "flow" through care pathways. This patient flow model [Figure 8], however, was not yet represented in supporting information systems.

Figure 8: Cross-functional Processes and Information Needs



The high level hospital business model developed in Stage One, was better revised into one which better reflected a patient flow from an integrated service logistics perspective.[Figure 9] It is derived from Michael Porter's Value Chain model of an organisation.

Figure 9: Logistic View of the Public Hospital



While the value chain usually applies to commercial organisations, it is increasingly being used in service industries, and is illustrative, at a high level, of the different types of activities undertaken in public hospitals..

Integrated service logistics is the management of capacity and the co-ordination of service delivery to the customer. From a logistics point of view, hospitals are incredibly complex. Material flows, as well as staffing and scheduling of beds, operating theatres and services, have enormous impact on the efficiency, quality and access in hospital patient care.

The public hospital oriented value chain has four main areas of activity:

- ***Inbound Logistics*** — Focuses on receiving the patient into the care facility. Typically, this would include admission, initial diagnosis, gathering information about the patient and similar related tasks. The objective is to determine if the patient can be efficiently and effectively cared for.

- ***Clinical Operations*** — Focuses on delivering the services the facility is expected and accredited to deliver. Typically, this would include subsequent or confirming diagnosis, treatment, post treatment monitoring and similar related tasks.

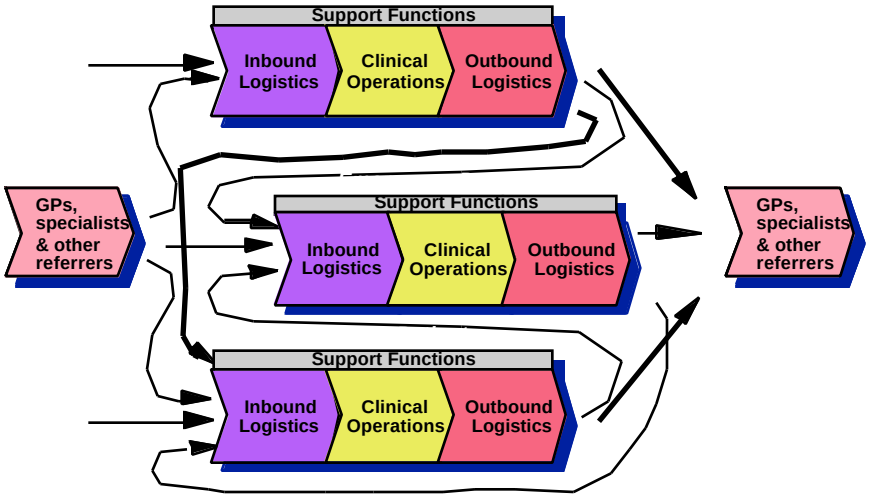
- ***Outbound Logistics*** — Focuses on transferring the patient to the next step of service, whether it be to the patient's home, to another care provider, or to another institution for chronic care. Typically this area would ensure the services delivered have achieved the desired outcome, assemble and issue billing for services rendered, transfer information about the service to subsequent care providers and similar related tasks. All of these tasks effectively conclude the service relation ship and ensure appropriate remuneration is received.

- ***Support Functions*** — Focuses on activities devoted to supporting the three groups of clinically oriented functions. Typically this would include the acquisition and disposal of resources consumed in any of the clinical areas, managing the overall direction of services, ensuring operational areas perform to desired targets, recruitment and management of personnel and interfacing with regulatory and external authorities, etc.

This logistics view of patient flow is not restricted to a single institution. In many instances, patients readily move from one hospital to another as part of a single episode of care, for chronic care, or during separate episodes [Figure 10].

The flow of information across the hospital, and to other providers must be understood.

Figure 10: Patient and Information Flows Between Hospitals



4.0 The Strategy Defined

With the Supply and Demand Dimensions framework, and the Stages of IT Model as a guide, analysis was conducted and key strategies have been developed to achieve a set of desired public hospital information capabilities in three successive phases.

4.0.1 Tiered Structure for Implementation Requirements

A tiered model of prerequisite capability in infrastructure and applications will ensure appropriate foundations are built.

It was evident from the investigations during Stage One that most public hospitals do not have pre-requisite information technology infrastructures to support many of the proposed integrating information systems.

As a result is was necessary to use a tiered model for information resources to clearly identify the pre-requisite foundations for infrastructure and applications. The model focuses on two of the horizontal dimensions of the Supply and Demand Dimensions framework: the Applications Portfolio and IT Resources (infrastructure technologies). Figure 11 describes the tiered structure required for successful implementation of the information infrastructure.

4.0.2 The Costing Model

Development of the costing model included both input variables and reality testing with the industry.

Each tier of the structure was discretely costed. The technical infrastructure was costed once per hospital site, and for each application, based on the appropriate subset of the portfolio.

Costing assumptions included factors for each hospital type (based on average size), such as:

The costing model was based on a generic set of assumptions.

- number of beds;
- staffing levels (EFT)
- patient throughput (inpatient and non-admitted patient);
- data traffic (specific to invisible infrastructure);
- the state of most existing systems and the technical infrastructure;
- physical layout, (eg. the number of rooms, including wards);
- no economies of scale or consolidated purchasing power are exploited (these are incorporated into the estimates at a later stage).

The outputs of the model were reality tested with the Information Services Reference Group at several stages.

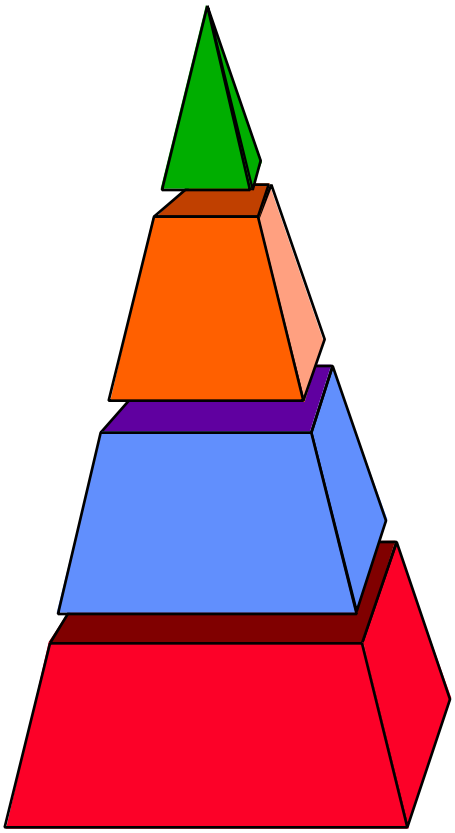
Output factors in the costing model included:

- the number of work stations per ward;
- a minimum average workstation ratio for full time clinical personnel in the peak shift appropriate for each clinical work group. The minimum average is targeted at 1 workstation for every 6 EFT [C, D & E hospitals] or 3 EFT [A& B hospitals].

Cost dimensions & assumptions are detailed in Appendix 2.1

Figure 11: Tiered Structure for Implementation Requirements

- Categorisation of each layer is according to commonality, visibility and the pre-requisite nature of each component.
- Each 'tier' or layer of the pyramid is dependent on the capability of the layer below.
- With the goal of raising the standard of I, IT & T capability in the greatest number of hospitals, the focus has been on the lower three layers :
    - Common Systems and Repositories
    - Visible Infrastructure
    - Invisible Infrastructure
- Unique information systems and databases were not addressed in the strategy
- The Common Systems and Repositories comprise the conceptual applications portfolio



Unique Systems and Repositories: information systems and databases supporting clinical and business processes unique to a small number of public hospitals' core work groups [eg. a family genetic history index, or a clinical endocrinology decision support system].

Common Systems and Repositories: supporting clinical or business processes common to most (ie 70%) or all public hospitals [eg. general ledgers, admission systems, workflow software and patient clinical record repositories].

Visible Infrastructure: relatively common & visible systems and technologies which on their own do not support specialised clinical or business processes [eg. basic workstations, printers, commodity software (e-mail, word processing, scheduling systems, etc.)]

Invisible Infrastructure: the technologies which enable the flow of information between physical points within and between hospitals. The category is further divided into: common information definitions and logical repositories; cables, routers and patch panels; and application, print and file servers.

4.1 Conceptual Applications

Greater emphasis was placed on the need for clinical information in the conceptual applications portfolio.

A high level mapping of information (as defined in the *National Health Data Dictionary* and several other Department and Industry health-related information documents) to business functions resulted in the formulation of a high level set of hospital information system requirements called the *conceptual applications portfolio*.

