MET Technology Architecture Project (METTA)

Project Outline

(Draft) Revision 7b
1995 June 12

Ontario Ministry of Education and Training
Technology Support for MET Business Processes

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1. Summary and Recommendations

Global competition has created an unheralded demand for businesses to be focused and efficient in their operations. Viewing this trend as desirable, the public is increasingly expecting its' government institutions to be more *business-like*. At the same time, new technological paradigms are transforming entire sectors. Communications, media and computers are mutating into a single technology with greater individual and combined capabilities. New technologies are creating new ways of working, overcoming distance and creating new synergies through improved teams.

All organizations must react to these changes. They must learn to use technology wisely to support their business. MET's business is support to *Lifelong Learning*. It doesn't deliver learning as a product. Rather, it provides funding and standards for education providers. MET *steers* rather than *rows*. Technology can provide vast new locomotive capabilities to those that row - and MET has a role in developing principles for rowing so that all rowers assist in moving the boat in the same direction. But, technology can also assist in steering. Electronic communications, client-server architectures and computer assisted cooperative work make groups and decision-making more efficient. This added efficiency must contribute to the overall redirection of funding away from administration to providing learning services.

To do this requires a comprehensive strategy to make technology central to the planning and strategic thinking within MET. Critically important to this strategic direction is the early identification and implementation of a comprehensive technology architecture which provides guidelines for both the rowers and steerers of the educational boat.

Developing a technology architecture unique to MET's businesses and obligations is no easy undertaking. Educational reform makes business process reengineering more problematic than in other ministries. The architectural model must envision a future comprising more variables with less clarity. While the Enterprise Model represents a start, there must be additional effort in defining MET service functions so that information models and infrastructure support needs can be assessed.

This project plan presents various methodologies to develop an architecture which supports MET's new business needs. These needs are contrasted with the current directions so as to evaluate the ***GAP*** between the two and propose solutions for closing it. The project plan should result in recommendations for technology **retooling** by proposing a new architecture and to **realign** internal IT services to better realize a continuing process of retooling through continuous quality improvement.

To do this will require a greater commitment of staff than has occurred in the definitional stage of the project. There is a need for permanent staffing over the next nine months in the following major activities:

- collecting and evaluating the current state of information technology including inventories of machinery and software, principles, models and standards currently adhered to. The amount of current staff and financial resources devoted to maintenance and development activities,
- analysis of the current situation - strengths, weaknesses and factors critical to success,
- assessing the service functions resulting from the Enterprise Model and Educational Reform initiatives and developing the information models and infrastructure implications,
- process modelling how IT decisions are made and how IT support is provided in order to make conclusions and recommendations on how to better align IT to MET business processes,

- development of Implementation and Change Management Plans to introduce the architecture and realign the IT organization.

2. A Framework

2.1 The Need for a New Approach to Information Technology

> ***Our present educational system is an archipelago with lousy ferry service. What we have to build is a learning highway.***[1]
>
> -- Bob Rosehart, Task Force Member

The application of technology to yield business improvement has been on a case-by-case basis within MET. There is little consideration of wider, strategic considerations. The union of the former ministries created a mélange of disparate computer architectures and software applications which has only recently been subject to a process of consolidation and standardization.

The situation in the wider educational community is no better. There is little uniformity of technologies amongst MET, schools and school boards, colleges and universities. This has led to criticisms of MET leadership, major questions of interoperability amongst computer systems, duplication of efforts and unnecessary access problems for learners.

The situation is typical of Information System organizations as they enter the 1990's and is aptly described by Bernard Boar in his book *The Art of Strategic Planning for Information Technology*[2]

> *For the most part, the typical IM&M [Information management and Movement] has engaged in technology planning but not strategic business planning. As a consequence, many IM&M organizations have tended to be product oriented, repeatedly offering products based on familiar technologies similar to those they have always offered, instead of being user oriented and striving to offer constantly evolving services in*

[1] reported in Lifelong Learning and the New Economy, The Premier's Council on Economic Renewal, Queen's Printer, Ontario, 1994, p. 1

[2] Bernard H. Boar, The Art of Strategic Planning for Information Technology, John Wiley & Sons, 1993, p. 5

synchronization with emerging user requirements without embedded technology prejudice.

This mode of planning is simply inadequate to deal with the challenges of the 1990's... the IM&M function is coming under extraordinary pressure from three forces.

1. *The business, reacting to intense competitive pressure, is demanding that IM&M resources be deployed in a manner to develop and sustain competitive advantage. The business cannot carry the IM&M function, rather the IM&M is needed to accept the role of being a foundation of competitiveness for the business.*
2. *IM&M technology is changing at an unprecedented pace. When systems were developed 20 years ago, architecture and technology decisions were simple because there were few choices. The situation has completely reversed itself. The IM&M organization is now confronted with a plethora of advantageous technologies which need to be integrated into its platforms and architectures.*
3. *Competition, for the first time, is a serious threat to the internal IM&M organization. System integrators, facility managers, business consultants, and business re-engineering specialists all provide viable substitute solutions to insourcing (doing the IM&M functions internally.) Unless the internal IM&M organization can convince management that it delivers value-added to the business, the outsourcers may win the IM&M business through open and free competition.*

Yet, government and business are different institutions. Businesses are usually driven by competition while governments usually exist as monopolies. Public accountability, however, is increasingly becoming the surrogate for this competition. Recent studies reveal that - "*The real problem for Canadians is that 'It [government] cost too much or it didn't work - we didn't get the results.'*"[3]. This same sentiment was expressed years earlier by Osborne and Gaebler in their seminal work - *Reinventing Government* -

> *The fact that government cannot be run just like a business does not mean it in cannot be more entrepreneurial... Any institution, public or private, can be bureaucratic. Few Americans would want government to act just like a business. - making quick decisions behind closed doors for private profit. If it in did, democracy would be the first casualty. But most Americans would like government to be less bureaucratic. There is a vast continuum between bureaucratic behavior and entrepreneurial behavior, and government can surely shift its position on that spectrum.*[4]

The 1993 Ontario Economic Outlook echoed this viewed when it noted *"the re-invention and re-engineering of organizations"* as a driving force of structural change.[5] Earlier the Ontario Government had responded with *Telecommunications - Enabling Ontario's Future* in which the stated goal was to be **model user** of technology - *"to effectively utilize network computing to improve the quality and reduce the cost of service delivery.* Specific government initiatives include **self-service kiosks** by MTO, and **Integrated Safety project** by SOCGEN, Corrections/MTO, a new **CaseWorker**

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[3] Edward Greenspon, "Maintain services, Canadians tell survey", Globe and Mail, Feb 25, 1995, p. A6. The study also found that "Canadians were riven by social-class differences. When elite Canadians were asked to list the values governments should be pursuing, their top choices were goals such as prosperity, competitiveness and minimal government. On the other hand, the general public ranked these goals as three of its four lowest values.

