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SERVICES TO BUSINESS IN THE
MANAGEMENT OF TECHNOLOGY:
A FRAMEWORK

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under contract with Carleton University

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CONTENTS

Executive Summary

1.	Scope of the Report	1
2.	The Context	1
	2.1 Difficulties	2
	2.2 A Learning Environment	4
3.	The Objective Restated	4
4.	Outline of the Report	5
5.	Definitions and Content of Management of Technology	7
	5.1 A Range of Activities	8
	5.2 Integration	11
	5.3 The Integrative Task	12
	5.4 Integrative Strategy/ Organization	12
	5.5 The Business Plan	13
6.	National Precedents	14
	6.1 Australia	14
	6.2 West Germany	16
	6.3 France	16
	6.4 United Kingdom	16
	6.5 United States	17
	6.6 New Zealand	18
7.	Total Quality Management	18
8.	Human Organization	20

9.	Issues of Form	21
9.1	Purpose	22
9.2	Practice	23
9.3	Awareness	24
9.4	Integrated or Modular?	25
9.5	Distance Learning	25
9.6	University Networks	26
9.7	Push or Pull?	27
9.8	Consultants	27
9.9	Firm-specific Problem-solving	28
10.	Forms of Learning	29
11.	Scale and Selectivity	30
11.1	Intensity of Effort	31
11.2	Leverage	32
12.	Subsidies	33
13.	Who can Teach or Lead?	35
13.1	The Ideal Teacher	38
13.2	Canadian Resources	39
14.	Conclusions	44
15.	Document Attached (NIES)	47
	Short Glossary	49

EXECUTIVE SUMMARY

Management of Technology (MOT) is the discipline and art that enables a technology-based business to compete by fully integrating technology, strategy and organization.

It is a way of thinking and acting which underpins technology-related business problem solving.

From a public policy point of view resources spent on promoting R & D and advanced technologies are wasted unless business knows how to manage technology.

Therefore MOT should be a priority for any departmental technology-related service activities of an educational or training nature.

An integrative discipline such as MOT can only be mastered in the course of an intensive, if intermittent, process of learning-by-doing.

It should therefore be distinguished from other more specialized, modular and problem-focussed training or consulting activities.

Since MOT is still at the formative stage it could initially be grafted on to more established but still integrated business educational packages, such as Total Quality Management or Business Planning or World Competitive Manufacturing, but because of the shortcomings of those packages it should be a temporary measure, or those other packages will have to be redesigned.

ISTC will also have to make up its mind with regard to both the scale and the selectivity of its educational and training activities.

This report suggests that MOT-type education must be undertaken on a highly selective basis, mostly for resource-related reasons.

It will therefore be driven by explicit industrial development objectives - proactively, not reactively.

At the company level only the "winners" should qualify for assistance. For example, MOT training is wasted on manufacturing firms that do not employ engineers.

Many companies, however, can benefit from awareness sessions, which can be quite cost-effective.

ISTC would do well to clearly differentiate, even administratively:

- (a) proactive MOT-type education
- (b) spreading awareness, and
- (c) reactive, specialized training and corporate problem-solving or consulting services

The difference between (a) and (c) above is also, by and large, the difference between two technology-related industrial development strategies.

Just as good MOT teaching induces subsequent policy-making processes in a company (as a by-product), the focus on MOT-related services in this report opens up questions, for ISTC, at the level of mission, strategy and roles. For example, it impinges directly on the qualifications and roles of regional branches and field officers and on the decision of how much will be done by departmental officers and how much by outsiders.

We have only been able, in this report, to suggest a framework.

Although the report also gives examples of how other countries have been trying to do similar things, it does not address the next step, namely, how to organize for results in the Canadian context. That would depend on departmental answers to some of the more fundamental questions.

To this end it is suggested that, among others, the Australian National Industrial Extension Service (NIES) offers the closest analogy and a useful benchmark.

SERVICES TO BUSINESS IN THE MANAGEMENT
OF TECHNOLOGY: A FRAMEWORK

1. SCOPE OF THE REPORT

The following report was commissioned to:

- (a) articulate the information needs of ISTC and its business clients in the area of the management of technology (MOT);
- (b) identify Canadian resources in MOT that could be exploited by or on behalf of corporate clients; and
- (c) outline a plan for information exchange and networking among ISTC, identified resources, and corporate clients across Canada

2. THE CONTEXT

Parts of this assignment have already been overtaken by events. In seeking to redefine its role in industrial development ISTC is building an inventory of services encompassing marketing, technology and management practices. The Services to Business Branch is therefore committed to a work plan within a service-rendering framework, providing for a diverse range of activities across regions. Most of these activities involve, to a greater or lesser degree, aspects of technology applications and of related management practices, as well as networking among agencies operating in these domains.

Secondly, ISTC has launched a series of in-house training courses in the field of MOT. In that connection the department has already moved to identify (with a view to harnessing) resources for future educational and training purposes. Accordingly, and for maximum utility, we would aim to complement those initiatives rather than duplicate them. This affects the weighting of the three components of the present report. And, to the extent that we see directions that may differ from the pattern of services to which the department has now apparently committed, they should not be taken as critiques but rather as potential templates for any future changes in policy and programming the department might want to contemplate.

A considerable amount of similar experimentation has been taking place elsewhere in the advanced industrial world. As yet, nobody has sufficient experience to claim a satisfactory answer. This is particularly true in the field of the management of technology which is itself still underdeveloped and poorly understood, and therefore bound to raise unrealistic expectations. A quick look at any of the contemporary textbooks on the subject will bear out this observation.

2.1 Difficulties

One of the difficulties facing officials in the public sector is the well-established tendency to regard R & D as the catalyst or driving force for technology-based industrial development. We would even say that the emphasis on technology itself causes a problem. Science and technology are viewed instrumentally, indeed almost deterministically, as in a production function - "S & T in, development out." From our perspective a disproportionate share of public resources is devoted to the rubric of science and technology even if we include the new strategic or generic technologies. Relatively few public (and private) resources are directed to the managerial and organizational competence (or rather incompetence) of businesspeople whose competitiveness depends on the management of technology. The problem is merely underlined by the fact that among the manufacturing firms in Canada employing more than fifty people, fully seventy percent do not have the services of a qualified engineer.

Under the present competitiveness conditions in the industrial world, there is more or less agreement that competitiveness is less determined by access to resources, assets, endowments (even information and levels of science and technology) than by the presence of a special kind of competence. The phenomenon has been addressed in recent studies under titles such as "Why do some countries innovate, and others do not?" This competence consists not only of skills and experience but also of new ways of thinking about technology and its deployment.

These are also the same elements that are causing difficulty for public sector agencies purporting to render services in the field. The same elements constrain the selection of companies that deserve and are capable of benefitting from such services, a controversial question we shall have to address as well.

A second source of difficulty is the double-barrelled aim of this report, insofar as it addresses the rather different needs of two domains - the public service and the (business) clientele of departments like ISTC. For example, Canada is not the only jurisdiction in the world where there is confusion and ambiguity about the role of field officers, when these people are responsible for the public policy aims of their employers while also seeking to meet the needs of individual clients. Indeed the competence-cum-credibility of public sector agencies who inject themselves into these roles has been a subject for debate among business-people. This comes at a time when industry departments in several countries have been trying to redefine their roles if not to justify their own existence.

One further problem deserves to be raised at the outset. It hinges on the undeveloped and still largely undefined character of MOT. MOT is a discipline in its own right, not just an angle on business, but it is still inchoate despite the fact that many companies have been successful at it. Inside successful companies like IBM the subject is actually taught, more or less formally. In the first place, MOT cuts across and integrates the other business functions but it is also heavily problem-driven, seeking specific solutions to specific problems in specific firms.

In this sense MOT has both a horizontal and a vertical character, and if these two dimensions are combined with the two domains (brought into play when public sector agencies decide to become involved) the following matrix emerges:

		<u>Domains</u>	
<u>Dimensions</u>		Public	Private
Horizontal (integrative, functional)			
Vertical (specific, specialized)			

One must therefore struggle to find and to define an overall context for an activity that not only links the public and private domains but also the other elements of our matrix.

2.2 A Learning Environment

What we see here, perhaps, if we stand back, is best described as a complex learning environment. The core of the exercise is developmental. The department (ISTC) along with its clients, see themselves in a learning process. It so happens that in the field of MOT, more than in most, the only really effective learning process is "learning by doing." Lessons are learned, insights emerge, and development occurs in the course of addressing real problems, not through academic instruction. Learning by doing covers learning by failure as often as learning by succeeding.

This qualification leads directly to the kinds of issues we must address. For example, there is the question of the identities and capabilities of the "teachers," joining queries about the qualifications of public servants and agencies, to querying the effectiveness of most academics and consultants. It would be wise, from what we have seen and heard, not to harbour illusions on this score.

The same line of inquiry extends, naturally, to the content of the learning and the places where the learning is supposed to occur. And last, but not least (already hinted at) is the problem of who are or ought to be the students? (For example, which public servants are in a position to enjoy learning by doing?) Thus pedagogical issues are intertwined with public policy concerns (and we have not even mentioned the question of either cost or the threshold scale of a creditable, credible program).

3. THE OBJECTIVE RESTATED

The foregoing are the appropriate parameters of this report, which can now be briefly restated as follows:

The objective is to promote industrial competitiveness by promoting

- (a) an understanding of technology management in both the public and private sectors, and
- (b) the competitive practice of MOT in business

The core of the activity is developmental; it consists of a process of learning, preferably in the context of doing.

Against this background we shall therefore discuss the following issues:

- (a) the content of the activity (which, in turn, derives from its purpose)
- (b) the form of the learning activity
- (c) the appropriate scale of the government's interventions
- (d) the selection of "students" (or, as we call it, the issue of selectivity)
- (e) the qualifications and availability of "teachers."

4. OUTLINE OF THE REPORT

At the risk of being pedantic one should start by clarifying the meaning of MOT. How have those agencies which are trying to "push" MOT, defined it? The definitions tend to determine the scope of the program activities conducted under the MOT umbrella. This does not mean that we do not recognize that definitions often beg the question (you define your ability to act, in effect).

We should then expand or complement the definitions by also examining the range of activities that are usually associated with MOT (or its surrogates) but which are undertaken without their having been explicitly tied to an MOT label. This is inevitable when a discipline is still unformed. For one thing, most universities are still caught up in the traditional disciplinary compartments, reluctant or unable to recognize and promote a new cross-disciplinary intruder.

For another, businesspeople looking for solutions to specific business problems prefer advice in a form which is tailor-made for and directed to the problem area (whether quality control or research management or new product development or automation), and the advice would typically come in the form of a contract with a consultant, and not in the form of a seminar.

The other more customary event is where somebody comes in

to give technical advice to a company (say under the equivalent of NRC's IRAP) but the technical problem then serves as a "hook" or catalyst for broader managerial assistance (indeed learning). Several practitioners of MOT-related business services are adamant that whatever broader guidance is given must be attached to a "hook" of one kind or another. (On the other hand the teaching of Total Quality Management, or TQM hereafter, is invariably accepted in its own right - no "hook" is required. TQM is the closest practical analogue of MOT; it is not confined to solving any single or specific problem. We shall therefore discuss the issue of whether MOT is best marketed in its own right, or whether it could be most usefully put across in some other guise, as in the form of TQM.)

Just as the content of an MOT-related government program derives from its purpose, the appropriate scale of the intervention depends on the public policy objectives of the government. Is the program national, regional, sectoral, or enterprise-directed? Is it proactive or reactive? Is it on/off assistance or is it continual? Here again, what is possible or desirable from a public policy perspective may be incompatible with the pedagogical demands of a process of learning by doing. And speaking of scale, it often happens that governments run the risk of programs succeeding rather than failing - they create such expectations that the appropriate level of service cannot be sustained.

And so the next question as well, namely, which companies ought to be assisted, becomes a function of the resources the public sector can make available; as well, it depends (or ought to depend) on industrial development priorities.

Lastly, available resources in the public and tertiary sectors include the people and agencies who are capable of conducting MOT-related education, training and consulting. They include, as well, companies (peer groups) willing to share their experience with other businesspeople, even competitors.