Conceptual applications are not information systems in the literal sense, in that they are not defined to the point of being "buildable". They are, however, extremely useful in refining requirements with user groups and assessing high-level opportunities and their feasibility.

A key observation of Stage One was that the majority of existing investments in public hospital information systems had been in administrative areas. As a result, Stage Two placed a relatively greater emphasis on clinical information systems for data gathering, decision support and where possible, automation of 'nuisance' and routine clerical tasks. This approach to devising the *conceptual applications portfolio* centres around the clinician and patient relationship.

A high level summary of the Conceptual Applications Portfolio is shown in Figure 12.

Access to effective, patient-centred, integrated clinical information will assist clinical decision making and improve care delivery.

The conceptual application portfolio has two key themes:

1. **To enable more effective and efficient care delivery**. This will enable clinicians to interface with other information systems from a single point, and therefore access the required clinical information in a patient-centred format. The interface, embodied in one of the systems described in the conceptual applications portfolio (Figure 13: the Case Management System) will also be the source of most patient data for electronic medical records.

Critical to both themes is the ability to link information on care and resources around a single patient.

2. **To enable more effective and efficient management of capacity and co-ordination of resources and services delivery to the patient**. A key feature of this capability is the linking of patient, fixed resource, clinician and support function activities and resources into a cohesive scheduling, planning and monitoring model.

Full descriptions of functionality, potential benefits and prerequisites for each conceptual application are documented in the technical papers in Appendix 2.2.

Figure 12: The Conceptual Applications Portfolio

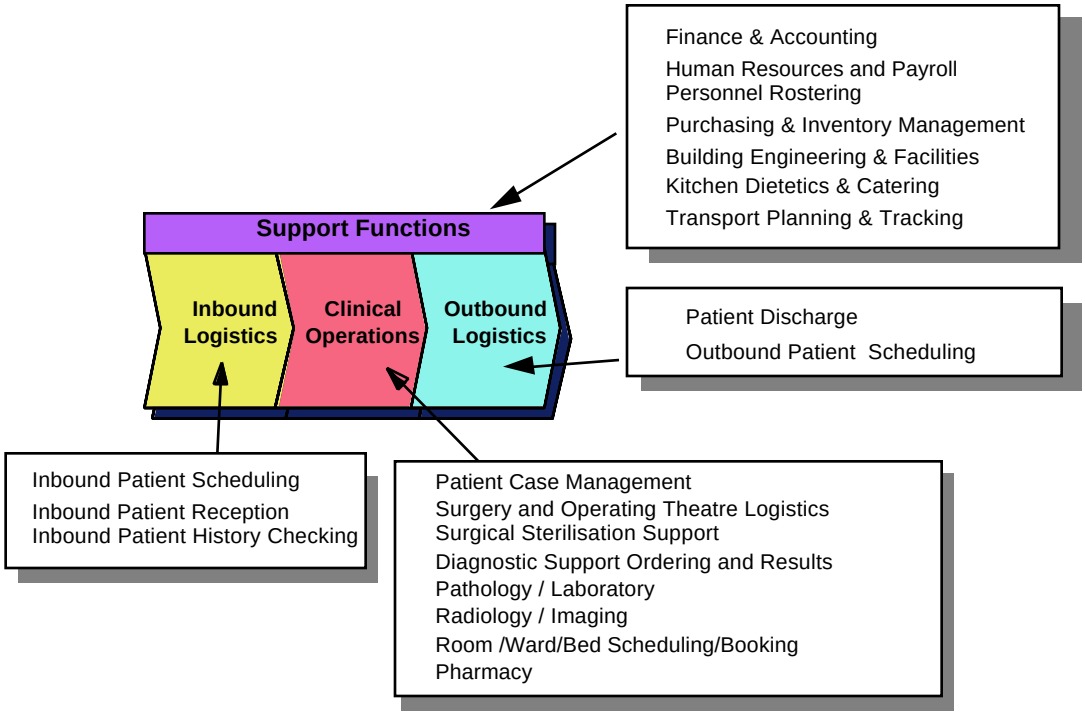
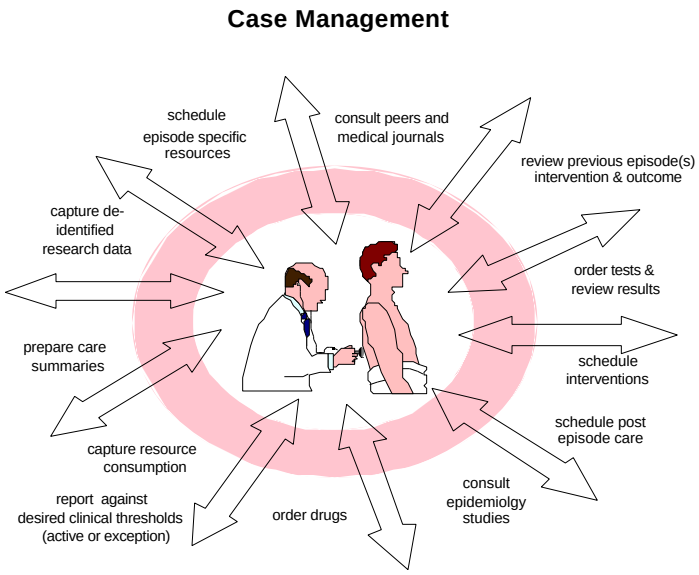


Figure 13 : A Patient Centred Model for Portfolio Design



The potential applications portfolio was developed through extensive multidisciplinary consultation.

A wide range of workshops focused primarily on shaping the functionality of the potential systems and identifying potential costs, benefits and risks of implementation. Two sets of questionnaires and a series workshops together were used to determine perceived needs and priority of implementation. Details of methodology for the development of the conceptual applications portfolio are documented in Appendix 2.3, Appendix 2.4 (Three Part Questionnaire) and Appendix 2.5 (Conceptual Application Assessment Summary Questionnaire).

Prioritisation was performed discretely for each hospital category (A, B, C, D & E).

The perceived needs and priorities of category A & B hospitals were very similar. Category A & B hospitals are generally more sophisticated in their information systems needs than most smaller hospitals and saw most of the future requirement to be clinical information systems and decision support. Category A & B hospitals saw a need to implement most of the conceptual systems and identified the following applications as the top six in priority for acquisition and implementation:

The priority of the larger hospitals is with the clinically-oriented information systems.

1. Electronic Ordering System [diagnostic ordering & reporting]
2. Patient Discharge System
3. Pathology / Laboratory System
4. Patient Case Management System
5. Kitchen / Dietetics Catering System
6. Surgery and Operating Theatre Logistics System

The priority and urgency within this group differed between hospitals. While this ranking implies a commonality across all A & B hospitals, in reality, some hospitals saw urgent need for surgery & logistics systems while others saw no need for kitchen / dietetics systems.

Details of the analysis and findings of the Three Part Questionnaire, the Conceptual Applications Portfolio and the function point analysis are included in Appendix 2.6.

The smaller hospitals perceive their needs to be less complex.

Category C, D & E hospitals generally felt their information system needs were less complex and would initially focus on improving administrative processes. Despite this dominant focus on administrative support, many smaller hospitals still saw a need for clinically oriented systems such as Case Management and Patient Discharge. The perceived priority for acquisition is:

1. Finance and Accounting System
2. Human Resources and Payroll System
3. Purchasing & Inventory Management System *[Assets & Supply]*
4. Patient Case Management System
5. Patient Discharge System
6. Building, Engineering and Facilities Management System

This ranking did not differ greatly between Type C, D and E hospitals.

A number of assumptions were used to create the high level estimates of implementation and migration costs for the applications portfolio, outlined in Table 1 The cost estimates have the additional assumption that appropriate technical infrastructures are in place (a dubious assumption overall but required at this point to estimate information systems costs isolated from workstation and other infrastructure costs).

Table 1: Conceptual Application Implementation Estimates ($millions)

Hospital Type	**A1**	**A2**	**B**	**C**	**D**	**E**	**Total**
Number of conceptual applications per hospital	20	20	20	15	8	4	
Portfolio Cost per hospital	$10.9	$7.8	$4.8	$1.0	$0.4	$0.2	
Number of hospitals by type	6	10	21	16	26	23	102
Total Conceptual Application Cost	$65.4	$78.5	$101.0	$16.5	$9.7	$3.25	$274.4
Costs as percent of average annual Total Operating Expenditure	7.3%	13.0%	18.7%	19.8%	15.8%	8.5%	
Costs as percent of average annual Total Operating Expenditure if spread over five years.	1.5%	2.6%	3.7%	4.0%	3.2%	1.7%	

[Note: Rounding results in minor adjustments to figures.]