[4] David Osborne and Ted Gaebler, Reinventing Government - How the Entrepreneurial Spirit is Transforming the Public Sector. Plume Book, 1993, p. 22

[5] Floyd Laughren, 1993 Ontario Economic Outlook, p. 56.

project by COMSOC and the **Ontario Educational Highway** by MET. Being a model user, however, implies additional progress:

- *Investment in systems and information technology are tightly linked to organizational strategies and policies*
- *An overall architecture management framework is being used to guide planning at all levels of decision making*
- *Identification of strategic opportunities is guided by business models which provide the context and metrics for sound business decisions*
- *An inter-enterprise and enterprise-wide perspective of both opportunities and solutions has been adopted and collaborations mechanisms are in place*
- *The impact of technology is being considered at its maximum level of benefits, including full automation of service delivery and client self-service*
- *Projects are assessed for business and technological risks and managed accordingly, with particular attention to all related change management issues*
- *The latest available and provable technologies are being considered and applied*
- *The best practices in process reengineering, systems development, and technology infrastructure management are being utilized*
- *Users are being supported in the best possible way, through well designed work stations and user interfaces, ease of access (including mobility), multi-media information presentations and reliable service and support*
- *Key supplier partnerships are in place to provide the best products and services in a responsive and efficient manner.*[6]

The reengineering effort within MET is complicated by major new educational reforms sponsored by the *Royal Commission on Learning*. The combined undertaking is daunting but the challenge cannot be ignored. Given the current fiscal deficits by federal and provincial governments, these reforms can be funded only by refocusing current resources. Reengineering, through a pragmatic reliance on present technologies, provides a way to maintain services while reducing costs. The savings must contibute to the new enterprises.

2.2 The Enterprise Model & Reengineering

> *Objectives for the redesign and renewal of government delivery of services must be to reduce both total cost and overhead, to improve value and provide a more responsive "customer service" orientation. These objectives must be achieved while also addressing the concerns of other stakeholders.*[7]

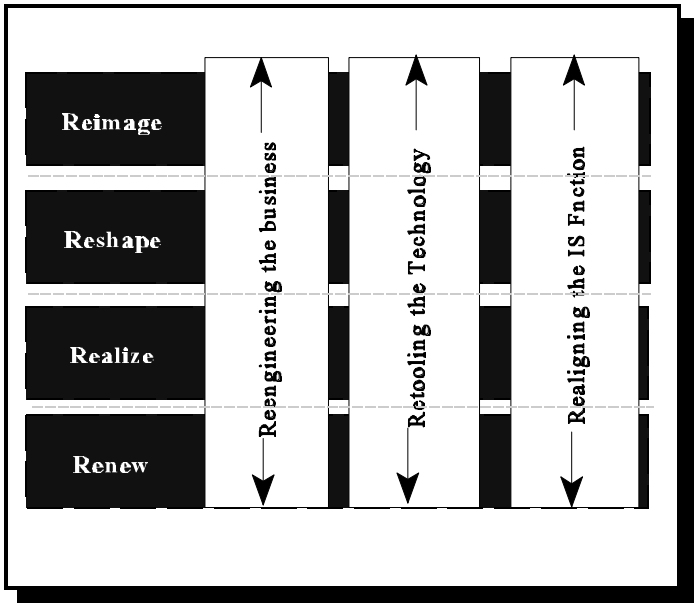
"*We are entering a second era of information technology in which the business applications of computers, the nature of technology itself and the leadership for the use of technology are all going through profound change."*[8] The Consulting Group CSC Index reported that 72 percent of American companies were reengineering and that top-ranking IS executives rated "reengineering business

[6] A.T. Caston Consulting Inc, "Jump-Starting the Government of Ontario's Use of the Information Highway", June, 1994, p. 3.

[7] Beyond Expectations, The Opportunity to Link Industry and Government to Serve Canadians, Background for Discussion, unpublished manuscript sponsored by Digital Equipment, Stenntor, Xerox Canada, Northern Telecom Canada and SHL Systemhouse, p. 2

[8] Don Tapscott and Art Caston, Paradigm Shift, Mcgraw-Hill, 1993, p. 13

processes" as their most pressing concern for 1993.[9] Caston suggests three key elements to a ***Transitioning Framework*** . First, the organization must ***reengineer the business***. Next, it must ***retool the information technology infrastructure***. Lastly, it must ***realign the IS function with the business***. To make the transition, each of the three thrusts must move through four plateaus. During each plateau, the thrusts are aligned or synchronized to support a common business result.



The first plateau is to achieve a common vision of the organization - Reimage. This effort sets the context for a reengineering effort.

The second plateau is to *structure the solution*. This is the role of **architects** who translate the vision into a workable set of blueprints.

The third plateau if to *develop and deploy the planned changes*. This is the role of the construction crew with its specialized building and implementation capabilities.

The final plateau is *the ongoing measurement and operation of the reengineered business processes, and supporting IT infrastructure, with a focus on their continuing evolution and improvement.* This requires ongoing measurement of key performance indicators.[10]

The Enterprise Model reflects an *Reimaging* undertaking within MET. It establishes the future business context. Developed in January 1995, it provides the framework for the reengineering tasks of the second plateau. It employs a *Value Chain* methodology to trace MET products and services as they migrate from educational suppliers to distributors. The Model highlights MET's value-added in the process. While reiterating the vision of ***Lifelong Learning***, this value is **Support for the Learning System** and is by the **DO** in the traditional Quality Control sequence of

PLAN ⇨ DO ⇨ CHECK

The model is intended to ensure focus on the learner.