We will not be able to separate all of these factors in discussion. For example, scale and selectivity are the two sides of the same coin.

5. DEFINITIONS AND CONTENT OF MANAGEMENT OF TECHNOLOGY

How MOT is defined is strongly coloured by the chosen rationale or the agenda for MOT-related interventions or services. It is perhaps more useful to look at the definitions favoured by agencies with clear developmental objectives. In this regard one is struck by the consistency and frequency with which the promotion of MOT is coupled with a drive for competitiveness.

Here MOT differs remarkably from other similar disciplines. One rarely hears, for example, of pleas for more MBA training for the sake of competitiveness. The linkage of MOT and competitiveness also comes out in the reverse direction. For example, the Australian governments (federal and state-level) have not yet taken steps to "push" MOT education as such, but if one examines their WCM (World Competitive Manufacturing) business training seminar one finds elements of a potential MOT curriculum.

Not surprisingly the "challenge for the United Kingdom" is described as follows: "The United Kingdom faces fierce competition from abroad in its manufacturing, construction, process and service industries... it is a problem of technology management."

The most widely accepted definition of MOT in the United States comes out of a 1987 task force report titled "Management of Technology: The Hidden Competitive Advantage."

Now for the definitions. First the American:

"Management of technology links engineering, science and management disciplines to plan, develop and implement technological capabilities to shape and accomplish the strategic and operational objectives of an organization."

The British definition:

"Management of technology is a human skill, combining elements of engineering, science and management techniques, which is needed by organizations in order that they may fulfill their technological capabilities and thus maximize their strategic and competitive advantage in the marketplace."

The editors of a new Journal of Engineering and Technology Management describe MOT as:

"....an industrial activity (that) concerns the process of technology development, implementation, and diffusion in industrial or governmental organizations. In addition to managing the innovation process through R & D, it includes managing the introduction and the use of technology in products, in manufacturing processes, and in other corporate functions."

They also stress that MOT has a dual nature, being cross-disciplinary (integrative, horizontal) as well as problem-driven (vertical). It "deals primarily with using knowledge to solve problems rather than with increasing knowledge."

In their in-house training module for ISTC personnel, Professors A.J. Bailetti and John Callahan have defined MOT most succinctly as "the use of technology for competitive advantage."

5.1 A Range of Activities

As we have observed MOT is also defined by way of listing a number of constituent activities or training objects. In this vein Professors Bailetti and Callahan cite the following "important issues in the management of technology":

- integration of technology with business strategy
- management of new product/process development
- adoption of new manufacturing technologies
- manufacturing for global markets
- barriers to innovation
- supplier and customer coupling
- management of technical networks for information gathering
- technology forecasting and selection
- to develop in-house, or source outside
- management of technical personnel
- work force training and education

- management of change
- technology transfer: inbound and outbound

("Management of Change" is also the favoured definition at the University of Western Ontario, while others tend to refer to MOT and "management of innovation" in the same breath).

By comparison, the British definition of MOT goes on to identify the following key elements:

- the identification and evaluation of technological options
- research and development itself, including the determination of project feasibility
- integration of technology into all aspects of the organization's activities
- implementation of new technologies in a product and/or process
- obsolescence and replacement

(The British follow up by distinguishing the practice of technology management as "the design and use of the means needed within organizations to achieve economic and social objectives through technological innovation.")

SRI International (to quote a final example) has addressed the following "technology management issues" in some detail:

- identifying, accessing, and utilizing external technology
- dealing with the globalization of technology
- integrating technology and strategic objectives
- shortening product development cycles
- coping with the increased pace of technology change
- maximizing the return on technology investment

- technology transfer and delivery
- dealing with shorter time horizons
- managing human resources
- optimizing organization design
- coping with relatively uncertain government policy

(The last rubric is a growing problem for business; politicians and bureaucracies are increasingly unable to sustain "commitments" and we were struck by the almost unaccountable failure of several government-financed educational and training initiatives to follow through after excellent and promising starts. We came to call it the "petering out syndrome" where the reasons for the loss of interest were apparently not financial. In one such instance the creators and launchers of a training service are now exploiting the know-how in another grateful country, essentially at the expense of the original taxpayers.)

One other remarkable aspect of MOT definitions is the frequency of coupling it with engineering management, education and training. Thus, in Britain, the Engineering Council is actively involved in campaigns to promote MOT education, and in most countries there is a related emphasis on the manufacturing side of enterprise - certainly in Britain, Germany and Australia, but also at the state level in the United States (notably in Michigan and Pennsylvania).

What we have said does not mean that MOT is overlooked or neglected vis-à-vis secondary and tertiary activities. It is generally accepted that technological hardware is not the major competitive factor; MOT focusses typically on managerial software, but it is nevertheless apparent that the companies most interested in MOT are the ones whose operations revolve around basic manufacturing activities. Nor is the broader perspective confined to the business community; the observant reader will have noticed that the definitions of MOT cited above are careful to refer to the management of organizations, not just business enterprises. MOT-based insights can have surprising applications even for the management of public sector bureaucracies, as participants in ISTC's in-house pilot training programs have discovered.

5.2 Integration

Whatever components appear in a typical MOT curriculum we have found a consensus that the real challenge for MOT is the integration within a company (and across companies in the case of strategic alliances) of increasing numbers of functions and resources, both technical and organizational. The core challenge is to combine strategy and organization and technology, even as it rests on a sophisticated understanding of technology - its character, its development, the way it works, its potential, and its limits. In extreme cases the technology and the strategy are the same thing, for example, in telecommunications and other information technology-intensive businesses (as described by Peter Keen in his book Competing in Time).

To identify the elements of an activity is not difficult; the problem is to combine and integrate them for competitive advantage, through people. Those who have struggled to understand and convey the essential character of MOT tend to describe it as a cement or mortar or glue, or as the spaces between elements and not the elements themselves, and with much emphasis on the management of boundaries and interfaces.

MOT so defined is not easily understood, let alone taught. Nevertheless it does give a clue to what is meant when MOT is described as a way of thinking, above and beyond it simply being a collection of techniques - which is regrettably but understandably the level at which most people operate. One imagines that the Japanese facility of constantly improving production efficiencies and practising a process of incremental innovation is essentially a continuous manifestation of an underlying way of thinking about organization and production. There is a set way of approaching and solving certain kinds of generic problems, almost regardless of the particular situation and context.

The integrative approach to both the teaching and the practice of MOT is at one end of a continuum. At the other end we find a proliferation of elements or modules which could be taught and implemented one by one, and which would be subsequently combined or integrated in the actual process of managing technology and running a business. This approach will be discussed later. The fact remains that the integrative task is not only the main challenge but also the most difficult to achieve, and it is the area where most companies fail and where good MOT teachers or consultants are the scarcest.

(The more specialized an element, the easier it is to locate available expertise - for example, teaching and consulting in R & D management; marketing; new product development; automated/computerized design and manufacturing; forming and conducting strategic partnerships; procurement; labour relations; technological forecasting, etc.)

5.3 The Integrative Task

The integrative task consists of two main parts:

- (a) integrative strategy - essentially an intellectual challenge, and
- (b) integrative organization - essentially the task of organizing people

The common denominator between (a) and (b) is the fact that both are concerned with the management of relationships. Indeed, Professor Neil Kay of the University of Strathclyde reminds us that, if anything, a business firm is not identified with products or even processes; it is the embodiment of managed relationships. This is yet another reason MOT, when described in these terms, is so central to the managerial challenge of our time.

Now admittedly it would not be practical for ISTC or any other agency interested in fostering MOT education among businesspeople to describe the subject area in so abstract a fashion as the management of relationships, but the fact is that, in the end, this is how businesspeople will have to understand it. The question is then, how does one arrive at such an understanding?

5.4 Integrative Strategy/Organization

We regret to report that there is not much of a track record to date in MOT teaching, whether pushed by governments or confined to academia. Almost invariably the educational/training agencies have been teaching modular material (aspects of elements of MOT). The most successful training programs have used rather familiar devices, catalysts, or templates to achieve the desired integration:

- (a) the business plan, and
- (b) total quality management (TQM)

A business plan has an intellectual (and competitive) component but it soon cries out for implementation by and through (organized) people. TQM has a strong attitudinal

(and competitive) component but it too depends on organizational structures, processes and human behaviour. Neither the business plan nor TQM is academic or theoretical; both of them are idiosyncratically focussed on the affairs of a particular company (although the underlying principles and techniques are not company specific).

At this point the reader must be alerted to the fact that the business plan-as-catalyst is by no means a universally accepted "handle" on the teaching or practice of MOT. Seasoned practitioners of MOT in companies remind us that, in real life, successful high technology firms rarely decide to create or organize for or acquire and deploy new technology after, and on the basis of, formulating a business plan. Rather, they see new technological excursions as offshoots of prior experience and established competence in a given field. These developments are triggered by events in the marketplace and by the actions of competitors.

One response, however, is that these kinds of companies have already achieved the underlying capability of formulating and implementing integrative strategies and practising TQM, almost regardless of their technological choices. At the same time we concede that there will never be an end to the debate of what comes first: the business plan or strategy; organization and competence; or the technology? Clearly TQM, for one, has less to do with technology and more with motivating and organizing people.

On the other hand, authorities like John Fawn of the European Management of Technology Program are adamant that modern technology is a dynamic; one is forced to stay with and manage the dynamic; one gets caught up in technological trajectories, and the technology dictates not only organizational change but strategy itself. In the same breath Rias van Wyk of the Graduate School of Business in Capetown, South Africa, has argued persuasively in several journals that MOT starts with and rests on a rigorous analysis and understanding of the technology itself, in many dimensions.

5.5 The Business Plan

Several advantages attach to using the business plan as the platform for an integrative, strategic approach to MOT. In the first instance, field officers in ISTC who had previously been involved in dispensing program funds to companies are fully familiar with the concept of the business plan. Companies too have to have business planning

experience even for the purpose of dealing with non-governmental sources of capital. The point is that a good business plan, including the process of formulating a business plan, has a multiplicity of actual and potential uses, looking both outside the firm (competitively) and inside the firm (organizationally).

Yet undoubtedly the use of the business plan-as-catalyst is not a general panacea, and therefore much will depend on what types of companies are selected for MOT-related education and training. A fair number of those companies will already be so sophisticated that the business planning approach would not be suitable. They would merit exposure to more advanced insights into MOT. And, of course, there is a class of companies that have little requirement for outside assistance; they are fully capable of obtaining any help they need for themselves, or of helping themselves.

At the other extreme, as we have noted, is a huge underclass of firms in Canada which, although in the business of manufacturing, do not employ a single engineer. They might not be candidates for MOT training either, but they would certainly benefit from exposure to business planning and they would certainly merit "awareness" education for a start. At this point we are assuming that a firm which undergoes business planning-based MOT education has already been made aware.

Still conscious that we are not yet dealing with the form of an appropriate educational vehicle, as distinct from its content, it is time to turn to available precedents of government-pushed experiments in integrative business education and training. These would include cases where integrated education is not explicitly pursued in the first instance, but where it becomes a by-product or necessary consequence of specific technical problem-solving (the proverbial "hook").

6. NATIONAL PRECEDENTS

6.1 Australia

For several reasons (listed later) Australian precedents are remarkably appropriate to the Canadian context. In that country extraordinary efforts have been made to educate and train manufacturing, exporting firms in various aspects of competitive business management, not only by the federal (commonwealth) government but also by state governments. The trigger for these actions was, and still is, Australia's dismal balance of payments performance.

The core activity of Australia's National Industrial Extension Service (NIES) - an umbrella program - is a three-day training seminar titled World Competitive Manufacturing (WCM).