Table 1 outlines the total estimated cost of implementing the systems by hospital type. It further estimates the impact on the hospitals total operating expenditure if the costs were accounted for in a single year and if they were spread over five year period.

It is apparent from these figures that the cost for most hospitals to implement all or a selection of the conceptual applications portfolio would be prohibitive as measured by the impact on annual total operating expenditure. The total industry investment to implement the appropriate level of the conceptual applications portfolio in all existing public hospitals in Victoria is estimated at $274.4 million (in 1996 dollars). This is subject to the proposed cost sharing model of funding which is embedded in the strategy.

As a result of this analysis, discussions and feedback it was concluded that;

Large hospitals require all the applications.

- category A & B hospitals require the functionality of all the systems in the conceptual portfolio. Some functionality could be obtained by modifying and extending existing systems;

Small hospitals require a subset and have different priorities.

- many category C, D & E require less than the full portfolio. Generally, category C hospitals saw a need for many of the systems in the portfolio, while category D & E hospitals saw a need for a much simpler portfolio;

No need for statewide prioritisation of applications is evident.

- the ranking process resulted in relatively low variance between the most and the least urgent system for implementation. As a result it will be difficult to prioritise a state-wide program that would be relevant to all hospitals;

Determining clinical benefits will require increased clinician awareness.

- many clinicians have difficulty understanding the benefits of system implementation in other than broad terms without direct exposure or explanations and discussions with peers;

Rural hospitals will need to work in partnership with each other.

- rural hospitals in the categories of B, C, D &E will not be able to afford *on their own* to acquire and implement many of these systems. As a result, some mechanism of sharing cost and rationalising management of information systems between hospitals will be required. The creation of the Networks will provide an increased resource base for metropolitan hospitals;

Current Infrastructure is inadequate.

- the workstations and infrastructure pre-requisites of most of the information systems are inadequate or non-existent; and
- a strong theme of scheduling personnel and resources, and clinical decision support pervades many of the clinically oriented systems; and
- that successful implementation would require a co-ordinated and strategic approach to changing to work practices.

Scheduling, clinician decision support and work practice change are critical.

Throughout the consultation, regardless of hospital size, geographic location, clinical speciality and complexity, users emphasised the need for information systems to facilitate the co-ordination of the complex set of resources and services inherent in delivering integrated health care.

A common theme that must therefore underpin I,IT&T implementation in hospitals is the need for improved scheduling.

This requirement is strong enough that it may be necessary or desirable to place simple scheduling capabilities as a mandatory pre-requisite or infrastructure as opposed to specific systems such as surgery logistics or patient scheduling.

Information standards are the foundation for integrated information.

Patient centred information must flow between these applications. This has major implications for the ability to identify patients across systems, link the data and present the integrated information to the user at a single point of access.

Appendix 2.7 provides an overview of the issues surrounding information standards in the health industry. The development and adoption of information standards is a key recommendation of the strategy.

A series of recommended initiatives have been proposed to progress the applications portfolio.

Initiative #1	Plan conceptual applications portfolio creation.
Initiative #2	Refine application functionality and benefits.
Initiative #3	Pilot conceptual applications
Initiative #4	Acquire and implement conceptual applications

The structure, program, time line and cost for each initiative is documented in Appendix 2.8.

4.2 Visible and Invisible Infrastructures

The different needs and organisational structures identified in the rural and metropolitan hospitals have implications for the analysis of information and information technology infrastructures. Different scenarios were created for the Metropolitan Health Care Networks and the States' rural hospitals.

4.2.1 Metropolitan Hospital Networks

A phased implementation of a centralised data repository is proposed for the Metropolitan Hospital Networks.

Four different potential models were evaluated to determine an appropriate approach to support the proposed conceptual applications portfolio in the Metropolitan Health Care Networks. Potential infrastructures were analysed, revised and discussed with the technically-oriented Information Services Reference Group.
Details of each scenario analysis are documented in Appendix 3.1.
Each alternative;

- was modelled using the infrastructure elements required;
- was analysed for its' relative advantages and disadvantages;
- described the method of operation, the implications, issues, and the implementation projects required; and
- emphasised a different view of how 'physically centralised' systems and data were structured and operated

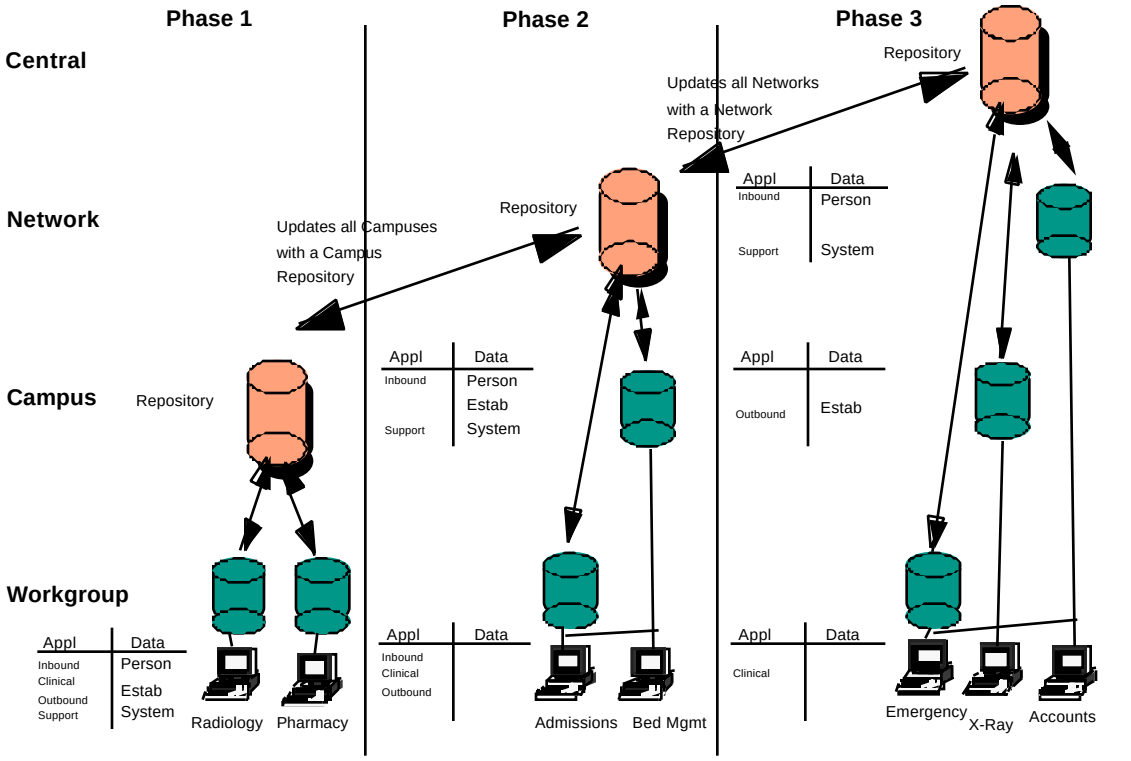
Through analysis and consultation, Alternative Four: The Phased Network Centric Infrastructure, was selected as best aligned with requirements. Alternative Four represents a phased migration over time to a view where:

- hospitals will have prescribed activities and associated information managed as a corporate resource that progressively expands:
  - local work group [Phase 1]
  - Network campus or health care facility [Phase 1]
  - Network-wide (linking facilities) [Phase 2]
  - statewide [Phase 3]
- there is recognition that the State has interests in promoting the availability of longitudinal patient information to many clinical decision makers within and ultimately across networks; and
- there is acknowledgment that some of the metropolitan Networks are already rapidly progressing down a similar path.

Figure 14 provides an overview of the Phased Network Centred I,IT&T Infrastructure Alternative for Melbourne Metropolitan Health Care Networks.

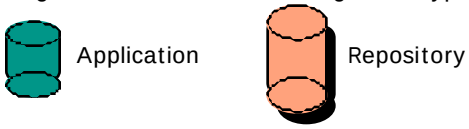
Figure 14: Overview of the Phased Network Centred I,IT&T Infrastructure Alternative for Melbourne Metropolitan Hospital Networks

This shows the progression of information technology design through the 3 phases: from V level, through hospital-wide to Network-wide data storage and application processing. App details each design phase.



The applications named in the diagram are examples of information systems which could operated at
- Radiology is an example of an application possibly best processed at Workgroup level.
- Bed Management possibly best operates at hospital wide level.
- Accounts & Finance possibly best operates at Network-wide level.

Applications were segmented into a number of generic types (Inbound, Clinical, Outbound and Support).