The Enterprise Model		
Governance		
Communications		
Funding		
Common Infrastructure		
Understanding Learner Market	**Delivery System**	**Evaluate Effectiveness**

[9] Cheryl Currid & Co., Computing Strategies for Reengineering Your Organization, Prima Publishing, 1994, p. 121

[10] Paradigm Shift, op cit., p. 186-189

Segment the Market	Understand Learner Requirements	Provide Content	Provide Context	Provide Infrastructure	Set Standards & Measure Results	Feedback Requirements for Change

MET "TO BE" ENTERPRISE PROCESS MODEL				
Understand the Learner & Provider Market	**Provide Education & Training System Leadership**	**Support Learning Delivery**	**Ensure Accountability**	
			Design Feedback & Measurement Processes	**Monitor & Facilitate Compliance**
Understand Trends	Set Future Direction & Goals (Strategic Planning)	Manage Elem./Sec. Curriculum Development	Translate Standards into Measurement	Collect & Analyse results
Monitor Segmentation	Establish & Promote Common Values		Design the Process	Communicate Results
Direct Services - R&D	Agree on and Assign Responsibilities	Set Delivery Standards	Agree on & assign roles	Negotiate Compliance
	Facilitate Partnerships	Coordinate Common Technology / Infrastructure Development		Recommend Changes
	Link with Broader Public Sector			
	Contribute to & Access Overall Gov't Agenda	Allocate & Distribute Funding		
	Develop & Execute Strategic Communication Process			
	Foster Research & Scholarship in Universities			

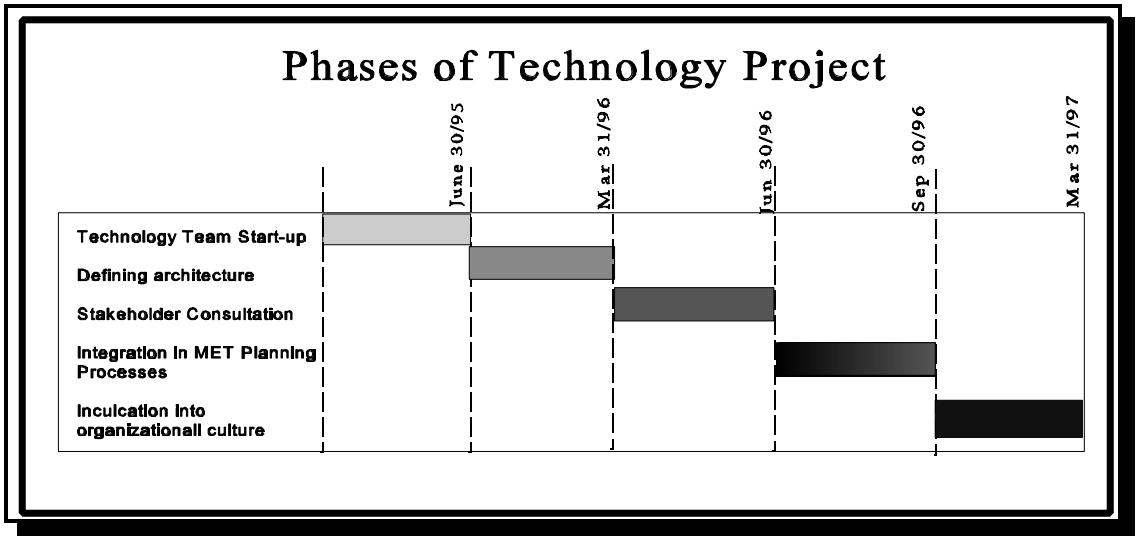
The challenges ahead cannot be met by traditional incremental improvement. A new, more radical approach is called for - one that does not merely replace one system with another, but, rather revolutionizes the kinds of work MET does and the way it does them. This shift will have a profound impact on the way IM&M (Information Management and Movement) is provided within MET. This project is based on this belief. It outlines a strategy to achieve the integration of technological thinking into management decision-making and, then, the inculcation of technology awareness as a key cultural ingredient of the educational sector.

This strategy emphasizes *process*. The traditional response of a *Strategic Plan* is too limiting. These plans are most often the result of a planning event, which has a beginning and an end. The manuscript inevitably focuses on internal IT issues, not the market or customer. System issues tend to be grouped like an organization chart. "*It no longer makes sense to create IT strategies separate from business strategies - they are too intertwined*"[11]. Furthermore, "*systems thinking and consistent strategy are required at every level of an enterprise, from the individual and business team to the enterprise level.*"[12]

[11] Paradigm Shift., p. 189-191

[12] Paradigm Shift, p. 63

Rather than creating a planning event, the shift will be toward establishing a working-learning environment where IT thinking becomes part of the life of every person and the activity of every organizational unit.[13]



The long-range strategy of technology awareness in MET

2.3 Methodologies

A MET Technology Architecture represents an important first step in this process. To develop, report and implement an architecture for MET requires several elements:

- a methodology to focus the architecture;
- a clear vision of MET business processes and technology's enabling role;
- accurate data on the state of current IT processes;
- thoughtful analysis of the **gap** between the current infrastructure and the future architecture needed to implement the business vision.
- a layout for reporting findings;

Bernard Boar suggests that most companies, by assumption that "*the purpose of IM&M is competitiveness"*[14], seek to develop an information architecture which has the following three attributes:

- *Maximum Reach* - Anyone (or any processor), anywhere, anytime can access the IM&M assets.
- *Maximum Range* - any information object (data or process) can be shared.
- *Application Manoeuvrability* - On top of the reach and range platform applications are built with manoeuvrability attributes - [maintainability, scability, adaptability, portability, openness, standards, autonomy, flexibility, data accessibility, inter-operability and appliance connectivity]. Manoeuvrability will require migration to a network computing architecture which imposes dramatic

[13] Paradigm Shift, p. 192-3

[14] Art of strategic Planning,, p. 28

change on the IM&M organization.[15]

This *reach/range/manoeuvrability* architecture would consist of, at minimum:

- *A corporate-wide local, metropolitan, and wide-area network based on a standard set of communication protocols,*
- *Gateway capability to interface with the networks of suppliers, the extended trading community, and customers,*
- *Support for both traditional and wireless communication technologies,*
- *Support for synchronous, asynchronous, store and forward, file transfer, Messaging, bursty, and non-bursty traffic,*
- *Industrial grade operations, administration, and maintenance capabilities to life cycle operate and administer the network computing environment, and*
- *Standard application program interfaces (API's) that enable communications between heterogeneous clients and servers. Service-based API's would encompass messaging (e-mail), data access (SQL), remote procedure calls (RPC's), file transfer, distributed transaction management, output services (print, CD-ROM, etc.), and systems management. This set of API's is increasingly referred to as bonding products or middleware;*