The creator of the WCM module (he is a consultant, and the module has gone through six revisions and updates over three years) claims that both the academic/consulting community and the business community have proven, through experience, that an effective integrative educational vehicle (i.e., WCM) must adhere to the following hierarchy and sequence of issues or topics:

- first define your sustainable competitive advantage in conjunction with your core mission
- then embody your resulting strategies in a business plan, whose main components, in the following order, are
 - marketing (environment, customers)
 - design, and
 - production
- then apply the following "enabling" activities:
 - human organization/resources
 - innovation (product, process)
 - finance

In our mind, two observations jump out of this particular scheme: (a) the prominence of design and (b) the relegation of "innovation" to an "enabling" activity. Nevertheless we have here an extreme case of "business planning first." At the same time it is a rather conventional but still comprehensive answer to the managerial problems worrying Australian governments, businesspeople and educators. Even companies that simply want guidance in automation, for example, are expected to go through the learning sequence of first sorting out their strategic planning, then perhaps addressing human or worker issues, and finally receiving technical assistance.

6.2 West Germany

West German change agencies (heavily subsidized by governments) are more inclined to hang their hierarchy of issues/questions on a technical/product peg, and the following would be a typical sequence in a business plan-oriented learning or consulting setting:

- what is the relevant technical idea or objective?
- what are the products?
- what are the markets?
- what marketing is involved?
- what selling must take place?
- what is the business plan?
- what financing?
- what management?

Here the observations leaping at once out of this scheme are: (a) how far down in the sequence the subject of the business plan emerges; clearly the effort is more tied to problem solving than education; (b) as in the Australian case, financing is low on the totem pole; and (c) managerial/organizational questions apparently come last.

6.3 France

A prominent French exponent of MOT who is also engaged in a government-subsidized MOT educational program of Europe-wide dimensions, shared the West German sense of priorities when he told us:

- "you must be a technologist first - understand the technology," and
- "only then do you learn about management"

6.4 United Kingdom

The British Department of Trade and Industry tends to break down the educational/training agenda into discrete categories, such as design, quality, production, purchasing and supply, marketing, etc. Nevertheless the department

does have a Business Planning Initiative "to help you define your business strategy." There is, however, little evidence of an integrative approach to corporate education and training, except for certain courses on MOT offered at or by a few universities, whose existence is advertised with government financial assistance. (Recall that this report does not deal with the contents of academically conducted or sponsored education but with direct MOT-relevant government interventions and programs of an educational nature. Nor do we consider the more general and diverse educational activities of the British Training Agency, including its interest in worker education and training.)

The other public sector initiative in business training that caught our attention was the business consultancy program of the Scottish Development Agency (SDA). But their emphasis has been more on raising awareness, mainly of quality concerns, among chief executives.

6.5 United States

The two outstanding government-pushed learning/developmental programs for business firms are found in the States of Michigan and Pennsylvania respectively. Both programs were inspired by a pressing need for industrial renewal. In both cases any extensive learning would only take place as a consequence of an initial problem-focussed encounter with a consultant. So, in Pennsylvania the "teaching" hierarchy is strictly as follows:

- what is your problem?
- what do you want to do with your company?

Note, however, how the second question immediately raises the prospect of the Australian WCM sequence.

In Michigan the authorities are clearly wedded to the notion that starting the learning process depends on an initial "technological hook" with much of the emphasis resting on the automated production needs of firms in the automobile, metalworking and furniture sectors.

Though not strictly relevant here, since we are dealing with public sector initiatives, one is somewhat surprised that the public sector programs in the United States are quite inconsistent with some of the best advice emanating from people like Peter Drucker, who categorically told an MOT conference in San Francisco that "the business plan (always) comes first" (not the technological issues).

Likewise when SRI International addresses MOT it does not place the business competitive strategy first, but SRI at least places it on an equal footing with technology strategy, with a view to integrating the two in a systematic way.

6.6 New Zealand

Although New Zealand ranks low in the world of affairs their government does have a track record in business sector education, and one must note that the leading consultants (subsidized by government) claim that "New Zealand is no longer beholden to business plans up-front." "They are not an effective entry point." "They may tend to divert attention from key business processes."

Nevertheless New Zealanders do apply a hierarchy of questions and issues in the training process, but these apparently emerge mostly in the context of TQM:

- do not focus on the product or service but rather on improving your business as a whole
- identify your critical success factors
- then ask how the processes in your firm impact on the critical success factors
- ask how well you are doing it? How are these processes performing?

One notices some similarity to the WCM sequence and the final stages of the learning encounter are the same, i.e., in both cases the process must be followed by closely monitored efforts to implement the lessons. As in Australia there is great sensitivity to the managerial deficiencies of business, which also explains why technology is not at the top of the learning or planning hierarchies. (For example, in South Australia the view is that "new technology is the last thing they need"; the New Zealanders will say that "the management side is more important, more deficient, than the technological side.")

7. TOTAL QUALITY MANAGEMENT

We mentioned before that TQM was the second device, catalyst or template employed by government-driven efforts to achieve an overall integration of strategy and organization

and technology and all the other vital components of competitive business management. (Design management is yet another candidate, but it will not be dealt with here, except to recall how high up in the WCM hierarchy design was placed, taking the word design in its broadest possible sense.)

Suffice it to note that TQM has, by this time, developed into a well-understood and widely accepted business learning tool in most industrial countries. We have merely identified it as a readily available vehicle for extended use as an MOT-trainer. The Australians are adding it to their WCM module, i.e., as a separate but complementary training vehicle. The businesspeople we have spoken to who are critical of NIES and WCM seem to be the ones who look more favourably upon TQM.

By contrast, in Scotland the SDA claimed to have "moved back" TQM (downgraded it) as a "core issue," and when they used it it was to put much more emphasis on the human development and organization side of management.

In New Zealand TQM became the flagship of the Department of Commerce's business training initiatives. Likewise in Pennsylvania, TQM is high on the state's list of priorities.

We mentioned TQM because, like the requirement for business plans, the concept and the practice are well-known and well-established and therefore both of them are good candidates for the role of Trojan horse if a government agency should wish to graft the dictates of MOT on to these vehicles.

The problem is that TQM, while a necessary condition for success, is increasingly less sufficient. It seems that top quality, whether in product, service, or indeed in the business itself, is now a starting condition for competitiveness. The concept is being stretched to include added requirements, such as an ability to customize your product or service to the needs of particular customers, and with short product life cycles.

What this means is that the content of TQM must be rewritten. In effect, TQM cannot escape the pressure to find or to create integrative ways of teaching and practising management. Whether such a vehicle is labelled business planning, MOT or TQM is of lesser importance.

It remains to comment, briefly, on the second aspect of the integrative task identified earlier - integrative

organization (the task of organizing people).

8. HUMAN ORGANIZATION

If one believes that the secret of competitive MOT does not lie in the technological stream but rather in the organizational-managerial stream, then quite obviously any related education and training (not to mention practice) must take cognisance of the importance of organizational design, organizational structures and processes, work design and human motivation. These design parameters apply not only inside the firm but increasingly inter-firm (the formation and conduct of alliances, partnerships, joint ventures and consortia).

Yet few government agencies (Sweden being the best-known exception) have been interested in education-for-competitiveness in this dimension, or under these kinds of labels. Recall, for example, the absence from, or the low ranking of these issues in, the curricular lists we have already outlined. We can only speculate that among the reasons for the neglect could be counted:

- a possible scarcity of talent among teachers, consultants and practitioners
- the fact that the subject matter tends to be idealistic and theoretical, not least because of its appeal among academics in social science departments
- there are strong ideological overtones; even in Canada quite a few academics (and possibly their homologues in academic granting agencies) who now profess a strong interest in MOT, are approaching the subject from an unmis-takeable marxist/socialist perspective; in other words, they may have an axe to grind
- on the other side (which also bears out the ideological element) is strong skepticism among trade unionists about the motivations of governments and business managers who profess an interest in Quality of Working Life and the promotion of industrial democracy and "participative management" in the workplace; in Canada trade union opposition helped to derail

government-sponsored initiatives in QWL

- a further complexity was added by the astonishing experience in Sweden, where the highest worker absentee rates in Western Europe are said to have occurred in the most "progressive" of factory work places such as Volvo's avant-garde motor plants (some was observed that if we wait long enough the entire Swedish population will have worked for Volvo); it seems that QWL cannot overcome the negative aspects of a broader social and moral malaise in a society (a point of view expressed by a knowledgeable observer at a Scottish university)

Despite these difficulties and misgivings there must be a place in MOT for organizational theory and the human side of enterprise. Canada harbours some expertise in the field (also labelled "socio-tech") despite our spotty track record.

By way of examples in other countries, the German commitment to co-determination ensures that the worker side of enterprise figures strongly in business-oriented curricula. Australia's NIES includes a labour-management module called Contribution of Labour. Michigan's program covers "cooperation in production relations" while Pennsylvania clearly recognizes the need for education in "employee involvement." An MOT-directed engineering course in Colorado stresses group dynamics, leadership and team building. A recent British company survey disclosed a "strong need for training in the areas of leadership, motivation and interpersonal skills." In Scotland the SDA has consistently emphasized the human factor in its sponsored training schemes. Lastly, the European MOT teaching program also includes a separate human relations/organization training module, titled "People and Organizations."

Now that we have dealt at some length with the content/subject matter of MOT-related, government-sponsored business education and training, we shall move on to the formal aspects of these kinds of activities.

9. ISSUES OF FORM

The fact that form, substance and purpose are all inter-linked causes a great deal of difficulty, so much so that we can only make an arbitrary choice of matters to highlight.

The difficulty is compounded by the undeniable role here of pedagogical theory: when and how and why do people learn best? The most we can do within the confines of this report is to treat it as a catalyst for discussion.

9.1 Purpose

Perhaps we should start with the purpose of the exercise. Indeed, if ISTC purports to practise what it seeks to teach businesspeople, the entire activity must hinge on a prior clarification of mission, core competences, and departmental strategy. What are the department's resources, what is its market, on what scale will it operate, what are the task allocations between and among federal and provincial agencies? Does the department dabble in a smorgasbord of services, reactively, or are its energies concentrated on a few selected priorities? What are the roles of the field officers? Is ISTC a provider/supplier or an intermediary/broker?

Other governments have grappled with these kinds of choices as a precursor to their educational/training initiatives. What then are the main alternatives in deciding an overall approach to industrial-technological-knowledge-skill development? How will industrial competitiveness be promoted? We think we have discerned, at the very least, a two-tiered approach to the spectrum of initiatives that one might associate with the pursuit of competitiveness-cum-MOT.

For example, the State of Michigan sees two distinct challenges, paths or levels. One task is described as "sustaining modernization" - where the objective is to offer direct customized services to "first hundreds and then thousands of firms." This is a "general reskilling" objective, mobilizing all economic interests so to speak.

The Australians call this level of developmental activity "adjustment, or incremental adaptation" (involving a variety of learning activities, the diffusion of technology and knowledge, promoting change, and so forth.)

In Pennsylvania this particular emphasis is embodied in their Industrial Resource Centers, which are supposed to be pragmatic, dealing with immediate problems, "meeting particular issues," helping to achieve "quick turn-arounds." At the level here identified MOT would be largely regarded as a problem solver. Innovation is a process of adjustment; innovation is incremental; and, as in Japan (until recently) it is closely aligned with improving production processes.

Michigan, however, also recognizes another tier or level of policy-programming-service, also called "seeding growth." Here is a longer term perspective, described as the "high ground." The buzzwords are the development of new processes, new producer goods, entrepreneurship, ingenuity.

The Australians associate this level of activity with the need to deal with "discontinuous (i.e., not incremental) change," "transformation," governments acting on the recognition of the limitations of relying exclusively on the market for development. The buzzwords are policy, planning, structural change.

In Pennsylvania the equivalent domain is the work of the Franklin Partnership, which aims to foster longer-term, creative R & D (built on nine key technologies). Besides, the activity is closely tied in with the work of universities and colleges; it is "organizational" and "integrative." In this domain MOT is not so much a problem solver as it is a discipline, a "glue", indeed a way of thinking, a preparation for the future, for contingencies.

Now admittedly this dichotomy is by no means a symmetrical fit of the distinctions observed in the three quoted jurisdictions. We could perhaps simplify it by saying that we see, on the one hand, an effort to foster adjustment and problem solving across the board (modernization) for the benefit of the many (an industry-wide task). The watchwords are adjustment and incrementality. MOT-related business services would be on a relatively large scale. All qualified agencies would be co-opted in a network of activities.