Data entities have been categorised according to the National Health Data Dictionary:
Person: Personal information about patients, staff. May also include high level episode summary
Establishment: Information about hospital activities and resources eg type, capacity, patient load
System: Information gathered at a single point for purposes such as casemix reporting.

Each design alternative was analysed using variations of where data is to be stored and applications processed at the Workgroup (ie. functional unit), hospital wide (ie. cross-functional) and Network (ie. multi-campus) levels. For example:

	APPL	DATA
Workgroup	Inbound Clinical Outbound Support	Person Estab System

indicates that Inbound, Clinical, Outbound and Suppo Applications are to be processed at the Workgroup le and that Person, Establishment and System data is t stored at the Workgroup level.

4.2.2 Rural Hospitals

Technical partnerships are required in the rural health sector.

At a high level, the four infrastructure models reviewed for the Metropolitan Health Care Network are also appropriate for Victoria's rural public hospitals. However the rural hospitals have additional complexities and issues that must also be addressed:

- most lack the resource base in terms of patient activity and complexity of casemix to justify any more than minimal IT application and infrastructure investment;

- while using relatively fewer applications, anticipated communications requirements to other service providers or to Melbourne (ie. to DHS or HCS) incurs greatly increased per capita communications costs than experienced by Melbourne users; and

- smaller environments and isolated rural communities make recruitment and retention of highly skilled IT staff difficult.

A number of potential scenarios were identified and analysed against the criteria Cost, Benefit, Risk and Timescale, used a simple High/Medium/Low rating. The solutions identified were:

1. Each hospital charts it's own course, and continues to develop its own systems and provide it's own support (ie the current situation);
2. Hospitals create informal 'buddy' networks to provide applications and *ad hoc* support; or
3. Hospitals create formal 'Hub and Spoke' arrangements, where hospitals enter into a binding commercially enforceable agreement for the 'hubs' to provide service to the 'spokes'.

#	Cost	Benefit	Risk	Timescale
1	**H** - Infrastructure & applications will be duplicated	**L** - Small hospitals will still not have resource base to deliver an effective applications portfolio built on an effective infrastructure	**H** - Small hospitals don't have the expertise, risk of large scale failure is High	**L** (Long) - Lack of planning, design, development & support expertise in small hospitals will stretch the timescale before an effective solution can be delivered
2	**M** - Some savings will be achieved through economies of scale	**M** - Some benefits will be achieved, but there are no guarantees	**H** - The informal nature of this scheme means that it is susceptible under pressure ie. your "buddy" may not help you if too busy	**M** (Medium) - Because of its informal nature, this scheme can only be put in place when the "buddy" feels like it
3	**L** - Economies of scale achieved through effective use of facilities & staff	**H** - Both parties can potentially benefit	**M** - Depends on "buy in" from both parties, & whether "Spokes" believe that it's not the start of amalgamation	**H** (Short) - A large number of hospitals have indicated their willingness to discuss the concept, suggesting a high chance of an early implementation

Within these parameters, Scenario 4 carried the least risk & the highest benefits. The potential of rural hospital 'clusters' was further investigated. Characteristics of a 'hub and spoke' structure include:

- larger rural hospitals or service providers ("Hubs") provide facilities/support to smaller hospitals ("Spokes") on a commercial basis;
- expected Hub & Spoke relationships will mirror patient referral patterns, and hence patient information flows;
- facilities offered could be application access or computer facility access;
- facilities could be centralised, but support provided locally;
- arrangements would be created on a mutually agreed basis, either geographic, specialty care or any other mutually agreed criteria;
- any organisation meeting the technical and organisational criteria described below can become a "Hub". This includes metropolitan hospitals, larger rural hospitals or IT Vendors;
- relationships amount to an outsourcing arrangement, similar in principle to existing arrangements for pathology and other services;
- arrangements acknowledge a process that has been underway in some places on an informal basis for some time.

Investigations of potential relationships among rural hospitals led to the conclusion that most are very willing to enter into associations with each other. Appendix 3.2 provides details of the preferred 'Hub & Spoke' relationships that were self-selected by hospitals responding to the questionnaire.

The rural hospital infrastructure design should be based on a 'hub & spoke' model to optimise benefits of IT deployment.

It is proposed that the rural hospital infrastructure design be based on a 'hub & spoke' model. The recommendation for these technical partnerships developed from:

- consultations with representatives of VHA Divisions 2 & 3
- analysis of implementation costs (based on sophisticated information systems on an individual hospital basis); and
- strong positive response to questions about potential partnerships.

Many hospitals perceived that they would only be able to economically and effectively implement sophisticated hospital information systems if they did so in association with other hospitals. The relative advantages can be summarised:

- if a 'Hub' was a hospital, it would benefit from the ability to build a larger applications portfolio & infrastructure for their own users because of increased resource base;
- 'Spokes' gain access to more capability than they would be able to justify in their own right;
- access better support than they could provide on their own,
- attract more highly skilled IT support staff, being part of a larger resource base.

Contractual relationships are necessary between rural hospitals to enable each hospital to retain a high degree of management autonomy

In order to maximise the successful clustering of rural hospitals, a preferred or minimum set of service levels will be required for any hospital or service provider wishing to offer "Hub" services. This minimum set of service characteristics is similar to the service level contracts that are normally negotiated between information services purchasers & providers.

The details of the contract conditions, structure of 'hubs & spokes' & business rules associated with this proposal should be developed by the Department, in partnership with the rural hospitals. The contractrual relationship must protect both the 'hub' & the 'spoke'.

A possible set of service levels for **'Hubs'** includes:

There are minimum service levels expected in the 'hub and spoke' structure

1. **Planning & Logistics**

· A formally documented IT Strategic and Operating Plans;

· A documented methodology for running IT projects;

· An existing process for liaising between IT and business areas;

· An IT Department with its own cost centre, which has at least two staff members allocated full time to IT activities;

· Formally documented operating procedures and standards; and

· A willingness to enter into contractual arrangements with prospective "Spokes" for an agreed minimum period, with mutually agreed premature exit and renewal terms and conditions.

.

1. **Performance & Operations**

· A fully documented and tested backup and disaster recovery strategy;

· An advertised support number staffed during agreed hours;

· The ability to locate IT staff if they are unavailable, eg. mobile, pager;

· An automated problem tracking and reporting system;

· A willingness to guarantee agreed availability of computing resources;

· A willingness to operate and support applications, shared resource units eg. servers and network printers, communications devices eg. hubs, routers.

1. **Analysis & Reporting**

· Track and report on system usage and availability; and

· Provide usage reports to end-users based on agreed criteria.

'Spokes' have obligations to the structure

Any Rural hospital or Service Provider wishing to enter into a contract as a **"Spoke"** must have the following characteristics:

· accept the standards and operating procedures used at the "Hub" site;

· be willing to enter into contractual arrangements with a prospective "Hub" for an agreed minimum period. Mutually agreed premature exit and renewal terms and conditions would be agreed.

4.2.3 Invisible Infrastructure Cost Implications

Table 2 outlines the estimated cost of implementing the invisible infrastructures by hospital type. It does not include the costs of shared Wide Area Network (WAN) infrastructure costs. It further estimates the impact on the hospitals total operating expenditure if the costs were accounted for in a single year and if they were spread over five year period.

Table 2: Invisible Infrastructure Implementation Estimates ($ millions)

Hospital Type	A1	A2	B	C	D	E	Total
Invisible Infrastructure Cost	$4.7	$3.7	$1.9	$0.2	$0.1	$0.06	
Number of hospitals by type	6	10	21	16	26	23	102
Total Invisible Infrastructure	$28.3	$37.0	$38.9	$3.3	$2.8	$1.4	$111.9
Costs as percent of average annual Total Operating Expenditure	3.2%	6.1%	7.2%	4.0%	4.6%	3.7%	
Costs as percent of average annual Total Operating Expenditure if spread over five years.	0.6%	1.2%	1.4%	0.8%	0.9%	0.7%	

(Note: Rounding results in minor adjustments to figures)

It is apparent from these figures that the cost for most hospitals to individually implement a fully functional invisible infrastructures would be prohibitive as measured by the impact on annual total operating expenditure. The total cost of implementing some or all of an appropriate invisible infrastructure in all existing public hospitals in Victoria is estimated at $111.9 million.

In addition to this hospital specific infrastructure, estimated costs for the shared infrastructure proposed in Phase 3 is $13.2 million. This is shown in Table 4.

As a result of this analysis, discussions and feedback it was concluded that while some category A hospitals could probably afford implementation of an appropriate invisible infrastructure, many category B, C, D & E would find the costs prohibitive.