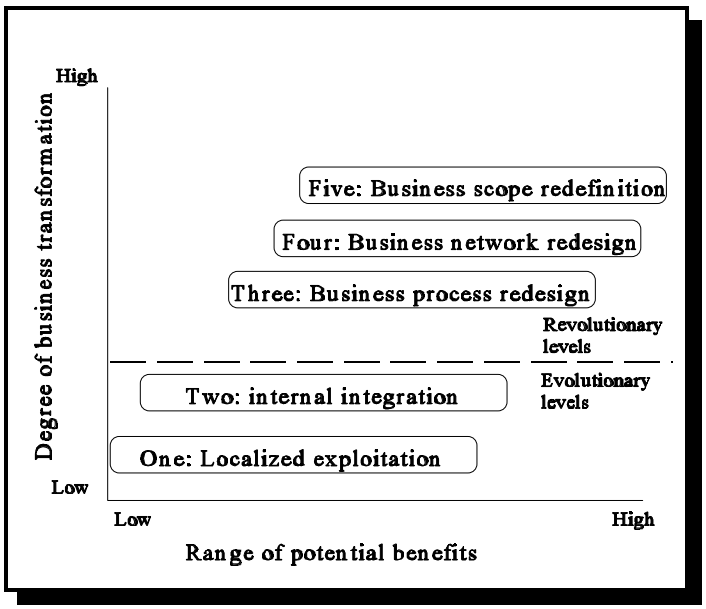
There is enough known about technology developments to use such a generic list - *"By using a generic set of requirements and solutions, it is possible to develop a conceptual-level architecture that can be used to both foster understanding about the enabling effects of IT and begin the migration of the technology itself.*[16] Doing so, however, does not ensure a strategic fit between the business processes and the IT infrastructure, nor does it address the realignment of IT functions to support the new architecture. As a government ministry, MET is not driven by profit-maximization motives nor the competition on which the generic models are based. Furthermorer, Educational Reform promises to profoundly alter MET businesses in ways that are not presently clearly understood.

Therefore, this architecture must uniquely reflect METs future obligations. But, these obligations cannot be defined in isolation of the promise and opportunites presented by the technology. The *Challenge for Strategists* is how to "*develop strategy-IT alignment*." N. Venkatraman classifies the emerging challenge in terms of a hierarchy of five levels of business reconfiguration.

The evolutionary change of the first two levels progresses to the "*reconfiguration of the business using IT as a central level. Instead of treating the existing business as a constraint in the design of an optimum IT infrastructure, the business process itself is redesigned to maximally exploit the available IT capabilities. This reflects conscious efforts to create an alignment between the IT infrastructure and the business processes".*

[15] Art of strategic Planning., p. 28.

[16] Paradigm Shift, p. 246



Five levels of IT-induced reconfiguration

Level four is concerned with "*the reconfiguration of the scope and tasks of the business network involved in the creation and delivery of products and services. This includes the business tasks both within and outside the formal boundaries of the focal organization and the consequent redesign of this "virtual business network" through IT capabilities.*"

Level five re-evaluates the basic purpose of the organization. - to "*possibilities of enlarging the business mission and scope."*[17]

MET is certainly involved in a level three transformation and must develop an infrastructure to accommodate level four concerns. The architecture must define a symbiosis between business needs and technology as an enabler of opportunites.

An IM/IT **Architecture** has been defined as:

> *the underlying framework which defines and describes the IT platform required by the business to attain its objectives and achieve a business vision. It is the structure given to information, applications, organizational and technological means - the grouping of components, their interrelationships, the principles and guidelines governing their design and their evolution over time.* [18]

In *Paradigm Shift*, five distinct views of an architecture are provided. The *business view* models the future enterprise using ***logical service units*** to represent the reengineered business. A *Business Model* is presented as a network of service functions linking internal and external clients and servers (note: that this model is derived by Client-Server architectures).

The *work view* models the enterprise from the point of view of work flows. "The goal of the modelling is to determine the most effective means of supporting these activities with information technology." This is similar to IBM's *Process Modelling* which has been adopted as an important tool in MET reengineering projects.

The *information view* determines fundamental information resource requirements and represents these as an information model.

The *applications view* links the business and information models in order to make as much of the enterprise's information as possible available in computer-accessible form.

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[17] N Venkatraham, IT-Induced Business Reconfiguration, reported as Chapter 5 in The Corporation of the 1990s - Information Technology and Organizational Transformation, Michael s\Scott Morton, editor, Oxford, 1991, p. 127-8

[18] Public Works and Government Services, Canada, "Government-Wide IM/IT Infrastructure Services Model",, p. 7

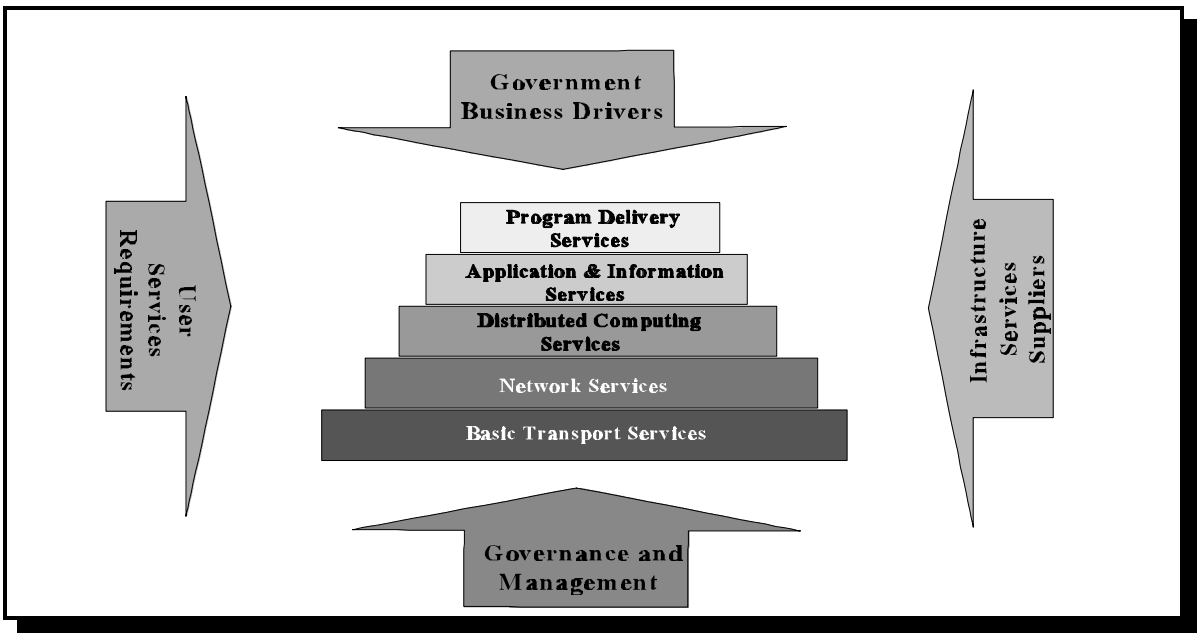
Lastly, the *technology view* links up with the work model by providing the required technology platform to meet the needs of various user classes.

These views where developed into a more comprehensive methodology which Art Caston called the ***PROACT*** model (see Appendix A). Using this model seven major business functions were defined for MET:

- education and training assessment,
- strategic policy and programs,
- curriculum development/outcome [reengineering project],
- education information technology infrastructure coordination,
- establish and distribute program funding [reengineering project],
- provider relationship and partner management,
- eligibility and compliance monitoring.