The second tier, on the other hand, is aimed at anticipating and coping with discontinuities, including technological discontinuities. The kinds of firms that can be relied upon to thrive in a world of discontinuous innovation and (often fundamental) change are few and far between. Equally rare are the communities able to harness and integrate the longer-term focussed and diverse activities that are required. The challenge is organizational; the actions are anticipatory; MOT is less of a problem solver than a developer of leadership. The candidates are already meritorious. If there are fewer qualified "student" firms there are also fewer qualified teachers (providers of services) because the degree of difficulty mounts. The watchword is selectivity.

9.2 Practice

In practice, government-driven or government-assisted

services are far more ambiguous. Plans and programs fail in implementation. But the fact remains that governments cannot avoid making these choices, if only for budgetary reasons. To restate the question: Are the proposed services a nation-wide program of industrial development where there is a definite (minimum) scale threshold, and where the aim is to raise the general level of industrial-managerial competence, harnessing and coordinating public and private sector agencies at all jurisdictional levels?

If so, Canada must launch the equivalent of (and do better than) Australia's NIES with all that entails. We attach the latest official self-evaluation prepared by a joint management committee of businesspeople and federal and state bureaucrats; it gives an idea of the scale of the operation.

On the other hand, are the services to business (for reasons related to budgets, scarcity of resources/talent, industrial strategy) meant to be selective; pro-active rather than reactive (squeaky wheel responses); to address the more difficult parameters of MOT such as the need to integrate functions (combining, for example, different generic technologies and business operations); to cultivate awareness and leadership (not only at the executive level but for the purpose of fostering a leadership role for firms); and so forth?

If these kinds of considerations are clustered (of course there are overlaps among clusters), they will soon affect not only the scale of the business developmental activity but also its form. We should therefore examine some of the other factors/choices governing the relationship between purpose/mandate and form.

9.3 Awareness

Consider, for example, the difference between raising awareness of competitiveness and MOT, and actually going in to help solve production management problems. We think we have uncovered a consensus in several jurisdictions that the raising of awareness (as a necessary precursor to related services) must take place at the level of the chief executive officer. (We do not subscribe to the rather silly syndrome that will insist that everything worth doing must be directly reportable/responsible to the chief executive.)

In Scotland awareness sessions are strictly confined to CEOs (who, it is claimed, are subjected to a "hard-edged

blast that leaves them numb.") We might disagree with the opinion, bluntly expressed at the University of Manchester, that "only CEOs can understand and talk about strategy." But even in New Zealand awareness of TQM issues is only cultivated, initially, among selected CEOs. In Britain, quite clearly, "awareness is the problem." By contrast, several spokespeople in the United States hold the view that awareness of the importance and nature of MOT is no longer the main problem.

Our point is that if MOT awareness is a Canadian priority, the design and form of a related business service function will be much different than a service aimed at solving production or technical problems. For example, awareness sessions are not so sensitive that they cannot be aimed at groups of executives (even audiences containing competitors). They can be very cost-effective but the degree of difficulty is probably much higher (and the available teaching talent much scarcer) than in a setting where specialists address production or technical problems in a particular firm or group of firms.

9.4 Integrated or Modular?

Yet another important dichotomy concerning the form of a service is the distinction between integrated, strategy-based teaching, and modular instruction. We surmise that because the former is so much more difficult the design of a related business service will have to reflect its cost and its (inevitable) selectivity.

On the other hand, we should like to draw attention here to the growing interest in modular forms of teaching in all countries and in many educational/training institutions. Space and time do not permit details here. Instructional courses are broken down into numerous discrete components so that the elements can be arbitrarily combined to suit given occasions, students or needs.

It is not so much a case of breaking down existing disciplines; rather, new programs of instruction are built up (Leggo-style) from functional, interchangeable components. By definition this kind of thing can only work with economies of scale and must therefore be associated with large programs, including alliances and networks of providers.

9.5 Distance Learning

Form also touches on delivery modes or media. It is no coincidence that modular teaching fits easily with modern

distance learning (often self-teaching) delivery systems, an attractive option for a country shaped like Canada. The technology for distance learning is developing by leaps and bounds, including the use of satellites, micro-wave transmissions, land lines (especially optical fibre allowing high capacity movement of integrated vision, sound and data), new interactive hardware and software, fax, compact disks and "realistic" classrooms.

We have looked into the operations of the three most notable distance learning enterprises in the world that also happen to have a growing interest in MOT education and training. They are the National Technological University of the United States (NTU) based at Fort Collins, Colorado; the British Open University at Milton Keynes; and Europace (the European MOT program headquartered in Paris). A similar activity is being planned in Australia, but they plan to use compact disks rather than the other transmission systems. Both NTU and Europace are based on satellite transmission.

For our purposes an important observation is that, although public subsidy plays a role in Europace (and underpins the Open University) in none of these cases is government involved in either the production or delivery of the service. The services are primarily designed to harness academics. And there is a general impression that both NTU and Europace serve, primarily, the interests of large corporate clients. Both the Open University and NTU are also strongly dedicated to the requirements of individual degree-earning students.

In Canada distance learning activities have taken place on a smaller, regional scale, mostly revolving around universities (for example, in Québec; around Carleton University in Ottawa; or the University of Athabasca; and some dedicated programs have been "piped in" from American locations such as Maryland). TV Ontario has made a plea for a national educational television network. NTU has "downloaded" its services at only two Canadian corporate establishments - owned by IBM and NCR respectively. There are signs that NTU has begun a sales drive for Canada, having collared several government officials over the past couple of months.

9.6 University Networks

Yet another dimension or form of education is the creation of an organized national network of courses offered by participating universities and colleges (with some consultants involved as well). The most developed example of

this model is the British JUPITER consortium. JUPITER stands for Joint Universities and Polytechnics Industrial Technology Education and Research - sponsored by the EEC COMETT Fund, the British Engineering Council, the (government) Training Agency and PICKUP (a program of the British Department of Education and Science). JUPITER's most useful publication (networked service) is a Short Course Compendium and Training Guide in Technology Management. (A similar compendium covers Software Engineering and Advanced Manufacturing Technology/CIM).

JUPITER has linkages with the Open University as well as with Europace. A quick look at the MOT compendium shows how inchoate and varied the MOT discipline is still at this stage, with courses being listed at varying levels of integration and practicality. Even strong supporters of JUPITER describe it as "still an idea."

Recently the JUPITER management conducted a nation-wide survey of corporate (business) needs in the field of MOT, but the response rate could only be described as dismal - bearing out our earlier observation of a need for awareness education.

9.7 Push or Pull?

We also heard criticism of Europace's (expensive) reliance on satellite transmission (similar to NTU's technology) as if the driving force was partly a case of product pushing by vendors of the technology. One comment was to the effect that most corporate users simply recorded the live transmissions on tape for possible subsequent use: "Why not then simply mail them the tapes or disks?"

On this issue of supplier-pushed versus customer-pulled services the same criticism could perhaps be directed at the strong self-serving academic institutional impetus behind most of these long-distance learning systems. This type of comment also surfaced among some of the business critics of the Australian government's WCM educational franchise, which was described as an "ideal boondoggle for Australia's consulting community, designed by consultants for the government, but for their own benefit." (Australians are unbelievably candid about the degree of corruption in their public sector.)

9.8 Consultants

The outstanding characteristic of the Australian WCM and the New Zealand TQM type of business service (identified

earlier in this report) is their exclusive reliance on consultants. Consultants are also employed quite liberally but more on an ad hoc basis by business development programs in Britain, Germany, Michigan and Pennsylvania. New Zealand, although small, can offer valuable qualitative insights, but the Australian case merits consideration on account of its formality and its scale.

In Australia close to 200 consultants have been officially trained and licensed for the delivery of the WCM seminars. More will be said about these consultants in a later section under the heading of qualified teachers. The important thing is that the Australian program has a track record (close to three years' experience) so that it is becoming apparent what opportunities and pitfalls are associated with this type of service. Opinions on its effectiveness are divided, not so much among public servants with a stake in the program, nor among the consultants who deliver it, but certainly among businesspeople. Yet the choice of consultants as the channel of delivery of the WCM service is accepted as the least undesirable alternative.

Many universities and colleges in all jurisdictions are in the consulting business themselves and institutions like the ISTC-sponsored Management of Technology and Innovation Institute at McMaster University tend to regard their public seminars as a way of securing more lucrative problem-solving or educational contracts with individual (mostly large) companies. Since ISTC is well acquainted with the modus operandi and outputs of the Institutes at McMaster and the University of Western Ontario we shall not describe them any further. This type of university-based or university-linked business education and consultancy is part of a worldwide pattern.

9.9 Firm-specific Problem-solving

The remaining, rather obvious model for disseminating MOT-related expertise is direct, firm-specific problem-solving, in fact a variant of the consultancy model. Assistance of this kind is the mainstay of industrial development services in Michigan and Pennsylvania; the newly created Training and Enterprise Councils in Britain (where the Department of Trade and Industry spends over a hundred million pounds a year on advisory services); the Fraunhofer Institutes in Germany; Canada's IRAP; and the follow-up services rendered by consultants under Australia's NIES.

10. FORMS OF LEARNING

A somewhat related question focusses on the form of learning. What is the best learning process? Most practitioners seem to agree that the best form of learning is learning-by-doing, and that exposure to the dictates of good MOT should be a by-product, so to speak, of real problem-solving in a company. We do not wish to get into the question of how much learning is action-related, and in what situations the learning process is purely "intellective," particularly in highly computerized business control systems. In a normal business environment it seems to be the ideal that participants in an MOT seminar should have a chance to consolidate their insights by applying them to actual business problems, concrete situations in their own firms.

Even better is a teaching system that allows students to take even lengthy breaks between seminars, i.e., to go away and come back for a re-evaluation of what they had learned. Europace works like that. Necessity too dictates it in many instances where busy executives can only be available for short intensive sessions. The next best alternative is to use good, up-to-date and pertinent case studies.

The main drawback of the learning-by-doing model is its cost, both financially and time-wise. On the other hand the firm gets the benefit that real problems are being addressed. However, development agencies despair at the slowness of the process in terms of the coverage of the population of firms in need of upgrading. This is the reason the State of Michigan is using computerized questionnaires and protocols to try to speed up the diagnostic processes and the task of selecting the most worthy firms. A diagnostic service is almost a necessity if resources are to be well spent in a learning system such as we are describing here. The Australians are experiencing great difficulty in meeting their original quotas (of firms that ought to be reached and helped).

In Germany one of the Fraunhofer Institutes complains that only the firms in deep trouble bother to call for assistance; many of the others "do not even know that they have a problem." But a firm in deep trouble is usually not worthy of the attention of an intensive training service.

To repeat, whereas one can successfully use town hall meetings to engender general awareness, so-called "action learning," problem-directed seminars usually only

succeed on a one-on-one basis (a set of teachers or consultants working with the executives of a single firm). Here is a good demonstration of the close interdependency among form (appropriate learning models), scale and cost, available resources, and the degree of selectivity (public policy). In fact, the issues of scale and selectivity are so interlinked that they might as well be treated together.

11. SCALE AND SELECTIVITY

Scale and selectivity of service are probably the crucial considerations for public policy and may well constitute the difference between playing parlour games and meaningful business. Recalling the two-tiered perception of industrial development earlier in this report, a competitive community (country) will most likely not treat those choices as alternatives but as a dual imperative, a case of both/and rather than either/or.

Nevertheless even the Australian NIES has had to temper its former universalist ambitions by falling back on selective interventions, aiming to concentrate on pressure points in the industrial sectors. The evidence of a growing selectivity is rather overwhelming, wherever one looks. So much for the alleged shift from sector-specific and firm-specific strategies to horizontal/framework policies!

So we find that in Pennsylvania there is an explicit strategy to only give substantial assistance to manufacturing firms, and among those, only to firms developing technology that is new to the State, not just new to the firm. Furthermore, the authorities will "only work with firms who are committed to growth" in nine priority generic technology fields. The numbers of firms helped are not important, we are assured. Indeed, Pennsylvania's Franklin Partnership will only help firms that are already "80 per cent of the way" (meaning, in effect, helping the strong).