4.2.4 Visible Infrastructure Cost Implications

Table 3 outlines the estimated cost of implementing the visible infrastructures by hospital type. It further estimates the impact on the hospitals total operating expenditure if the costs were accounted for in a single year and if they were spread over five year period. It is apparent from these figures that the cost for most hospitals to individually implement a fully functional visible infrastructure would be prohibitive as measured by the impact on annual total operating expenditure. The total cost of implementing the appropriate level of visible infrastructure in all existing public hospitals in Victoria is estimated at $94.4 million.

Table 3: Visible Infrastructure Implementation Estimates ($ millions)

Hospital Type	A1	A2	B	C	D	E	Total
Visible Infrastructure Cost	$5.5	$2.8	$1.1	$0.25	$0.15	$0.07	
Number of hospitals by type	6	10	21	16	26	23	102
Visible Infrastructure	$33.0	$27.9	$23.8	$4.0	$3.9	$1.7	$94.4
Costs as percent of average annual Total Operating Expenditure	3.7%	4.6%	4.4%	4.9%	6.3%	4.5%	
Costs as percent of average annual Total Operating Expenditure if spread over five years.	0.7%	0.9%	0.9%	1.0%	1.3%	0.9%	

Note: Rounding results in minor adjustments to figures.

4.2.5 Total Estimated Costs of Implementation

The specific recommended initiatives for both invisible and visible infrastructure are :

Initiative #5	Infrastructure Design Planning
Initiative #6	Implement Phased, Network centred Infrastructure model for metropolitan hospitals
Initiative #7	Implement "Hub & Spoke" Rural Strategy
Initiative #8	Perform infrastructure implementation planning tasks
Initiative #9	Implement invisible LAN infrastructure
Initiative #10	Implement invisible WAN infrastructure
Initiative #11	Implement Visible Infrastructure

The structure, program, time line and cost for each initiative is documented in Appendix 3.6.

The estimated implementation costs by hospital type are summarised in Table 4. The total estimated costs during the planning horizon amount to more that $490 million. This figure does not assume any benefits from consolidated purchasing power or the benefits of technical partnerships between hospitals.

Table 4 : Summary of I,IT&T Strategy Implementation Costs ($ millions)

Total Implementation Estimates by Hospital Type	**A1**	**A2**	**B**	**C**	**D**	**E**	**Total**
Total Cost Conceptual Applications	$65.4	$78.5	$101.0	$16.5	$9.7	$3.25	$274.4
Total Cost Visible Infrastructure	$33.0	$27.9	$23.8	$4.0	$3.9	$1.7	$94.4
Total Cost Hospital specific Invisibile Infrastructure	$28.3	$37.0	$38.9	$3.3	$2.8	$1.4	$111.9
Shared Invisible Infrastructure	____	____	____	____	____	____	$120 [a]
Total ($ millions)	$126.80	$143.5	$163.8	$23.9	$16.4	$6.4	$493.9
Costs as percent of average annual Total Operating Expenditure	14.20%	23.80%	30.40%	28.70%	26.60%	16.70%	22.30%
Costs as percent of average annual Total Operating Expenditure if spread over five years.	2.80%	4.80%	6.00%	5.70%	5.30%	3.40%	

Note: Rounding results in minor adjustments to figures.

[a] Infrastructure costs to expand likages between hospitals statewide

Experience in other states suggests that costs can be reduced through consolidation of purchasing power and clustering of hospitals could range from between 20% and 30% of original estimates. The resulting final cost estimate is therefore reduced to $346 -395 million. In addition, experience has shown that costs for technology will probably decline over the span of the strategy.

In addition, this costing assumes that the current number of hospitals in Categories A, B, C, D and E, will remain static. It is more likely that the profiles may change as the provision of health care moves to community or ambulatory care centres, and the role of hospitals evolves in the longer term. These factors should enable actual implementation costs to be somewhat lower than estimated.

Specifically, the forthcoming Metropolitan Services Plan will have an immediate impact:

- New facilities can be built to standards within the commissioning cost;
- Facilities to be closed/vacated do not require upgrade.

The cost estimates are therefore dynamic, and dependent on changes in service plans for both the rural and metropolitan hospitals.

Table 5 summarises I,IT&T Strategy Implementation Costs by Network and Existing Rural Region. The cost comparisons are based on the current role and size of hospitals, and the existing profiles of Health Care Networks and country Regions. Appendix 3.7 documents the profiles used in the calculations.

Table 5 : Summary of I,IT&T Strategy Implementation Costs by Network and Existing Region ($ millions)

Total Implementation Estimates by Hospital Type and Administrative Region	**A1**	**A2**	**B**	**C**	**D**	**E**	**Total**
Networks							
Inner & Eastern	$42.3	$43.0	$23.4	$3.0	$0.00	$0.00	$111.7
North Eastern	$21.10	$28.7	$0.00	$0.00	$0.00	$0.00	$49.8
Womens & Childrens	$21.10	$14.30	$0.00	$0.00	$0.00	$0.00	$35.50
Southern	$21.10	$14.30	$15.60	$0.00	$0.60	$0.00	$51.7
Western	$21.10	$14.30	$7.80	$1.50	$0.60	$0.00	$45.4
Peninsula	$0.00	$14.30	$0.00	$0.00	$0.00	$0.00	$14.30
Networks Total							*$308.4*
Regions	*A1*	*A2*	*B*	*C*	*D*	*E*	*Total*
Barwon	$0.00	$14.30	$15.60	$3.00	$2.50	$2.20	$37.7
Gippsland	$0.00	$0.00	$31.20	$3.00	$1.30	$0.60	$36.00
Grampians	$0.00	$0.00	$15.60	$6.00	$2.50	$0.60	$33.20
Hume	$0.00	$0.00	$23.40	$3.00	$5.70	$1.10	$33.20
Loddon	$0.00	$0.00	$31.20	$4.50	$3.20	$1.90	$40.80
Regions Total							*$172.4*
Shared Infrastructure							$13.20
Total							$494.0

Note: Rounding results in minor adjustments to figures.

4.3 Management Practices and User Sophistication

The applications portfolio and information infrastructure were the primary focus of the strategy development, however, the assessment of the IT maturity of the Victorian public hospitals identified that Management Practice is at a critically low level. For evolution of IT to be sustainable, an approach must be developed to strategically improve and maintain a high level of Management Practice.

Specific observations of public hospital I,IT&T management practice suggested that, as a group, I,IT&T management, (when practised) is focused on technical acquisitions and details. IT is viewed as an expense to be managed at least cost and in many cases is managed with whatever budget is left over after all other planned and potential expense items in hospitals have been addressed. IT is often not viewed as an important contributor to the efficiency and effectiveness of public hospital operations.

Evidence to support this view is seen in the fact that more than 65% of small hospitals (defined as those with less than $10 million in operating expenditure) have no I/T department and no I/T staff. Few hospitals of any size have I/T steering committees. Few hospitals have I/T management play a role in hospital business strategy and planning. Some hospitals have effectively used I/T capability to achieve dramatic improvement in performance but these are in the minority.

As the nature of applications portfolio and technology infrastructure requirements became apparent during Stage 2, it was decided that a series of management practice recommendations should be developed.

Design, acquisition, and implementation of the conceptual applications portfolio and supporting technologies will require a significant change to current I/T management practices:

- refinement of the initial portfolio design will be conducted in concert with a number of similar hospitals and/ or peer groups;
- not all hospitals will be active participants in the design process;
- proof of concept evaluation of portions of the portfolio will require a degree of rigour sufficient to convince hospital management, the Department of Human Services and the State Treasury that investments will produce tangible and intangible benefits;
- acquisition of visible and invisible components of the technology infrastructure will be on a scale far outside the experience of most hospital I/T managers;
- implementation of applications which cut across existing hospital organisational functions will require political skill and influence not typically associated with technology managers;
- hospitals will increasingly focus on clinical information systems representing a shift from an historical focus on administrative systems;
- budgets and funds being managed and controlled will be measured in tens of millions of dollars for many hospitals;
- resources deployed will probably include personnel from sophisticated technology and advisory consultancy firms, and will involve advnaced levels of contract managemtent;
- as managerial responsibilities devolve to managers typically not involved in I,IT&T analysis and decision making will increasingly be expected to play a more active role.

Research and experience with many clients around the world has resulted in the observation that Best I,IT&T Management Practice is the result of concerted effort by all managers throughout an organisation. The effort is usually led by a senior manager. Many I/T managers in larger hospitals and certainly most CEOs or administrative managers in smaller hospitals have little experience in many of the areas listed above. As a result it is imperative that the Department equip the personnel who will be held accountable for implementing initiatives described throughout this report.