In order to translate the business view into information, application and technology views it is necessary to *drive* the business definition *down one level*. This means developing business models for each high level function. This does not require the amount of detail needed for a *work* view - we are not reengineering the process - only undercovering the information and technology linkages.

IM/IT **Infrastructure** is defined as "*the technology and plant, including operations of the technology, required for the delivery of infrastructure service*" and IM/IT Infrastructure **Services** are "*unified solutions to common sets of service requirements for a broad range of clients and users*". These may be viewed as consisting of multiple layers of value-added services that build upon each other. IM/IT infrastructure services and/or products are made available and delivered through an IM/IT infrastructure.



Five Layers of Technology Architecture

Architectural Layer	Description
Basic Transport Layer	services that enable the electronic interconnection of two or more end-point devices or interfaces through which a transfer (or transport) of information can occur.
Network Services	services that enable a "client" or "server", in the client/server environment, to connect, through Basic transport services, to one or more clients or servers within which and across network domains as well as to enable value-added Messaging, conferencing or broadcasting services.
Distributed Computing Services	provide a unified workstation and computing environment which enables consistent and easy access to all required applications, workgroup computing tools and sharable information-based sources.
Application and Information Services	provides and integrates services for shared and common applications such as Personnel, Finance, and Materials Management and government-wide information services, in order to promote streamlined government administration and to eliminate redundancies.
Program Delivery Services	provide departments with common delivery vehicles for the provision of program-related services to users. This layer, as well as department specific delivery requirements, drives the need for services found in each of the supporting layers.

3. Project Objectives

One of the major problems with a Technology Plans is that it is imposed. In the end, the challenge is always to get buy-in from the staff needed to implement it, but, " *the orientation was old paradigm - command and control, rather than commitment"*[19]. The attempt is better promoted as a process - **the development of the methodology to CONTINUOUSLY realign IT functions to business needs**.

[19] Paradigm Shift, p. 192

The Architecture itself is only a snapshot - though a very important one at this time.

"*There is no more powerful engine driving an organization toward excellence and long-range success than an attractive, worthwhile, and achievable vision of the future, widely shared."*[20]. Within MET this vision is Lifelong Learning. The Premier's Council of Economic Renewal has outlined the challenges presented by this vision.

> *To practice lifelong learning, individual learners need this archipelago transformed into a "learning highway"; a more flixible and user-friendly system that enables them to customize their learning paths according to their individual needs. They need more planned links between, across and around the different islands that make up this infrastructure for learning in Ontario. They need more ferry boats, with more regular and flexible schedules. They need other ways of navigating the paths between, across and around the islands, such as bridges, tunnels, and modes of transporation other that ferries between individual islands. In short, they need a flexible "transportation system", with a minimum of detours and dead ends, through which they can "navigate" the archipelago, and in doing so, customize their learning experiences to their individual needs.*[21]

The Enterprise Model reinforced this vision of the **learner**. It points out that the main business is *to support learning delivery*. IM&M has few *direct* links in the value chain which defines the Enterprise Model - it is infrastructure. This makes it more difficult to measure performance in terms which add direct value to the realization of the vision. For too long (and for too many organizations) this has presented a convenient excuse to avoid performance measurement. With the advent of the Enterprise model, however, new stress has been directed to feedback and measurement. **An integral component of a technology architecture must be the establishment of IT performance measures in order to promote Continuous Quality Improvement.**

IS organizations are in transition as computing moves from the *glass room* and big platform mentality of the 1960's and 1970's into the networking paradigm of the 1990's. In the process the *walls between the traditional IS department and the business units in enterprises are crumbling"*.[22]

> *We believe that over time, as technology unfolds, there will be more occasions to associate information services people or computer people with business people and imbue them with normal business processes.*[23]

In view of the dramatic changes in technology and the political and business forces operating on MET **an investigation of the alignment of the IS structure is an important consideration**.

While it is necessary to provide some manageable boundaries around the architecture, it is equally important to acknowledge that MET only *supports* the learning delivery system. The providers of learning are the teachers, learning tools and equipment, etc., which interface most directly with the student. While MET cannot dictate an information architecture for these front-line institutions, an architecture must recognize their needs to access and exchange data. **The architecture should foster and promote partnerships throughout the educational sector while demonstrating MET as a**

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[20] Burt Nanus, Visionary Leadership, Jossey-Bass, 1992, p. 3

[21] Premier's Council on Economic Renewal, p. 7

[22] Paradigm Shift., p. 257

[23] Computing Strategics for reengineering Your Organization, p. 103

model user of technology.

These partnerships promote efficiency and effectiveness across the entire spectrum of the educational sector and not just within MET. Following this logic there is a concomitant **need to act in concert with wider governmental and educational sector IT policies**. This is evidenmt in the establishment of standards to facilitate information exchange across jurisdictions, both within the Ontario Government and across provincial educational bodies.

The architecture must also identify the IT implications of the educational reform initiatives and other reengineering projects both currently identified and potential. It must also be cost effective and reflect the realities of government financial restraint. Lastly, **it must further subsequent steps in the process - inclusion into MET strategic and operational planning processes and, ultimately, into the fabric of daily thinking.**

4. Project Scope

This project is to develop an IM&M architecture which is responsive to the new MET responsibilities emanating from Education Reform, MET reengineering initiatives and public demands for greater government efficiency and accountability. This task requires further refinements to the definitions of MET business processes as reflected in Caston's *logical service function* construction. While the Enterprise Model provides a beginning, in does not provide sufficient support to develop either and *Information Model* or a *Technology Model* for MET.

Reengineering, however, is not the prime motive of this project. While it references other reengineering projects and establishes a business service model this involvement is only to support the definition of an IT architecture. The study will include analysis of the present IM&M internal structure and offer some advice for "realigning" this structure.

There are a number of current technology initiatives occurring within MET. To avoid misdirected and needless duplication of effort it is essential to align these activities as soon as possible. Therefore, an early exercise will be to identify them and set out recommendations. As a principle, only activities for which duplication or misdirection is clear will be recommended to be put on hold.

An assessment of current information technology services is essential to understanding the direction and degree of retooling and realignment needed. IM&M positioning defines the state of the IM&M resource in the context of an encompassing IM&M architecture. It is important to understand the state of

- Inventory - What exists?
- Principles - What are the established high level rules which guide decision-making?
- Models - structural models (data models, organization structures, business models, etc) which illustrate IM&M, and
- Standards - the agreed to products, methods, vendors, interfaces, etc, which bond IM&M together.[24]

To the above I would add resource levels. This leads to the following tabular analysis of the IM&M function.