Michigan goes to extreme lengths to identify and assist what they call their "foundation firms." Such clients are "more sophisticated than the typical firm... the program is best used by determined firms already responding to the demanding new environment." Every two weeks officers of the Michigan Modernization Service sit down to discuss potential clients for targetting and assignment to field officers.

In Scotland the SDA claims that it will only work with selected, profiled firms, for example, suppliers to local

MNE subsidiaries. In Germany one of the Fraunhofer Institutes laments that "firms only want to learn when they have problems" (as we have seen) implying that resources should be spent on winners, not losers. In New Zealand it appears that the TQM seminars will be aimed rather more exclusively at "winners." Their main consulting service is not interested in firms employing fewer than 50 people and it will resist most applications, in favour of concentrating on the "survivors."

Given the ambitious scale of the Australian NIES one is struck by a strong shift towards selectivity. The State of South Australia employs its diagnostic (initial consulting) service as an instrument for selecting worthy candidates for further attention. We found it significant that the chief executive of the corporation which administers NIES in that State had previously been in charge of formulating the State's detailed industrial development blueprint - a confidential document. Typically, a targetted firm is not only in a preferred sector but it must show that it is committed to growth, produces high value-added products or services, and seeks to be internationally active.

In New South Wales, likewise, the State is targetting larger, value-adding, exporting companies; they must also meet rather tight criteria relating to a past history of growth and sound management. In other words, they are expected to demonstrate a track record, not promises. The State has actually stopped publicising its NIES program in an effort to reverse a rate of 60 per cent "reactive" visits to companies, as against 40 per cent "pro-active" contacts by their field officers.

In Victoria they are seeking out "star performers" which are committed to competition; have manufacturing capacity in place; and are classified as "growth drivers." High value-added exporters are at the top of the priority list. The main focus is on 3,000 out of 12,000 manufacturing establishments, plus large firms. At the federal (commonwealth) level officers seem to be favouring a shift towards the needs of Australia's larger firms (implying floor limits for candidates) and towards companies identified as "key cases."

11.1 Intensity of Effort

Perhaps scale is not the appropriate criterion; intensity might be a better qualifier, because selectivity still requires intensive effort. The attached NIES evaluation reflects the levels of resources employed in a program which is far more difficult to deliver and labour-intensive than ordinary industrial subsidies. Michigan's Industrial Technology Institute (which runs with the programs we have

described) was given a \$68 million kick-start in 1983! We have already remarked that the British department equivalent to ISTC, alone (excluding the Department of Science and Education) spends upwards of \$190 million a year on advisory services for business. The Franklin Partnership in Pennsylvania has generated 1,200 workshops for 82,000 participants (expenditures grew from \$1 million in 1983 to \$30 million in 1989).

These figures must be related to the difficulty of designing and delivering such labour-intensive services. (After two and a half years Australia's WCM has only reached 7 per cent to 10 per cent of the original target population - the success rate varies from state to state; WCM had been aimed at 4,000 companies over 5 years; in New South Wales, NIES had targetted 3,000 firms over 5 years, but by June 1992 they will only have reached 45 per cent of them; Michigan has come to accept that "you cannot meaningfully reach 100,000 companies.")

11.2 Leverage

One way of intensifying the programs is to employ various forms of leverage. Michigan's computer-driven diagnostic protocols are one possible answer, despite their limited usefulness. "Awareness" sessions could prompt businesses to seek their own solutions, and therefore awareness services could be quite cost-effective, at least initially.

The most obvious form of leverage is Australia's unequivocal campaign to educate, cultivate, license and deploy a nationwide cadre of qualified private sector consultants. Not only is the consulting community strengthened and expanded, but the client firms are taught to sharpen their "consultant engagement skills." And, most important, is the fact that Australia's NIES is almost totally predicated on harnessing state-level resources, getting states to help themselves, while it also serves as an increasingly effective federal-state "glue" (a learning-by-doing way of better coordinating the industrial development schemes of constituent governments and agencies). A very senior civil servant was quite emphatic on this point; he saw it as the main benefit of the service, namely, its political efficiency.

The pressure to find ways of leveraging the available resources is also patent in a British remark in support of MOT training: "The point is that progress must occur quickly. The Nation (sic!) does not have 10-20 years to wait..." A Canadian has observed that "IRAP, with 170 field officers, can only work with 5,000 clients."

The same pressure is driving program designers to consider using the technology of CD-ROM disks to reach many small firms in Australia that cannot afford WCM consulting. Michigan is trying all sort of devices to take out the high cost elements in training programs. The same pressure is partly responsible for the current experiments in distance learning.

12. SUBSIDIES

We refer here to direct subsidies to users, not the issue of government support for providers of services. Remember the persistently expressed view that educational services work best if they have a technological or direct problem-solving "hook." We have found a general consensus that the kinds of services described in this report depend heavily, at least initially, on a subsidy "hook."

This view is consistent with the selection criteria described above. Firms who know that they are in deep trouble will come for assistance regardless of subsidy, but they are the unwanted ones. By and large an up-front subsidy seems to entice those firms who either do not know that they have a problem, or who are in two minds about coming to a seminar. Such firms are typically quite busy and must be tempted to divert managers for education and training.

In some instances a subsidy would be wasted. For example, others have found that chief executive officers are likely to be tempted to attend exclusive-sounding awareness sessions from which lower-level executives are absolutely barred; this has been the experience in New Zealand and Scotland.

To get a flavour of current practices we should like to quote a number of examples, with the caveat that subsidizing programs are by no means internally consistent nor are they all that transparent. Note at the outset that consulting services generally follow a progressive pattern. At the front end the services are either designed to create awareness, or to diagnose the conditions in a particular firm. The result of the initial diagnosis or audit may be a decision to do nothing further, or to embark on more detailed and extensive education, training and problem-solving. These stages are increasingly expensive and financed by the firm itself; government subsidies either reduce percentage-wise, or there is an absolute limit on subsidy per firm.

Michigan charges nothing for an initial day-long visit, assessment, and a subsequent on-site meeting to discuss recommendations for further consulting. Follow-up consultancy must be paid for by the firm.

In Pennsylvania likewise, the first visit is free of charge but thereafter the "firm must pay something." This "something" may be a 50 per cent contribution to the first \$10,000 or only 10 per cent of a bigger bill.

In Scotland the initial sessions are free as well. In New Zealand the government pays for the first three-hour encounter.

In Australia the rules vary from state to state. Initial meetings (diagnostics) are generally free of charge, although in New South Wales the government will finance 75 per cent of the cost of a first encounter (\$1,800 out of \$2,400). Governments will subsidize up to 50 per cent of subsequent consulting costs (60 per cent in Victoria) to a maximum contribution of \$7,500 (out of \$15,000), although "it can reach 75 per cent." There is an upper limit, per firm, of \$50,000 on the cost of all consulting services of whatever kind.

Clearly these services are designed to act as "teasers," because many firms then continue to build on what they have learned by dealing directly with consultants at their own expense. There are doubts about the quality of a business plan costing \$15,000, and yet the Scottish Development Agency thinks that a five-day "quality audit" can achieve quite a lot (three to six days in South Australia). In fact, the Fraunhofer Institute in Karlsruhe, Germany, thinks one "can fix the core of a problem" quite quickly (after five hours of free consulting). (We were fascinated by the similarity of the "rules of thumb" used by consultants in different countries to help them assess the state of affairs in a company by simply walking around.)

Yet one is reminded of what is required when one learns that a proper consultancy may stretch to two years (Pennsylvania) and in Australia (after completion of the WCM) a firm might commit to a typical business planning stage lasting five months. Often a WCM is followed by intermittent contacts with the consultants over a period of ten weeks (the teams formed during the WCM are also encouraged to continue meeting at their workplace; consultants claim that this process becomes a multi-functional policymaking activity in the firm).

We must remember to distinguish diagnostic visits, other forms of firm-specific consultancy, and in-house or public WCM training seminars, from public awareness sessions. These latter sessions can cater for fairly large audiences and they are usually fully subsidized. All in all, we are not talking of big money compared with the cost of government expenditures on ordinary R & D and even on the promotion of so-called strategic technologies. One may well ask where the greatest cost-benefit lies. What is the use of R & D and strategic technologies to the economy when firms do not know how to manage technology?

13. WHO CAN TEACH OR LEAD?

We shall now move on to the question of the availability and qualifications of "teachers." It is generally conceded that the talent is scarce. The degree of difficulty increases the further one moves from specialization towards boundary-spanning integration.

First, the credentials of public service officials are almost universally suspect, especially in the aftermath of the dismantling or weakening of traditional industry sector branches where there had been recognized business expertise, at least in the eyes of the companies whose interests were served by those branches. We have also remarked about the fickleness of governments and the "petering-out syndrome." One may also suspect that politicians fight shy of programs that are blatantly discriminatory in their selectivity, particularly if common sense dictates that assistance should go to the strong, not the weak - on top of which the weak are usually in disadvantaged regions.

More pertinently one might query the public sector's grasp of what MOT really means, or could mean. Almost without exception innovation is still equated with high levels of R & D spending, in the words of Chesnais of the OECD (1986):

"...it is probably quite as erroneous and misleading for policymakers to equate R & D with innovative capacity as it is to equate competitiveness of most industries in advanced industrial countries with wage costs."

This kind of conditioned response is not too different from the ingrained belief that industrial excellence and competitiveness are a function of increased trade.

Yet it is interesting that Australia's NIES was consciously constructed on the model of the well-tried agricultural extension services which developed in several Anglo-Saxon countries. Close study of this model reveals that the field officers (who were public servants) were only successful when they were backed by an integrated system, which included specialists operating behind them, and who, in turn, had access to research facilities. The field officer was more like a two-way conduit pipe than a problem-solver in his own right. (Female field officers were added when the service started to operate in towns and cities, with an expanded mandate.)

Not surprisingly the field officers' greatest need was for extensive training in communication skills, and indeed, in the United States 5,000 field officers were put through intensive communication skills training, with tremendous results. And, typically, the agricultural extension service was the most effective (and subject to the severest criticism) when it faced up to the selectivity problem by concentrating on the best equipped farmers, not the weak ones.

Still on the issue of the credibility of public service officials, Pennsylvania will only use people who have been recruited from industry (they are either fairly young - 30 years of age; or quite experienced - around 60 years of age). The business background of the leaders in Pennsylvania's Industrial Resource Centers is impressive.

In Victoria (Australia) the responsible bureaucracy is infused with businesspeople who are brought in from retirement on two-year contracts "to influence/educate the old style civil servants"; the civil servants are taught to become pro-active, to start behaving like salespeople who are expected to garner "good accounts." In New South Wales it sounded as if the field officers saw themselves as "account managers."

In Germany there seems to be a preference for employing in-house advisory personnel in the government-financed advisory institutes, but at same time the effectiveness of such an institute seems to hinge on the personal qualifications of a few key people. We understood that firms, by and large, benefitted more from information exchanges among themselves plus the help of consultants. (Recall that we are not talking about specialist technical advice, such as IRAP and many others provide, but of the more difficult task of MOT-type assistance.)

Academics did not fare much better either in the skepticism stakes. SRI International (confidential communication) will not hire academics to deliver MOT-related services even if they come out of dedicated MOT degree courses. Pennsylvania does not believe that academics can help "and stay with" the problems of small firms. "Academics are no good; we and Michigan are the only two states that are not pushing business developmental funds through universities."

Australian universities are held in such low esteem that a number of leading companies are planning to fund private sector-designed and tested curricula, with the intention of then pushing them into universities - a complete reversal of the usual process. Allegedly \$1 million has just been spent on the development of one such course, with a further \$18 million of private sector money committed to bringing "alternative education" to the market. (The sponsoring companies are said to include major financial institutions who are concerned about the long-term viability of their Australian business infrastructure - their present and future debtors in effect.)