The benefits of this skill upgrade will be twofold. Firstly it will reduce the risk of failure - that the technologies implemented cannot be made to operate as designed. Secondly it will increase the probability of success - that the information and communications technologies implemented in the coming years produce measurable impact on tangible and intangible public hospital health care outcomes.

Specific recommendations and initiatives for management practice are:

Initiative # 12	Development of management development curriculums for public hospital management
Initiative # 13	Establish a Steering and Oversight Committee
Initiative # 14	Create a bulk purchasing mechanism
Initiative # 15	Improved vendor liaison

The structure, program, time line and cost for each initiative is documented in Appendix 3.8

Appendix 3.9 documents guidelines for the management of information technology in an organisation, and should be used a basis for reviewing management structure, accountabilities and protocols.

5.0 Benefits

Significant benefits, both financial and service related, can be expected.

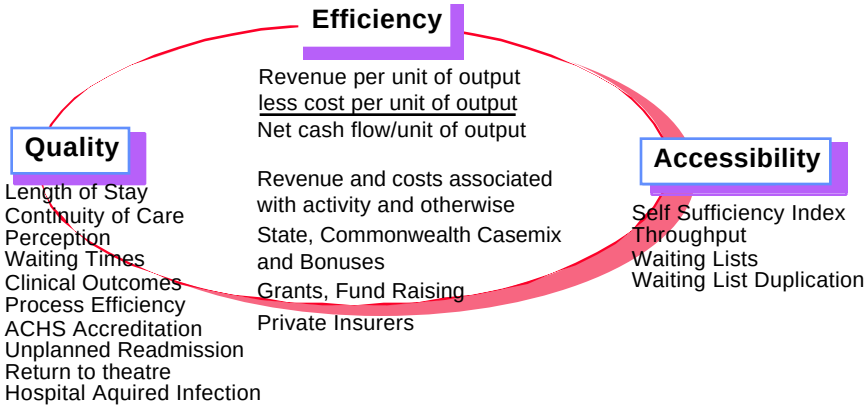
For a number of reasons, the transformation of the public hospital industry through the measured use of information, information technology and telecommunication carries the promise of significant benefit to the entire community. With careful planning and execution, it is foreseeable that focused investments over the next few years will be instrumental in managing future health care costs at sustainable levels, despite growth in volume and complexity of demands. Implementation of the I,IT&T strategy can in the short term be cost neutral and in the medium to longer term be instrumental in future health care cost avoidance.

The improvement in information capability will enable the development, monitoring and evaluation of performance measures.

The scope of performance improvement potential is not limited to the efficiency dimension.. In addition to these predominantly financial benefits, the ability to provide more focused, seamless and increasingly pro-active care will provide significant quality and accessibility benefits to the community. Figure 15 identifies a few examples of performance measures along the three key dimensions of efficiency, quality and accessibility.

Many of the tangible benefits are embedded in a functionality that helps caregivers to improve the quality of care, as well as being more efficient and effective.

Figure 15: A Balanced View to Public Hospital Benefit Performance Improvements



The magnitude of these potential benefits need to be viewed within the context of forecast public hospital operating expenditure for the next decade, outlined in Table 6. The baseline anticipated public hospital costs are derived from a variety of factors including ageing population, trends in treatment costs, inflation, and productivity, exclusive of I,IT&T initiatives. I,IT&T expenditures include both capital and ongoing operating costs. The basis for these forecasts is discussed in detail in Appendix 4.1.

Table 6 : Systemic Public Hospital Productivity Estimates ($ millions)

	96-97	97-98	98-99	99-00	00-01	01-02	02-03
Public Hospital Baseline costs	$3,005	$3,049	$3,093	$3,138	$3,184	$3,230	$3,277
Annual Productivity Benefits (cost avoidance)	0.00%	0.00%	1.50%	2.00%	2.50%	3.50%	3.00%
Cumulative Productivity Benefits (cost avoidance)	0.00%	0.00%	1.50%	3.50%	6.00%	9.50%	12.50%
Public Hospital Cost Avoidance	$0	$0	$46.4	$109.2	$188.8	$301.9	$400.2
Annual I,IT&T Expenditures	$5	$121	$60	$87	$65	$39	$106
Cumulative Public Hospital Cost Avoidance	($5)	($121)	($114)	$23	$127	$268	$304

Benefits will only be fully achieved by the integration of IT implementation and changes to clinical and business processes.

- an estimate of future public hospital costs which must be avoided to justify the entire I, IT & T investment program;
- a summary of policy statements and associated implications for information of information technology use in the evolving health sector; and
- anecdotal evidence of productivity achieve by hospitals adopting integrated information technology infrastructures.

This analysis led to the conclusion that the estimates of average annual productivity improvements of 3.5% summarised from a wide range of participants were achievable. Furthermore, it was calculated that implementation of the Public Hospital I, IT & T Strategy;

- is essential to achieve health policy
- requires an average annual productivity improvement of 2.45% to be cost neutral; and
- should enable all public hospitals to gain the productivity benefits experienced by early adopters

Caution is required in embedding these benefits into forward plans however, as achievement is contingent upon a variety of variables external to the technologies alone. Included in these variables is the need to integrate technology implementation with clinical and business process change.

Never-the-less, evidence from early adopters suggests that productivity gains from relatively straight forward technologies such as scheduling and E-mail systems will result in productivity gains of at least 5% when appropriate work practice change and time is accommodated for changed behaviours. As a result, productivity benefits should be visible within two years of implementation and represent cost avoidance of at least 1.5% of total public hospital operating expenditure. With the implementation of more sophisticated and integrating systems along with clinical and work-practice re-engineering public hospitals should be able to realise incremental annual cost avoidance of productivity gains of rising to 3.5% before beginning to taper off as the investment program comes to its conclusion.

This is forecast to begin at a low level of 1.5% of total public hospital expenditure after approximately 2 years, and rising to an annual improvement level of 3.5% at the end of the century. Since the Department and public hospitals are expected to share investment and operational costs over the life of the investment program it will not be necessary for the Department to harvest the entire benefit stream.

The investment, estimated at $400M will be contributed almost equally by the Department and public hospitals. If average annual productivity gain of 2.45% is required to justify the entire investment program, and the Department is contributing approximately half of the investment, then the Department should expect it to be able to harvest an average annual productivity gain of 1.3%. Benefits in excess of this amount will remain with hospital management teams to re-invest as appropriate. It is hoped that a healthy share of these benefits will continue to be directed towards improved information systems.

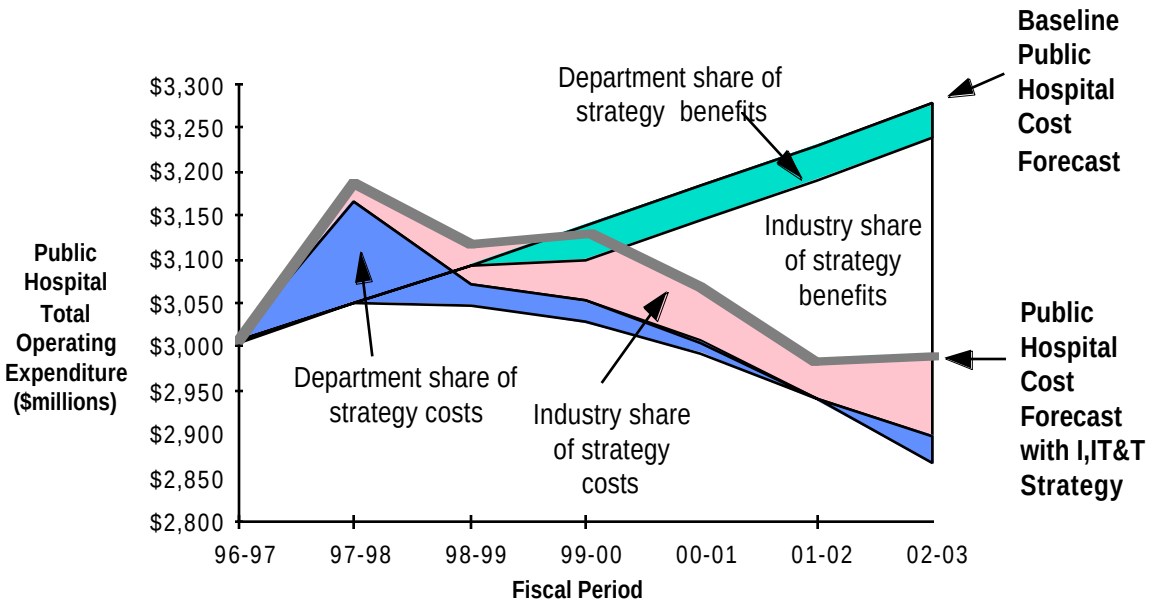
Risk management is a critical factor in optimising benefits

These benefits however will only be achievable through the careful management of risk. The size of the gap, the required investment , the time required to complete the program, the relative weakness of hospital I,IT&T management practice, and the size of the health industry all conspire to create a high risk profile. As a result, it is imperative that the early stages of implementation focus on risk management.