[24] Art of Strategic Planning, p. 122

Services for Infrastructure Layers	Inventory	Principles	Models	Standards	Resources
Basic Transport					
Network					
Distributed Computing					
Application & Information					
Program Delivery					

There are several possible structures for information systems:

- **Dispersion of IS Resources** - decentralization of IS functions toward operational units (eg. Local LAN administrators)
- **Centralization of IS Resources** - regroup resources under tight centralized control (eg. Help desk)
- **Decentralization of IS Resources** - provide all IS resources at each location (eg. Regional offices)
- **Establish a Profit Centre** - contracts with and services internal clients on a profit or break-even basis
- **Outsource** - purchase IS services from external source specializing in particular service[25]

To determine the appropriate structure requires an analysis of the current IT internal business - the IM&M economic system. Pivotal economic design points for this task might be:

- **Allocation System** - how are decisions regarding service demand made? Who controls the allocations of dollars
- **Market System** - how are decisions on suppliers made - centrally or through IM&M?
- **Resource (Budgeting System)** - Do user organizations control their own budget or are budgeting decisions for IM&M made centrally (or some combination)?
- **Suppler System** - How does the IM&M group interact with the customers[26]

It is beyond the scope of this exercise to include partners and stakeholders - schools, school boards, colleges and universities, ABC's of MET, etc., within the architectural model. While it is vital to recognize the importance of interoperability and the needs for standards in facilitating communications and data exchange, these institutions maintain their own governance structures and special requirements.

It is equally important to remain focused at the appropriate level. Unless, crucial to the selection of infrastructure elements, individual IT projects and initiatives will not be mentioned. As a principle, past IT decisions and activities are viewed as systemic manifestations of the environment at that time. No judgement will be made as to why MET failed to anticipate more strategic responses in the past -

[25] Paradigm Shift., p. 266-277

[26] Art of Strategic Planning., p. 130-133

the past is over. MET proceeds from this point.

Lastly, RCOL recommendations on the use of technology in the classroom are not a part of this discussion. While conformance to established standards has become an issue (and a solution) that everyone must be aware of, its' inclusion is outside the bounds of MET jurisdiction. These matters are assumed within the rubric of MET **acting as a model user of technology.**

5. Deliverables

An early deliverable will be recommendations on the status of varied IT initiatives currently being undertaken throughout MET. The intent is to avoid duplication and align activity in a directions which will support a new information architecture.

The Information Technology Infrastructure will be detailed in a comprehensive report which will provide guidance in subsequent phases of the overall movement of IM&M. This report will provide descriptions of MET service functions and information models which will provide baseline data for other reengineering and MET initiatives. Its' purpose is to advise on standards and the acquisition of key enabling technologies. The report will also advocate the alignment of Information Services including options as to how and who might offer the services. These options will impact the organization in many indirect ways, but, will have a direct and profound affect on IS units in MET. Some assessment of the degree and manner of change is therefore a necessary part of the document. In addition, since financial and political realities will fashion the speed of change, an implementation strategy must be developed which recognizes them, assesses risks and advances strategies to minimize their probability and/or severity.

6. Critical Success Factors

In *Paradigm Shift* ***ten guidelines for achieving an era II architecture*** are advanced:

1. Emphasize the *process* of architecture planning, not the plan.....
2. Ensure the architectural vision is owned *jointly* by the IS function **and** the business units...
3. Ensure that architecture planning is *business-, not technology-driven*. ..
4. Focus on *migration*...
5. Design for *continuous change*....
6. While the planning horizon may be longer term, *emphasize action and delivery of short-term results*...
7. Create a *fast-path process*...
8. *Drive down to the actual delivery of systems,* end-user tools, and facilities..
9. *Use the five architectural views as a framework for architecture*..
10. *Just do it*..[27]

A technology architecture should be based on a business view of the organization (rather than adopting a generic architecture). At least the first five of these guidelines should be considered critical to the success of designing and implementing an architectural plan for MET. But a successful architecture

[27] Paradigm Shift, p. 254-5

requires several additional elements.

First, the architecture must encompass MET's mission-critical services - where it adds significant value to the learner. The architecture must include recommendations to greatly improve (ie reengineer the dispersement of funding to the affected institutions and the development, retention and storage of curriculum). It must accommodate this within the framework of educational reform and the reengineering varied business activities. This requires expert knowledge of MET businesses in general and **strong coordination with the activities around the new initiatives.**

Reengineering provides a focus for the development of an information architecture (though the need is real even without this motivation). The continued existence and future extension of MET reengineering will provide an important umbrella for defining an architecture.

Realigning the organization to support reengineering and retooling directly affects many IS professionals and changes the nature of many traditional business functions. Indeed, the future will see and increasing convergence of the two, formerly distinct occupation sets. **The development of a Change Management Plan** is essential to the success of the project - " *the most overlooked and, ironically, the largest component of systems costs are the human costs of change."*[28]

Lastly, it is essential that MET architecture by consistent with approaches being taken by the central agencies of the Ontario government, and, hopefully with those being adopted by other ministries. **Some coordination with other ministries is desirable to avoid inter-ministry duplication.**

7. Organization

7.1 Roles and Responsibilities

Role	Responsibility	Person(s)
Project Coordination	**P**repare project plans. **P**rovide reengineering advice. **C**oordination with Reengineering Team. **P**roject control. **F**acilitate Team meetings	Hendershott,
Project Owner	**F**acilitate cooperation throughout MET. **E**nsure responsibilities are assigned. **L**iaison with corporate groups. **N**egotiate human resources requirements with MET departments & teams. **F**acilitates meetings and focus groups. **M**anagement reporting. **F**inal Report.	Ann Johnstone
Executive Sponsor	**P**romote project before DMG. **N**egotiate organizational issues affecting project which cannot be resolved by Process Owner or Project Lead.	Jan Donio
Process Mappers	**P**rocess maps MET (1) technology decision making and (2) technology support processes.	Scott McGregor et al.
Human Resource Advice	**P**rovide advice and assistance on the human resource implications of elements of the plan	Chris Birchall, Lynn Dodd
Researchers	**B**est Practices research for form and content on use of Technology Plans. **I**nventory of MET information resources. **D**evelop cost-benefit analysis of technology support options	
Business Experts	**G**ain understanding of MET Service and Information Models. **R**eview material from business perspective. **G**ain awareness of enabling technologies in support of MET business.	