The current crop of business consultants do not escape criticism either. Almost without exception the big consulting firms have been written off. Their presentational and organizational abilities are highly rated (having one of them involved assures the business community that the event will not be a complete flop) but because those kinds of firms purport to be able to handle any kind of problem or assignment under the sun, the depth of their expertise is suspect. Besides, they are usually too expensive for any but the largest clients. Slickness has its cost.

Even among the smaller consulting firms the distribution of MOT-related talent is very skewed. Despite their exclusive reliance on, and commitment to, consultants, the Australian authorities are quite candid about the shortcomings of the current arrangements. In South Australia, out of 50 accredited consultants, 10 are rated as good, but only one of them is "really on the ball" with WCM-type seminars. At a time when NIES had already licensed 160 consultants to deliver the core seminar (WCM) a reliably knowledgeable peer group member speculated that "in the whole of Australia there are probably 20 good consultants" (and he was referring to individuals, not firms).

An official in Victoria admitted that consultant competency was a "real problem; being on the list is not a guarantee of excellence; the process of licensing is too liberal." New Zealand started out with 4 consultants for their

government-subsidized campaign (TQM) but they "ended up with one good one" and he implemented the campaign singlehandedly.

The reason the Germans claimed to prefer in-house experts (however limited the supply of talent) was that "our expert consultants are useless." (These are not in the engineering or specialist technical fields but the kinds of experienced people we shall profile below.)

In Britain informed people stated that consultants were "good at presentation, contacts and market expertise" but they had "little knowledge of technical change, and what happens elsewhere." In Michigan the big accounting firms are "a dubious consulting resource." Pennsylvania maintains "strict quality controls over consultants."

13.1 The Ideal Teacher

We have pieced together an Identikit of the ideal consultant/teacher, based on a large number of reactions garnered from government sources, academia and the consulting community. The ideal provider of the type of service we would associate with MOT:

- is able to talk from his or her own experience
- has a technical degree
- managed a technical activity
- is probably an engineer
- then took an M.B.A., and moved in business circles
- is 35 years of age, but may also be a much older person with 25 years of experience
- has worked in or owned a business
- could have been a venture capitalist
- is keen to share knowledge with others
- if a generalist, has depth in one or two core disciplines
- is a good facilitator of interaction in a group (a process leader)
- which includes, but goes beyond, being

- a good communicator
- and is therefore a good listener, analyzer and synthesizer
- and "can lead people from behind"
- has rational and non-rational problem-solving abilities
- has linkages with an investment firm
- (and (very important) has experienced failures and overcame them

Precisely because of this impossible combination of attributes the Australians do not permit a single consultant to deliver the whole of the three-day WCM seminar. The seminar is always shared by at least two persons who relieve each other, and who are dissimilar but complementary. Occasionally a business person or academic is roped in. (We were told that in Canada there are surprisingly large numbers of retired business managers who are keen to contribute their knowledge and experience in seminar/training settings.) Business people tend to learn willingly from members of peer groups.

Finally, we observed that the excellent agencies among those who are in the business of developing and deploying the kinds of teaching programs with which we are concerned, invariably employ at least one highly qualified industrial psychologist-cum-training and educational specialist.

13.2 Canadian Resources

The availability of Canadian resources in the teaching of MOT depends directly on the way the subject happens to be defined. We have already remarked that MOT can range all the way from a highly integrated, strategy-based, concept to a collection of quite specialized teaching modules or learning objects. Somewhere between these extremes are blends of MOT material with the more established teaching disciplines, such as engineering (including automated design and manufacturing), information technology, organization theory, research management, innovation, marketing, total quality management, business policy, and so forth. We have also observed that in the more specialized aspects of MOT one can expect to find teaching resources relatively more easily than in the area of a fully integrated and strategic approach to the subject.

Secondly, it stands to reason that a suitable inventory of teaching resources for ISTC's purposes will depend directly on the department's choice of the policy and program frameworks under which MOT might be promoted. For example, the kinds of resources needed for a larger scale business problem-solving activity would be quite different from the resources required to raise awareness among the chief executives of Canadian companies.

Thirdly, we suggest that two major alternatives apply to the issue of resource specification. On one view the resources should be identified at the institutional level, such as the federal government-financed centres at the Universities of Western Ontario and McMaster respectively. The more we break up MOT into specialized components, the more likely it is that the (more numerous) resources can be associated with established institutions and centres. On the other hand it is our impression that the kinds of people who have successfully thought through and taught MOT as a distinct discipline are quite scarce and at this level the expertise is individual and idiosyncratic. Typically such an exponent of MOT has developed his or her own integrative model and framework for teaching the subject. It is also unlikely that such a model can be easily captured and replicated for delivery by a whole lot of other people.

At this time our own bias is that excellence in the teaching of MOT must be sought among a small cadre of individuals who are unevenly distributed across Canada and that those people would be best identified and harnessed on an individual basis, as distinct from the department relying on centres and institutions for its needs. We would hold this view even if we regarded MOT as a compendium of distinct teaching disciplines. For example, even in a relatively narrow area such as new product development, it is generally recognized that only a very few individuals have been consistently effective in teaching interactions with businesspeople. We refer here to professionals like Professor Robert Cooper at McMaster University. Likewise, in MOT-related organizational theory, one would rather point to Professor Harvey Kolodny at the University of Toronto than to any particular institution or consulting firm (other than perhaps a consultant like Socio-Tech, which operates out of Chelsea, Quebec).

In sum, the regrettable fact is that Canada does not have the equivalent of the Sloan School of Management at MIT or (as far as the needs of larger corporate clients are concerned) the equivalent of the McKinsey company.

Despite the reservations and qualifications expressed above we nevertheless think that ISTC (depending on its chosen policy and program directions) could, at this time, be guided by several rather exhaustive surveys and competitions that have already been launched, and whose results are readily accessible. The primary objective of these surveys and competitions was to identify research and teaching resources across Canada.

One of the earliest information sources of this nature was a proposal for a Centre of Excellence in Management of Technology, submitted to the Government of Ontario's Centre of Excellence Program in March 1987. The proposal, spearheaded by Carleton University, identified (and contained the curricula vitae of) MOT resources at Carleton University as well as the Universities of Toronto, Waterloo, Western Ontario and Wilfrid Laurier University. The proposal also served to identify executives at a number of large Canadian companies whose knowledge of (and interest in) MOT-related issues could be usefully engaged.

An equally early, and even more detailed survey of a related nature, was undertaken on behalf of the Science Council of Canada by two consultants, Thomas E. Clarke and Jean Reavley. Their report (published in May 1987) was titled "Educating Technological Innovators and Technical Entrepreneurs at Canadian Universities." Clarke and Reavley catalogued the available courses in technological innovation and technical entrepreneurship, listed the teachers, and talked in considerable detail to Deans of Engineering, Science and Business as well as the responsible teaching faculty.

In October 1989 the federal government announced the winners of a nationwide competition under the Networks of Centres of Excellence Program. Unfortunately the entry which was most directly related to MOT (the Technology Innovation Management Network) did not come up to the expected standards. Nevertheless a large number of Canadian universities participated in that submission with the result that it constitutes yet another source of information on the specific MOT research talents harboured by the sponsoring institutions.

A parallel initiative came from the Social Sciences and Humanities Research Council of Canada when it financed a special survey on MOT under the auspices of the Social Science Federation of Canada. The resulting two-volume report was published in November 1988 under the title "Report on the Management of Technology: the State of the Field, its Research and Researchers, the Networks of Researchers and their Views on Centres, Networks, Partnerships

and Funding Mechanisms, including Recommendations."

Even though the report was slanted in its emphasis on labour-related aspects of MOT it is the most comprehensive and most up-to-date survey of its kind in Canada. ISTC's attention is drawn specifically to the Appendix (list of researchers, and studies under two government granting programs). The report provides a full master address list of contacts, and participants in some aspect of MOT networks. (Apropos our earlier examples of a couple of well respected authorities in their respective fields, we note in passing that, among others, Professor Robert Cooper's approach to the discipline is described at some length; under the heading of "Organizational Questions" Professor Harvey Kolodny's work is mentioned. The report is recommended for its degree of specificity, in terms of naming institutions and individuals and identifying their differing "angles" on the subject of MOT.)

Presumably as a direct result of the 1988 SSFC report, SSHRC and NSERC jointly announced a Program of Chairs in the Management of Technological Change and held a competition for six such, partly subsidized, university positions. We assume that, in due course, ISTC might get access to the various applications received by SSHRC/NSERC in order to gain further information on the distribution of MOT research and teaching talent in Canadian universities.

A follow-up competition will be held in the fall of 1990. We have reason to believe that the information value to ISTC with regard to the available MOT talent (at least at universities) will be considerable. At the same time ISTC will be able to identify, perhaps, the business firms in Canada that have shown tangible interest in contributing to MOT education.

A more general but still potentially useful source of information is the 1990 Directory of Full-Time Faculty Members in Management and Administrative Studies at Canadian Universities, published by the Canadian Federation of Deans of Management and Administrative Studies. The directory contains an alphabetical list, a list by institution, and a list by teaching specialization.

By its nature the search for MOT-related teaching talent is open-ended. We should therefore like to conclude with a reminder of one final but potentially productive source of expertise outside of universities - the organizations that specialize in hosting public seminars for businesspeople. These organizations are usually able

to attract speakers from unexpected corners of the community, including consultants, practising business managers and specialists, even lawyers and accountants. Recently (April 1990) The Financial Post put on a public seminar/conference on aspects of strategic partnering involving technology. In November 1988 The Canadian Institute hosted a conference on Domestic and International Technology Transfers (Licensing for Profit). Quite a few well qualified potential teachers or advisers came to light on that occasion. Other conferences involving some managerial aspects of technological competitiveness have, from time to time, been organized by associations such as CATA.

We would reiterate again, however, that a meaningful specification of Canadian teaching and training and consulting resources in MOT would be contingent on prior decisions by ISTC of the sort described elsewhere in this report.

14. CONCLUSIONS

We have, successively, discussed the purpose and content of MOT-related education and training initiatives; the various forms such teaching can take; the issues of appropriate scale and selectivity; and, finally, the qualities and availability of "teachers" in the field. In doing so we have sought to identify the nature of the information ISTC and its business clientele would need if either should contemplate a meaningful developmental activity in the area of MOT. (Here one must distinguish between the nature of the information and the information itself.)

There is an implication that ISTC will have to decide on the importance of MOT in the galaxy of affairs encompassed by its mandate and where MOT figures in its list of priorities. For example, we have suggested that to promote R & D itself (even strategic technologies) is putting the cart before the horse if the management of technology is deficient. From the point of view of a public agency wishing to inject itself into the world of education and training the issues of scale and selectivity are uppermost. We would suggest, perhaps bluntly, that the more sophisticated (and effective) the MOT instruction becomes, the greater the likelihood of its being wasted on firms located in non-viable communities and regions. The same applies to companies; wherever we have inquired the public authorities are becoming more and more selective in favour of the stronger candidates.

The availability of qualified seminar leaders and teachers or consultants (problem solvers) will have a bearing on the contents of the curricula. We have suggested the possibility of grafting MOT on to better known root stock as a temporary measure, thinking here of advanced Business Planning or Total Quality Management. The other extreme is to break MOT into numerous modules and to facilitate business access to modular forms of training, with or without employing distance learning technology and facilities.

The problem is that modularity runs against the grain of MOT, properly conceived. While it has to show its ability to solve real business problems, MOT is an integrative science and practice, as much a way of thinking as it may resemble a technique.

Modularity of material and distance learning are complementary. The entire idea of distance learning would have to be carefully scrutinized in light of

Canadian needs and conditions.

We have stopped short of outlining a formal "plan for information exchange and networking among ISTC, identified resources, and corporate clients across Canada" because events have overtaken our initial intentions. This refers to the steps taken this year within ISTC to develop a departmental Workplan for Technology Services across the country, leading to completion of a draft integrated strategy by the end of April 1990.

If these services were to encompass MOT, there is no reason to believe that the chosen developmental and delivery infrastructure would have to be different from the basic vehicles created for other business services (and we note that the overall plan would make provision for "development of new service products").