The most urgent and effective risk management tactic which can be initiated is to increase the knowledge base of the industry with regard to I, IT & T, change management, and process and performance improvement. A sense of urgency emerges given the fact that the gap between current capabilities and those required to support an industry transformation is greatest in I,IT&T management practice.

The productivity estimates are believed to be achievable and have been reviewed extensively with the industry reference groups.

Table 16: Estimated Investment and Benefit Sharing



The I IT & T costs in the forecasts include initial capital, expected annual ongoing operating costs equal to 15% of ongoing capital outlay and assumptions about the ability to exploit health industry purchasing power.

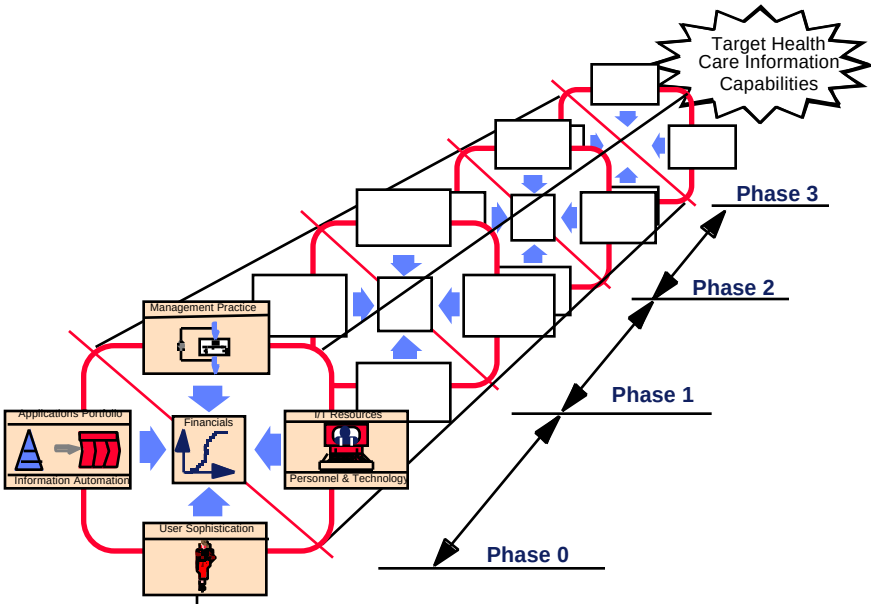
These costs also reflect a funding model based o cost and risk sharing arrangement with the public hospitals that will see the Department contributing a large portion in early years, and public hospitals contributing larger shares in later years. An estimate of the investment and benefit sharing is depicted in Figure 16.

6.0 Strategic Direction

A phased implementation of significant change is recommended.

The target capabilities enabled through the progressive implementation of the conceptual applications portfolio, the infrastructures and work-practice change will be a significant stretch for most hospitals, both individually and collectively. As a result, this industry transformation must be staged in a series of Phases to guide Network and hospital management teams [Figure 17]. Each Phase has demonstrable performance criteria and incremental funding arrangements.

Figure 17: Strategy Implementation Phases



Each hospital will progress through the Phases at different rates. Time frames given are an indication of the slowest time expected for the least well-positioned hospital to achieve the standards. Continued access to funding is dependent on achievement of standards for the lower levels.

6.1 Phase One

Phase One seeks to integrate health care information capture and use within a single or closely associated public hospital campuses. Public hospitals should be able to:

- electronically find and identify every physical location of patient information throughout the campus from any clinical workstation in the hospital;
- capture and use the information required for linking 'client' information as the primary search key using 'Client-Linking' naming conventions;
- demonstrate an operational invisible infrastructure throughout the campus;

- demonstrate that all information systems containing patient information, whether 'owned' by the hospital or acquired through contracted services, capture all the information required to comply with the Department's information definitions used for client linking purposes;

- demonstrate that an operational campus repository is the vehicle by which positive patient record identification is achieved;

- demonstrate completion of management and user education;

- demonstrate multi-year IT plan linked to service plans; and

- electronically transfer all reporting requirements to the Department.

Funding support for Phase 2 will be contingent upon demonstrating achievement of Phase 1 capabilities.

For the least well-positioned hospital, this should be achievable within two years. It is expected that with appropriate financial support, planning and focus, these capabilities will be widely achieved throughout the industry within that time frame.

6.2 Phase Two

Phase Two builds on the capabilities achieved in Phase One and seeks to integrate health care information capture and use within and across each of the Networks/'clusters'. Hospitals will be able to:

- demonstrate an operational invisible Wide Area Network (WAN) infrastructure implemented & tested across the network or between rural clustered hospitals;

- demonstrate that the Network/ cluster has a minimum average workstation ratio for full time clinical personnel in the peak shift appropriate for each clinical work group. The minimum average is targeted at 1 workstation for every 6 EFT [C, D & E hospitals], and 1 workstation for every 3 EFT [A& B hospitals]

- demonstrate that information required to be accessed by multiple work groups throughout the Campus will ;
  - have a single logical instance (common definition);
  - conform to the Department's information definitions;

- schedule and commit resources and times for a patients entire planned care path across the campus for resources that are under the direct influence of the campus;

- query the 'catalogue' of patient information from any clinical workstation in the Network / cluster;

- demonstrate that an operational Network/cluster repository is the vehicle by which positive patient record identification is achieved;

- demonstrate that business and clinical managers are accountable for information management and IT budgets;

- demonstrate that at risk indicators will be available electronically to authorised care providers for every patient treated by network/cluster resources;

- transfer electronic patient discharge summaries within 24 hours of discharge;

Funding support for Phase 3 will be contingent upon demonstrating achievement of Phase 2 capabilities

The least well-positioned hospital should target to implement these capabilities within three years of completion of Phase One. It is expected that with appropriate financial support, planning and focus, these capabilities will be widely achieved within that time frame.

6.3 Phase Three

Phase Three seeks to implement a summary or subset of integrated health care information capture and use within and across the state. Upon completion of Phase Three, all public hospitals should have the ability to:

- demonstrate an operational invisible Wide Area Network infrastructure implemented & tested across the state Responsibility for implementation of the WAN rests with the Department;

- demonstrate that information required to be accessed by multiple work groups throughout the Network/cluster will ;
  - have a single logical instance (common definition);
  - conform to the Department's minimum and required information definitions;

- electronically find and identify every physical location of all instances of patient information throughout the state;

- able to query the 'catalogue' of patient information from any clinical workstation in the state;

- demonstrate that all information systems containing patient information whether 'owned' by the Network/cluster or acquired through contracted services capture all the information required to comply with the Department's information definitions used for client linking purposes;

- schedule and commit resources and times for a patients entire planned care path across the Network/cluster;

- demonstrate that an operational cross Network/cluster repository is the vehicle by which positive patient record identification is achieved;

- demonstrate that electronic discharge summaries will be available electronically to authorised care providers for every patient treated by state funded resources within 24 hours of discharge.