[28] Paradigm Shift, p. 155

Role	Responsibility	Person(s)
IT Professionals	**P**rovide knowledge of MET current technology usage, its value and roles. **P**rovide knowledge of MET current technology service functions. **R**eview cost-benefit comparison of tech. support options. **U**ndertakes environmental scan of current & future technology directions. **G**ain understanding of MET service functions and business processes	
Reengineering Project Liaison	**P**rovide technology advice in support of MET reengineering projects & IM&M Infrastructure directions. **E**nsure reenginering project solutions are included in and consistent with Technology Plan.	Len Hendershott,
Writer/Reviewer/ Presenter	**P**repare and Edit material. **R**eview material with critical comment. **P**resent results to DMG.	L. Hendershott, A. Johnstone
Focus Group Member	**P**articipate in group focus group.	

7.2 Working Arrangements

The Technology Infrastructure Team is self-directed under the overall direction of the Project and Process Leaders. The Project Leader and Process Owner both report to the Executive Sponsor for the project, Jan Donio.

The entire Team will meet frequently to discuss issues of overall coordination and direction. Most work will be done in smaller Task Groups composed of three to four individuals with specific responsibilities.

Part-time status has been interpreted as one-day per weeks. Team members are asked to track their time on this project as it will be compared against project plan estimates. This information will provide base data for continued improvement of project administration and management.

As a self-directed team all members are responsible for the success of the project. It is their joint responsibility to ensure that the project is on track and proceeding in a way agreeable to the collective conscious of the team. It is the individual responsibility of members to read material before attending team meetings and to be prepared to engage in meaningful dialogue towards a stated objective of the meeting.

Both general and specific expectations will be described in contracts for Team members having a status greater than one-day per week. This contract will be supported by a *Training Agreement* outlining the acquisition of new skills valuable to the completion of the project.

7.3 Project Control

Project progress and reporting are the responsibility of the Project and Process Owners. The Process Owner is responsible for the overall management of the project including time lines and, in consultation with the Executive Sponsor, with the moving of resources between tasks as required. The Project Leader provides basic reengineering advice and assistance throughout the project.

Periodic progress reports will be made to DMG on this and to the other Reengineering Teams. Depending on the focus of the presentation, team members may be asked to participate in that briefing.

8.0 Project Tasks

8.1 Table of Contents for Final Infrastructure Report

The Table of Contents presented here is adapted from Bernard H. Boar's *The Art of Strategic Planning for Information Technology*.

1.0 Executive Summary
Reviews the main objectives, goals and recommendations to be presented in the plan.

2.0 Background
Provides a context for an effective information technology infrastructure.

2.1 MET Business Needs
Discussion of Royal Commission Report and Education Reform initiatives.

2.2 The Reengineering Initiative
Description of government-wide reengineering undertaking, MET's unique requirements with regard to it. The development of the Enterprise Model as MET's initial response and identification of the seven reengineering projects.

2.3 Technology Change
Current technology directions which present opportunities for MET to dramatically change the way it delivers programs.

2.4 Changes in IM&M Support
Current trends in the way IT support is provided to promote the reengineering initiative and to utilize to maximum advantage the new technologies.

3.0 Assessment
Assessment is the process of deciding the issues on which to focus attention. Gaps may occur in performance execution (quality, cost, time cycle, support) or in opportunities (customer satisfaction, enterprise, new products or services). Assessment is data collection which is used to analyse the current situation in section 4.

3.1 Business Scope
Concept definition, characteristics and formulae of the business which include mission, values, strategic purpose, driving forces, etc. Translation of Enterprise Model into **Service Function Model** to describe the organization in terms of product flows and relationships.

3.2 Directives and Assumptions
It is necessary to acknowledge and accommodate the entire host of government directives and operating assumptions which define the boundaries of a workable Information infrastructure. These include available resources, governance, commitment and available provider competition.

3.3 IT Position
This describes the current position of IT functions and activities within the current MET business repertoire. It includes a review of how IT decisions are made, the costs of providing IT support, an evaluation of user perceptions of IT's value and effectiveness. All infrastructure services

3.4 IT Direction

Consolidation of networks, equipment leasing and the selection of the Novell Suite all reflect an implicit or explicit direction by MET for the provision of enhanced technological capabilities. It is important to map that direction in relation to the evolving business needs.

3.5 IT Support

Some assessment of current IT support to MET business needs to be evaluated. Process mapping of IT support will provide the base level data to be used to evaluate gaps between business user needs for technology and the current provision of it. The currently accepted approach for this uses the **LOVEM/CABE** methodology which provides high level and detailed maps of business processes. Focus group sessions (using MET internal ITUG - Information Technology User Group) will compare the mapped process with internal perceptions of technology support.

3.6 MET Technology Costs

Realignment means redirecting existing resources to better advantage in the organization. To this end an inventory of current technology costs provides the basic ingredients to conduct a realignment.

3.7 Infrastructure Inventory

An inventory of current infrastructure support according to Caston's five layers of services (see section 2).

4.0 Situation Analysis

This section reviews the data presented in the Assessment sections in order to arrive at conclusions on the current state and technology directions of MET in relation to current and new businesses ensuant from Education Reform and reengineering initiatives.

4.1 Critical Success Factors (CSF)

This section highlights specific competencies, capabilities and processes which the organization **must** do or excel at in order to succeed.

4.2 SWOT (strengths, weaknesses, opportunities, threats)

Based on the previous data gathering and analysis this section is an appraisal of MET's ability to undertake change.

4.3 Future Service and Product Position

This is an environmental scan of current technology. Section 2.3 presented key technology enablers of new business processes (for which there is an abundance of literature). Since MET's business processes will change over the next few years and since the implementation of new technology directions involves some lead time it is preferable to be more forward looking and anticipate the confluence of the two forces.

4.4 MET Service Function Information Model

Based upon the MET Service Function Model developed in Section 3.1 an information model is developed for each Service Function. This model details major information elements maintained in information applications and will utilize process mapping undertaken for other reengineering projects most notably Curriculum Development and Data Collection in Support of Funding). Additional areas will be identified and modelled.

4.5 Probability of Success

This section defines the probability of success within the contexts of cost, support for strategic directions and the impact on the business.

4.6 Conclusions

Identify the imperative items that demand strategic action based on the following characteristics:

Conclusion A short statement that clearly defines a situation requiring

	strategic attention.
Description	Short paragraph describing the conclusion and explaining the root of the conclusion.
Possible Actions	Actions dealing with the conclusion.
Supporting evidence	Convincing argument to support the conclusion.

4.7 Assessment Gap Analysis

Conclusion on the size, cause and nature of the gap between MET's vision of an infrastructure and the current direction.

5.0 Strategy

What will be accomplished and how

5.1 Future Business Scope and Position

The desired state of the business once the strategic plan is completed. Includes extrapolation of Enterprise Model and Education Reforms, environmental scan and Situation Analysis.