We nevertheless strongly recommend that the department tries to establish focal points or core competences in its business service portfolio. In our opinion the real challenge for business competitiveness is the ability to integrate strategy, technology and organizational factors. It does not really matter what label is hung on such an ensemble, whether it is called Management of Technology, Management of Innovation or Management of Change. Australia chose as their flagship a product named World Competitive Manufacturing. The core of that product is the development of a business plan. The function of the product is catalytic. Its byproducts are a commitment to even more intensive learning and problem-solving within firms, and a better coordination of intergovernmental industrial development efforts.

In other instances the basic developmental packages may be known as Total Quality Management, a Modernization Service, or a Technical Change Audit. South Australia has Enterprise Workshops. The point is that, as far as possible, the service is recognizably focussed and integrated, even if it should be quite extensive in its reach.

Such a program is also, by definition, more likely to be pro-active and selective (among qualifying recipients) than a "program" that is essentially a smorgasbord of smaller and disconnected offerings, dished out reactively to inquirers. It is also, and this may be a difficult choice for a government agency with a service mentality, more clearly educational/developmental than problem-solving.

Not to recognize and address the differences between these approaches might well condemn a government service to

chaos and ultimate dissatisfaction. We would therefore distinguish the reactive, problem-solving activities in the department's service portfolio, and if there were a smorgasbord of offerings, it might make sense to place them in the problem-solving category. Fortunately a problem-focussed exercise can serve as a catalyst for, and lead to, awareness of a need for what we would regard as management education and development. One could not ignore warnings (for example, emanating from Michigan) that "you can't sell business education."

However, it appears that one can successfully promote awareness, and therefore the fostering of awareness is the third category of potential related services, to be distinguished from integrated education and problem-solving respectively. Awareness sessions can be cost-effective because they can be delivered to larger groups of people, including competitors.

SRI International suggests that there is a certain symmetry between product and delivery mechanism. For example:

<u>Purpose</u>	<u>Vehicle</u>
Generally sensitize (create awareness)	General (open) seminars
Sensitize a single firm	Customized seminars
Address "issues"	"Break-out" (i.e., dedicated) sessions at a public event
Learn by doing/ do what is learnt	Consulting

In the same vein the Open University at Milton Keynes stresses the need to "match the course content, the learning media, and the input-output characteristics of the student and the course."

We should also like to underline the need to aim for leverage of available resources, and to think of Australia's commitment to educating the educators - cultivating consultants capable of disseminating quality-controlled (franchised) material. ISTC should, however, be prepared for the experience of others that only a very small number of teachers/course leaders/consultants

can live up to expectations, and that a large proportion of the work load will settle on the shoulders of a handful of people.

We very much doubt that the answer to the country-wide needs lies in "institutionitis" - support for institutes or centres for this, that or the other. We would opt for the much less expensive, less cumbersome, more flexible, cultivation of a small network of gifted or informed individuals, follow them around (they are quite mobile), and steer clear of the endemic problem of the "stars" having to carry a bureaucratic overburden with them.

15. DOCUMENT ATTACHED

We have enclosed but a single exhibit - the latest description and evaluation of Australia's National Industrial Extension Service. We commend it as a model deserving attention, for several reasons.

In the first place, it represents a serious effort on the part of a people who know that they are in trouble. Second, there is a track record from which others can learn. Third, it has served multiple purposes, not the least of which is its success in helping federal and state-level jurisdictions to coordinate themselves better and to avoid costly duplication. Fourth, it is heavily decentralized in its administration and delivery. Fifth, the services are flexibly adjusted to local conditions at the state level. Sixth, despite its ambition and scope it is not extraordinarily expensive (say, compared with the money ISTC is prepared to devote to promoting strategic technologies). Seventh, its outputs are relatively focussed and integrated.

Lastly, despite misgivings on the part of ISTC management about the potential usefulness and validity of Australian experience, we find many relevant parallels between the Australian and Canadian situations. We also found that the quality of recent policy advice being tendered to the Australian government in the field of technology and its deployment has been equal if not superior to anything we have seen in either North America or Europe.

The foregoing observations should not be interpreted as unqualified admiration for NIES. Indeed, some Australian businesspeople have been very critical of it. They were consistently accused of poor marketing. As impressive as the people were in South Australia and Victoria who were in charge of program development and delivery, so

were we singularly unimpressed by their counterparts in the State of New South Wales. (The exception in New South Wales was the responsible federal government representative who gave two hours of his time, at home, on the telephone, on a Sunday evening. In this he resembled an outstanding New Zealand consultant who was prepared to part with his knowledge, free of charge, by way of a two-hour telephone conversation.)

We think that NIES is a rather unusual and particularly pertinent benchmark, given the nature of ISTC's current transformation, and not to mention our present federal-provincial debacle. Our own bias would be to see MOT as the lynchpin of a Canadian equivalent to NIES, in stead of WCM or TQM. On the other hand, given the still inchoate state of MOT we should think it perfectly feasible to graft MOT on to more familiar core activities such as Business Planning (WCM) or TQM. At least the possibilities should be discussed. One would have to recognize that with respect to TQM, quality (however broadly defined) is no longer good enough. Alternatively, business plans are now increasingly driven by technology, not vice versa.

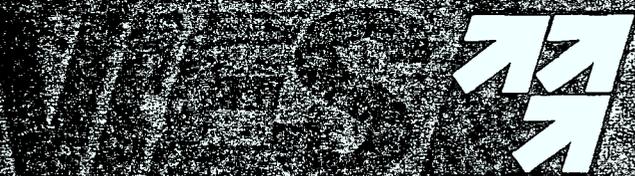
Nevertheless, what counts most in the end is not the name of the product but the quality of the learning process it engenders.

SHORT GLOSSARY

CEO	Chief Executive Officer
JUPITER	Joint Universities and Polytechnics Industrial Technology Education and Research
MOT	Management of Technology
NIES	National Industrial Extension Service
NTU	National Technological University
SDA	Scottish Development Agency
TQM	Total Quality Management
WCM	World Competitive Manufacturing

NIES - FUTURE DIRECTIONS

September 1989



NATIONAL INSTITUTE OF ENVIRONMENTAL AND TECHNICAL SERVICES

Preface

This report has been prepared by the National Advisory Committee on Extension Services (NACES) and presented to the State, Territory and Commonwealth Ministers of Industry for consideration at their September 1989 meeting.

The purpose of the report is to advise the AITC of:

- the achievements of NIES - the National Industry Extension Service - in its first three years,
- further improvements in the program that are being implemented, and
- NACES' recommendations for the extension of NIES beyond 1991.

In addition to considering this report, Ministers are invited to consider other material that has been provided, including the "NIES Report 1988".

Continuing evaluation work will greatly contribute to our understanding of the impact of the scheme on its target enterprises in terms of their improved performance, particularly in the areas of export and import replacement.

A Strategic Plan for the period 1989-93 is currently being developed with the help of a private sector consultant. Subject to favourable government decisions on the extension of the NIES program, this plan will be the basis for Operational Plans for each State, Territory and the Commonwealth.

NIES operates in a dynamic environment and looks for opportunities to improve its responsiveness to the needs of firms and governments. To the maximum extent it operates according to the best private sector practices.

The NIES Mission

*We aim to assist
Australian enterprises
to attain and sustain
international competitiveness
through focusing our activities on
enterprise improvement.*

*We will achieve this by
effectively developing networks
and information and advisory
services.*

Table of Contents

	Page
Preface	
Table of contents	
Summary and Recommendations	
1 Introduction - origins and rationale	1
2 The NIES Network	2
3 Enterprise Improvement Services	
3.1 Introduction	3
3.2 Roadmap of services	4
3.3 Field Officer service	5
3.4 Diagnostics	5
3.5 Core business - Enterprise Improvement	6
3.6 Strategic Planning	7
3.7 Marketing	9
3.8 Manufacturing	10
3.9 Human Resources	11
3.10 Innovation and Design	13
3.11 Quality	14
4 Information Service and Promotion	16
5 Consulting Infrastructure Development	18
6 NIES Management	21
7 NIES and Furtherance of Industry Policy Objectives	23
8 Evaluation	24
9 Future Directions and Recommendations	
9.1 The Program	25
9.2 Recommendations	25
9.3 Other Changes and Operating Principles	28
Appendices:	
A. National Advisory Committee on Extension Services	32
B. NIES program data	33
Related documents:	
NIES Report 1988	
C'OZ, August 1989 issue	

HIGHLIGHTS OF NIES ENTERPRISE IMPROVEMENT

ACTIVITIES FOR 1988-89

More than 200 firms, represented by over 1600 senior managers, have participated in WCM workshops.

160 consultants trained and licensed to deliver WCM.

70 academics participated in WCM, and are linked with the Key Centres for Strategic Management and Quality to foster curriculum development.

Several large Australian corporations have embarked on WCM, without NIES subsidies.

500 business plans subsidised with expenditure totalling \$3.4 million, and averaging \$6,500 per subsidy.

240 marketing consultancies awarded, totalling \$1.6 million, with an average subsidy of \$6,500.

Summary and Recommendations

The NIES program is a partnership between the State and Commonwealth Governments in their bid to ensure an internationally competitive Australian industry. This Report and the comprehensive strategic planning process that is underway are good examples of how effective such a partnership can be.

Key achievements of the NIES program to date are:

- a solid partnership has been built between the Commonwealth and State Governments, as shown by:
 - removal of duplication of industry extension effort between the Commonwealth and States, and joint decision-making on extension programs;
 - much closer working relationships between Commonwealth and State industry departments in a range of industry areas;
- strengthening of the partnership between Governments and the private sector, with many thousands of firms using the NIES service for a second or further time (indicating they are satisfied clients);
- establishment of one-stop-shop NIES information and referral systems for business inquiries;
- improved liaison between industry departments and other agencies concerned with enterprise improvement;
- improved referral of firms to the best source of expertise to meet their needs;
- development of several new programs which are contributing significantly to encouraging firms to become world competitive;
- established and confident networking between Governments and the private sector consultancy profession, with the profession providing an improved standard of specialist support to industry;

MORE HIGHLIGHTS OF NIES ENTERPRISE IMPROVEMENT

ACTIVITIES FOR 1988-89

62 enterprises assisted with consultancies relating to human resource aspects of their operations, totalling \$0.9 million, with an average of \$16,100.

165 enterprises assisted with design subsidies, totalling \$0.6 million, and averaging \$3,500.

250 consultancies relating to manufacturing strategies or systems support were awarded, totalling \$2.1 million, averaging \$8,500.

400 enterprises receiving quality improvement subsidies, expenditure totalling \$2.9 million, average subsidy of \$7,500.

20 enterprises in the information industries receiving additional assistance to meet international standards and regulations.

10,000 firms attending workshops and seminars organised by NIES.

20,000 telephone inquiries handled by the NIES hotlines.

- momentum for change taking hold within industry;
- improvement in the export, and import replacement, activities of targeted firms assisted by a range of NIES programs.

The NIES network of government agencies, private sector consultants, industry and unions presents Governments with a unique opportunity to accelerate change. The program has provided knowledge of the will, resources and dedication required to effect company improvement and of the time needed for change to be reflected in company profitability.

Much more needs to be done by way of:

- furthering the recent development of closer ties between NIES enterprise improvement activities and the export activities of Austrade and State Departments;
- further improving the integration of NIES services to target firms;
- giving more attention to larger firms than NIES initially focused on, particularly due to their leverage on small firms;
- further improving the quality of consultants required to undertake the delivery of NIES services, particularly in the human resources and workplace practices areas;
- improving coordination between departments and agencies;
- working with industry associations;
- evaluating the economic impact of some of the NIES programs, for example business planning, which have been in place for a reasonable time.