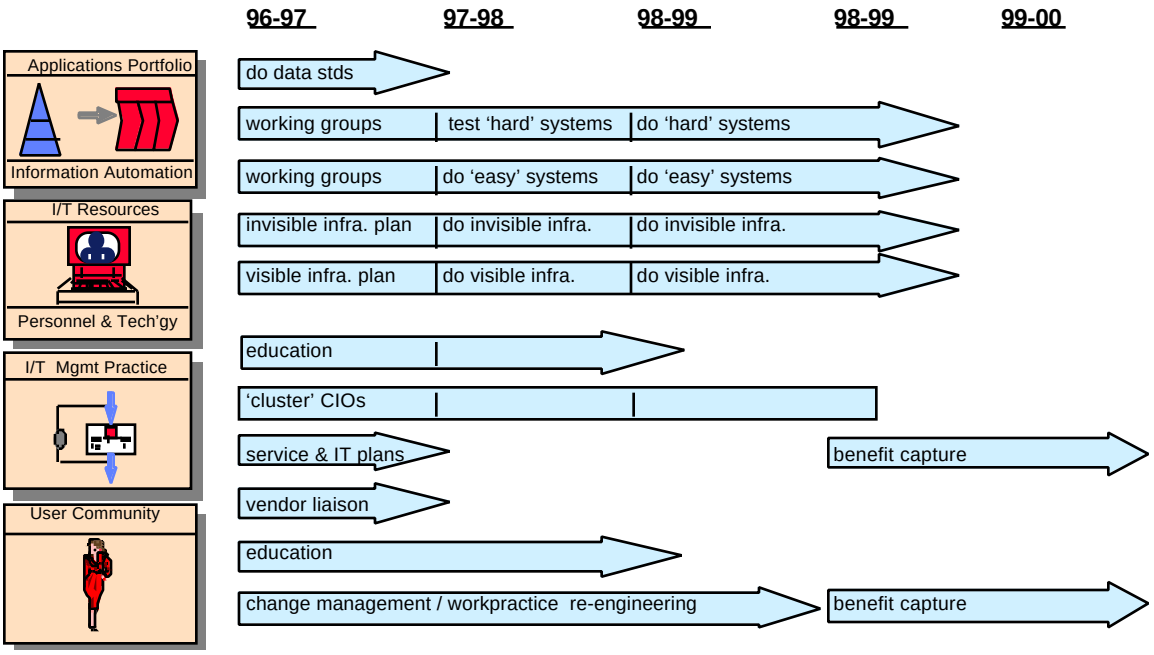
The least well-positioned public hospitals should target to implement the following capabilities within three years of completion of Phase Two.

7.0 The Path Forward

Early investment is skills acquisition will be essential.

To achieve the challenges set by the phased capabilities, the strategy has been developed to address all dimensions of the strategic framework. To ensure that the investment risk is managed from the earliest opportunity, there is particular emphasis initially on the user and management streams to arm the industry with the skills and experience as foundations to sustainability.

Figure 18 provides a high level contextual diagram of the proposed implementation strategy.



7.1 Enhance Management Practice & User Sophistication

1. Enhanced broad based I,IT&T sophistication and skills throughout the public hospital industry will be achieved through ;

   - customised health industry education programs;

   - encouraging the formation of associations of hospitals, especially in rural areas, into clusters to concentrate expertise and purchasing power;

   - linking funding access to Networks or rural 'clusters'. In order to access I,IT&T investment funds, network or cluster management teams will need to:

     - develop a balanced multi-year I,IT&T investment and benefit realisation plan for their network or cluster;
     - demonstrate that senior management has been 'accredited' through education programs.
     - employ appropriate senior I/T expertise for selected networks or clusters of hospitals to plan and manage the strategy implementation. The Department of Human Services will subsidise this cost for the first three years.

   - concentrate industry purchasing power where appropriate.

   - foster or encourage partnerships between hospital 'clusters' and the private sector to leverage limited expertise and funds.

Specific recommendations and initiatives for management practice are:

12 Development of management development curriculums for public hospital management
13 Establish a Steering and Oversight Committee
14 Create a bulk purchasing mechanism
15 Improved vendor liaison

The structure, program, time line and cost for each initiative is documented in Appendix 3.8

7.2 Build up Basic Technical Resources

2. Implement the target 'invisible' I,IT&T infrastructures with no expectations of funding from hospitals on the basis that;

   - 'invisible' infrastructures are expected to be difficult to cost justify;

   - benefits may accrue to organisations other than the hospitals (eg to General Practitioners and others); and

   - they will form a critical foundation for integrating care provision with health care providers beyond public hospitals.

3. Implement the target 'visible' I,IT&T infrastructures on a shared funding basis with the expectation that hospitals will contribute half of funding requirements.

The specific recommended initiatives for both invisible and visible infrastructure are :

#5 Infrastructure Design Planning
#6 Implement Phased, Network centred Infrastructure model for metropolitan hospitals
#7 Implement “Hub & Spoke” Rural Strategy
#8 Perform infrastructure implementation planning tasks
#9 Implement invisible LAN infrastructure
#10 Implement invisible WAN infrastructure
#11 Implement Visible Infrastructure

The structure, program, time line and cost for each initiative is documented in Appendix 3.6.

7.3 Design, Acquire and Implement Integrated Applications Portfolios

4. Concentrate early information system prototypes prior to wider implementation in those hospitals able to demonstrate;

   - an orchestrated high level of commitment from senior management through to nursing and medical staff;
   - the ability to rapidly implement and test integrated systems reducing the lead time to produce results;
   - the ability to reduce prototype costs by exploiting the current technical environment;
   - representativeness to many if not all other public hospitals
   - the intention to share learning's with the entire industry.

5. Facilitate a series of focused working groups to advance the development of detailed, integrated, cross-functional system specifications of and conduct feasibility prototypes for high priority information systems.

6. Conduct proof of concept implementations with as broad a set of information systems as possible to test integrated systems cost/benefits and pre-requisites.

7. Implement common systems in all hospitals on a shared funding basis with the expectation that hospitals will contribute two thirds of the funding requirements.

8. The Department should lead, in collaboration with public hospitals, the development of a complete set of information definitions applicable to public hospitals as soon as possible.

Specific recommended initiatives are:

#1 Plan conceptual applications portfolio creation.
#2 Refine application functionality and benefits.
#3 Pilot conceptual applications
#4 Acquire and implement conceptual applications

7.4 Manage a Multi-Year Investment Program

9. Maintain an investment program that over an seven year period will support the implementation and operation of sophisticated information systems in Victoria's public hospitals.

10. Set expectations with hospital management that repayment of invested funds;

    - will begin in the third year of strategy implementation;

    - will take the form of a 1.3% reduction of payments to public hospitals

11. Set expectations with hospital management that, as a mark of best practice, I,IT&T expenditure be benchmarked around 2.5% of total operating expenditure. This represents an industry average, and would be higher for high intensity facilities, and lower for lower intensity facilities.

8.0 Conclusion

The Imperative for Change

- In simple terms, hospitals face the challenge of continuing to do more with less.
- Victoria has fallen behind the progress made in other states
- I IT & T is a critical resource required to achieve the Governments policy objectives.

Scope of the Strategy

- The scope of the current strategy is limited to public hospitals, and thus represents an artificial boundary within the continuum of care.
- Integrated health care must be delivered in an environment which safeguards confidentiality and privacy.

The Support for Integration

- Improved Health Outcomes will be underpinned by integration
- Supply and demand dimensions must be addressed equally to achieve the balanced and sustainable performance improvements which can be realised through I,IT&T.

The Current Information Environment

- There is a significant difference between where hospitals and Government want to be in IT for the transformation agenda, and where hospital IT is now.
- The current information environment will not adequately support integrated health care.
- Industry comparisons show that Information Technology capability in most public hospitals is at least a decade behind most commercially oriented organisations.

Investment in the future is time critical

- The I IT & T fabric in most hospitals is deteriorating rapidly, leading to a sense of urgency.

Shared Investment, Shared Returns

- Shared industry investment will enable delivery of collective benefits.

Focus on Strong Industry leadership

- The mission is to strategically raise the capability of the health industry.
- Strong, commercially minded hospital management teams require leadership from Government.

Risk Management

- Risk Management will ensure success.

Phased Program of Change

- The phased approach to implementation minimises risk and maximises industry benefits
- Each Phase is characterised by clear performance measures.

The Challenge to Work Smarter using IT as an Enabler

- Technology innovation alone will not achieve the goal.
- Investments in I IT & T must be coupled with work practice change to achieve the benefits.

Key Implementation Strategies

- Focused investment and the provision of the right tools will achieve the strategic intent of a sustainable health industry future

Enhance Leadership, Management Practice & User Sophistication

- Leadership by hospital management and clinicians, and commitment at the highest level of the organisation is critical.
- Senior management and clinicians can demonstrate commitment and leadership through participation in planning processes and education programs

Build up Basic Technical Resources

- The information infrastructure is the critical foundation for future innovation and benefits

Design, Acquire and Implement Integrated Applications Portfolios

- The strategy is outcomes-based and focuses on supporting an integrated health care model.
- The major strategic initiative will be to conduct a number of pilots focusing on process improvement and information systems. These will serve to establish more aggressive qualitative and quantitative benefits.

Manage a Multi-Year Investment Program

- An investment program over an extended period will support the implementation and operation of sophisticated information systems in Victoria's public hospitals.
- The I IT & T Strategy offers opportunity to be at least cost neutral, and at best a significant contributor to improved health outcomes.
- Focused program is required to maintain cohesion of the public hospital system.