5.2 Objectives

Definition of concrete and measurable objectives for the plan which **must** include:

- financial objectives
- leaner satisfaction based objectives
- partnership objectives
- government-wide objectives

5.3 Contingency Plan

Analysis of events which could prevent the organization from achieving its objectives

5.4 Implementation Plan

interim points of accomplishment on the path to achieving the objectives including an strategic analysis of specific actions that will help achieve the objectives and a **Change Management Plan** for preempting resistance to change and for enrolling the organization in the change effort.

8.2 Tasks/Dates and Deliverables

REF	TASK	DESCRIPTION	DELIVERABLES	DONE	RESPONSIBLE
A	**Preparation : Scoping and Outlining project's complexities**				
A1	Form Team	Select Team members and assign to tasks for completion	Assignment of Leads to each task	May 2	Johnstone
A2	Project Outline	Outline of project scope, methodology, final report format, deadlines	Project Outline	June 12	Consultant, Johnstone, Hendershott,
A3	Technology Initiatives Alignment	Preliminary review of disposition of current inventory of technology initiatives within MET	DMG decision on status of current initiatives with regard to ITIP	June 12	Van der Wees
A4	DMG Presentation	Presentation to DMG on reengineering initiatives.	Approval for reengineering project to continue. Approval of key issues.	June 19	Reengineering Team w. Jan Donio
B	**Observations : Observations and conclusions on state of present MET business and IT**				
B1	Current business environment	Synopsis of major events affecting MET business processes. Initial fact finding followed by facilitation session	Section 2.1 of Final Report		Kuntz, Dunn

REF	TASK	DESCRIPTION	DELIVERABLES	DONE	RESPONSIBLE
B2 SERVICE FUNCTION MODELS	MET	High level development of MET service functions from data associated with Enterprise Model. Facilitation session to provide base data to be followed by Delphi round of question to widen review of model	High level service function model of MET business	Sep 30	Consultant
	Curriculum Development & Outcome	Develop service function model of **Curriculum Development and Outcome** function using facilitation session with Curriculum reengineering venture and coordination with Process Modelling.	Service Function Model. Training of internal MET staff in producing Service Function Models	Sep 15	Consultant, McGregor, Hendershott
	Program Funding	Develop service function model of **Establish and Distribute Program Funding** function using facilitation session with funding reengineering group and coordination with Process Modelling	Service Function Model.. Further training of MET staff in producing Service Function Models	Sep 30	
	Remaining high level Service functions	Develop service function model for function	Service Function Models	Nov 15	
	Consistency review	Consolidation of service function models and write up. Check for inter-function consistency in approach. Delphi round to widen scope of commentary. Review and write up following Delphi round	Consolidated and complete description of MET service functions	Dec 15	Consultant

B3: Current Infrastructure Review Analysis includes:

(1) an inventory of current services,
(2) the high level principles that guide decision-making around these services,
(3) structural models (data, organization, business, etc) which direct activity,
(4) standards developed in this area and MET's use of them,
(5) the resources expended by MET in their provision,

REF	TASK	DESCRIPTION	DELIVERABLES	DONE	RESPONSIBLE
B3 I N F R A S T R U C T U R E	Basic Transport Services	Review of current state of services that enable the electronic interconnection of two or more information devices or interfaces through which transfer of information can occur.	base data for Task C4	July 31	
	Network Services	Review of Services that enable a client or server (in a client/server environment) to connect through the basic transport layer to one or more clients or servers within which and across network domains as well as to enable value-added Messaging, conferencing and broadcast services.			
	Distributed Computing Services	Review of workstation and computing environment which enable consistent and easy access to required applications, workgroup computing tools and sharable information-based sources.			
	Application & Information Services	Review of integrated and common applications such as personnel, Finance and Materials Management and government-wide information services.			
	Program Delivery Services	Review of common delivery vehicles for the provision of program-related services to MET staff, partners, clients and stakeholders. The need for these services **drive** the need for services found in each preceding layer and lead to the next task.			
B4	Information Models	Using the Service Function models and Caston's *PROACT model* , Process Models developed for reengineering projects and existing data modelling material information Models are developed for each Service Function identified in task B2. Close cooperation with others involved in similar tasks is critical to the success of this endeavour.	Information Models	Dec 31	Consultant, Hendershott
B5	IT decision process mapping	Develop description of manner in which IT decisions get made within MET. Facilitation session with those most closely involved in setting IT direction.	base data for Task C4	Sept 30	ITSC
B6	IT support mapping	Process mapping of current methods in which IT support is offered within MET using health-care model which distinguishes "curative" and "preventative" services. Perceptions of services will be established through a facilitation session with ITUG. Process mapping of "TO BE" service situation will be subsequently undertaken to assess the possible state of MET service.	base data for Task C4	Oct 31	ITUG, Hendershott, McGregor, IT staff
C: Analysis: Drawing conclusions on the basis of the observations. Several methodological tools will be employed throughout these tasks including: • **root cause analysis - to uncover the underlying etiology of a problem,** • **"S" curve technology analysis to predict future state of technology offerings,** • **Delphi techniques to develop consensus around forecasts,** • **Value Chain Analysis to move services through a value chain to ensure value "to the learner",** • **Conclusion Map analysis to summarize the logical deduction which was made to adduce a conclusion.**					
C1	Governance, directives & assumptions	Summary of government directive, assumptions and directions which determine governance characteristics. Statement of Mission, Values, strategic purpose and driving forces for MET business.	Section 3.3 of report	June 30	Dunn

REF	TASK	DESCRIPTION	DELIVERABLES	DONE	RESPONSIBLE
C2	Critical Success Factors	Identification of factors critical to success of project. Facilitated in group session late - June) and reviewed using Delphi technique (early July). Responses consolidated.	Section 4.1 of Report	July 31	Johnstone
C3	SWOT Analysis	Identification of strengths, weakness, opportunities and threats to MET infrastructure. Facilitated in same group session as C2 and reviewed using Delphi technique. Responses consolidated	Section 4.2 of Report	July 31	Johnstone
C4	Change Management Plan	Develop Commitment and Change Management Plans to enhance commitment and facilitate change to the desired state. Facilitation sessions conducted Conclusion mapping performed.	Commitment Plan Change Management Plan	Feb 96	
C5	Implementation Plan	Identification of Implementation plan and specific projects for quick implementation.	Implementation Plan Project list	Mar 31	
C6	Report Writing	Writing of Information Technology Infrastructure Report	Draft of report for DMG consideration	Mar 31	

Appendix A: MET Service Function Model