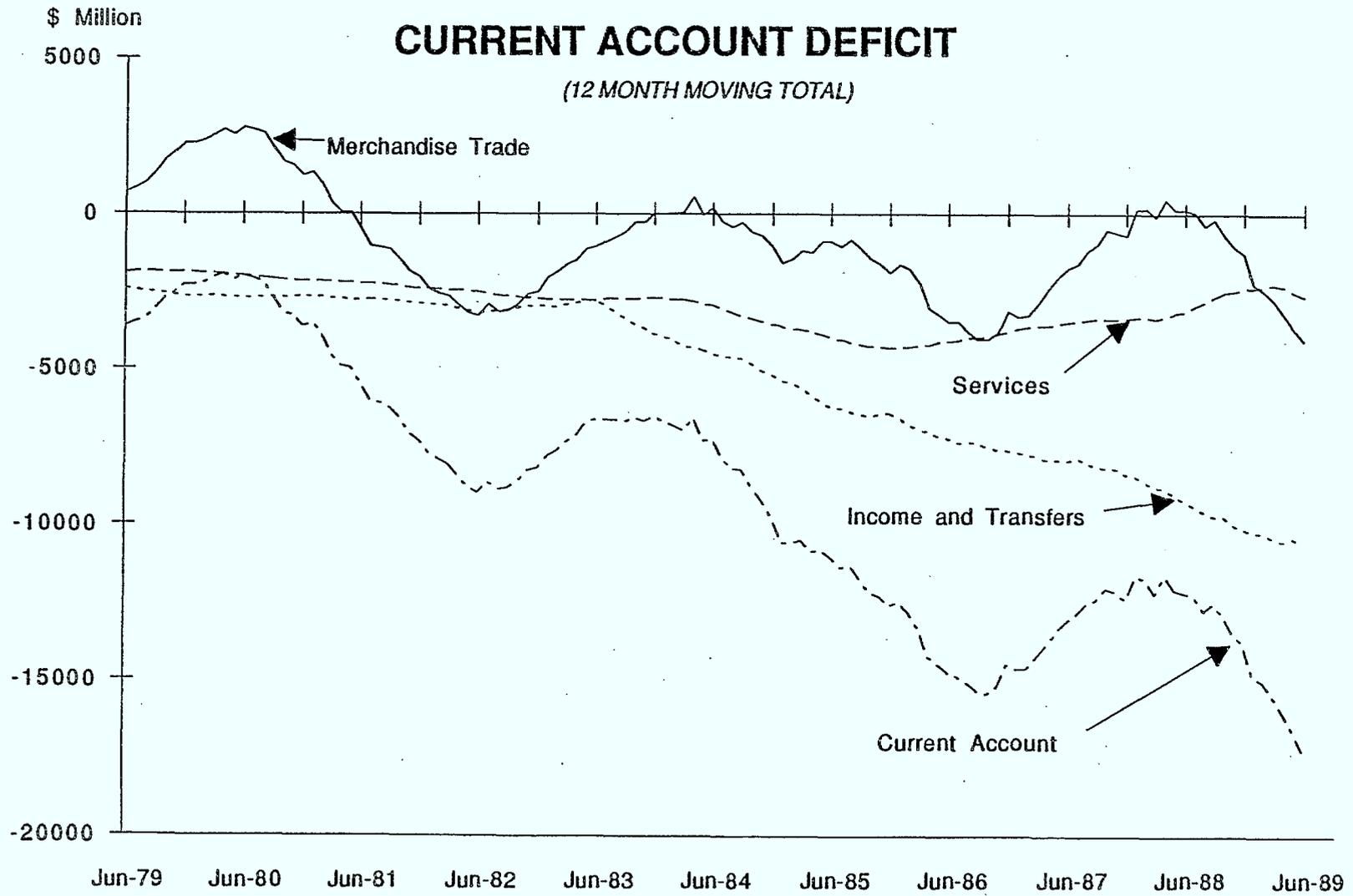
The need for NIES, as a targeted program assisting enterprises with growth potential to improve their international competitiveness and thereby Australia's balance of payments, remains strong.

Recommendations: Ministers agree that -

- 1. the necessary Government approvals be sought for the renewal of the Commonwealth - State NIES agreements for the next five year period, to 30 June 1996, with appropriate resources made available to the program.*
- 2. Governments build upon the foundation of the NIES network in their efforts to enhance structural change, and channel new industry initiatives through the existing NIES delivery mechanism wherever appropriate.*
- 3. as NIES is central to achievement of government industry policy objectives, Ministers promote the strengthening of links between NIES and other Commonwealth and State programs.*
- 4. the National Advisory Committee on Extension Services (NACES) continue as the key tripartite advisory mechanism in NIES, that private sector representation on NACES be expanded by four members, and that NACES be chaired by a private sector member.*

CURRENT ACCOUNT DEFICIT

(12 MONTH MOVING TOTAL)



1. Introduction - Origins and Rationale

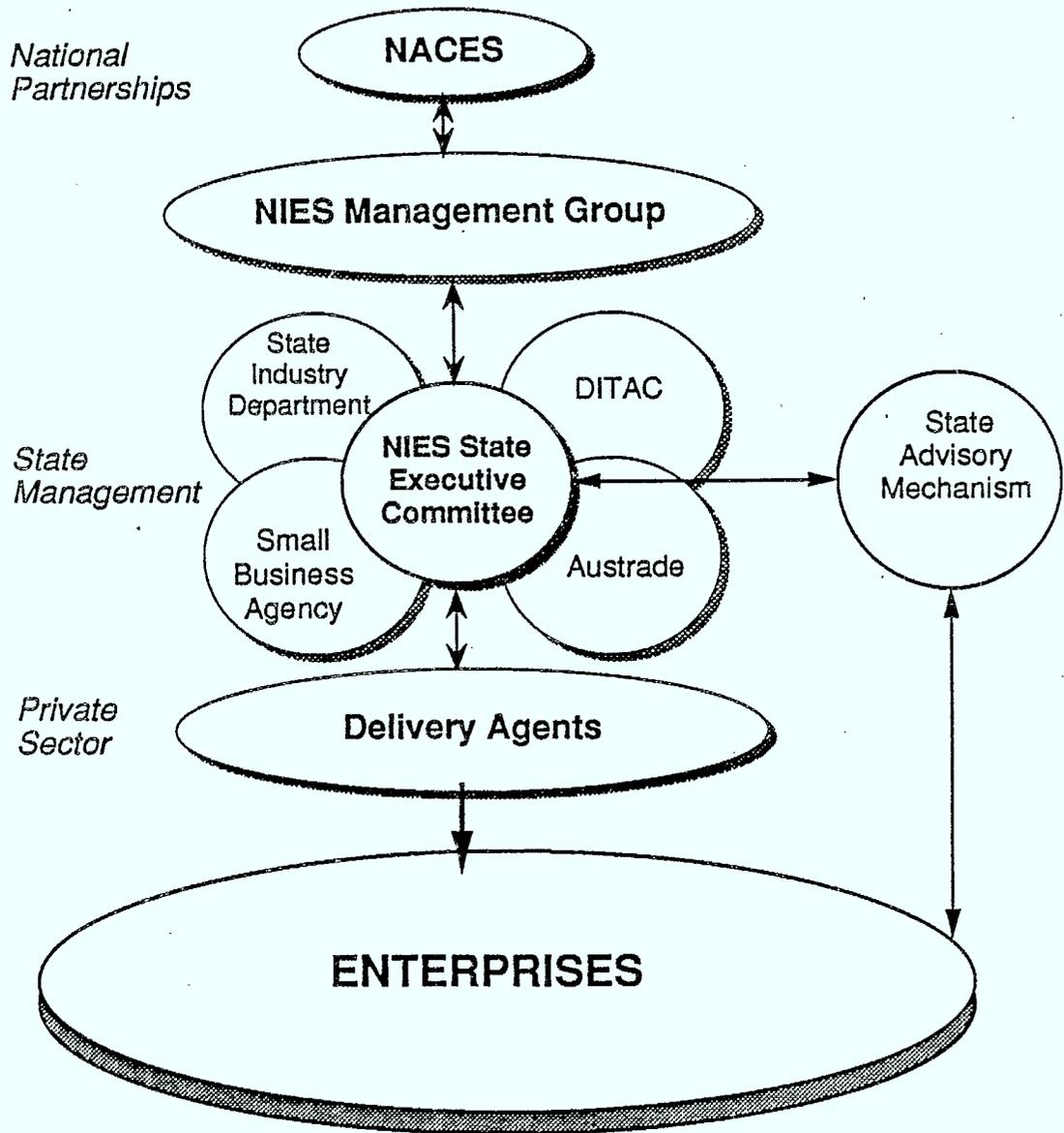
NIES is a joint Commonwealth and State* Government initiative to assist firms in the traded goods and services sectors to attain and sustain international competitiveness through improving their internal efficiency. The scheme was launched in 1986-87, at a time when there were already balance of payments problems and it was clear that manufacturing industry would need to make a greater contribution to economic growth.

The need for the program was established in the Cashman Report (1984) and the Nicholas Clark Report (1985). These reports clearly identified that small and medium sized enterprises tended not to access outside expertise to identify and fill gaps in their own competence in key management functions. There was also scope for improving the effectiveness of information and advisory - *extension* - services by rationalising and co-ordinating the activities of Commonwealth and State Governments and by developing new services where gaps were identified.

It was intended that through information provision, guidance in the selection of consulting expertise, and the provision of subsidies towards the use of private sector consultants, firms would be encouraged to use these services. Through stimulating industry demand for consulting services and expertise, it was expected that there would be a response in the supply of this expertise from the private sector consultancy industry. The NIES network was positioned to assess the balance between this demand and supply and to address gaps that might impede progress.

* In this report "State" is intended to refer also to the Territories.

The NIES Network



2. The NIES Network

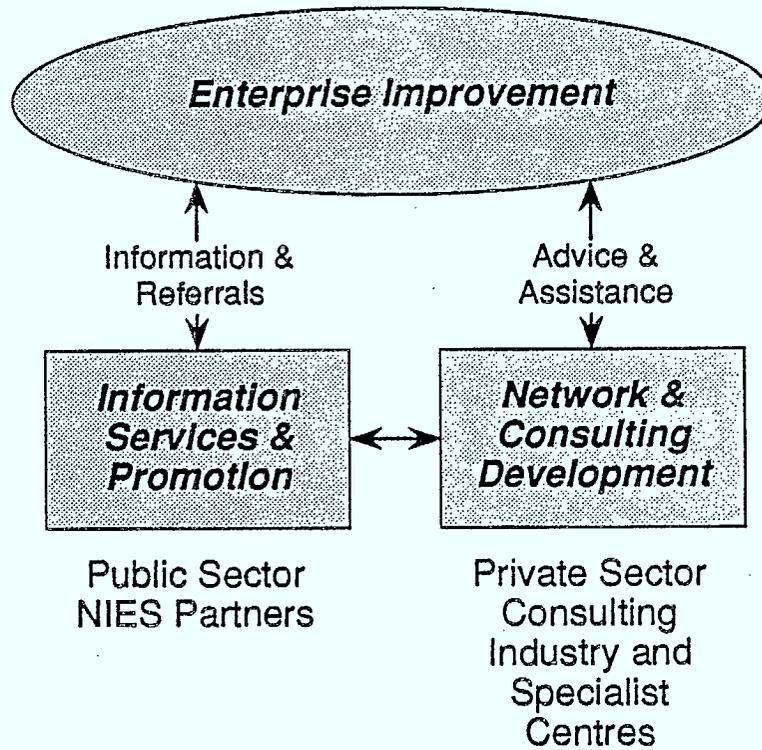
Although most States and the Commonwealth provided some extension services prior to the establishment of NIES, there was considerable room for improvement. The active involvement in each State of a number of Commonwealth and State agencies in delivering services to firms resulted in duplication, and it confused firms as to the most appropriate source of advice. The coverage of the services that were available was patchy between and within States, and there was insufficient sharing of information between Governments on the content of, and experience with, their programs.

Flows of information have been improved, and duplication of effort curtailed, by the establishment of more effective networks between:

- firms, thereby enabling them to share knowledge (with non-competing firms) about manufacturing methods, technologies, appropriate consultants, etc;
- consultants, particularly to meet firms needs for a range of outside expertise that one consultant alone is unlikely to possess;
- government agencies and industry associations;
- different service providers and agencies within each State, and those within the Commonwealth area of responsibility;
- design, R&D, education and skill-formation institutions;
- the States;
- the Commonwealth and each of the States;
- the network's links with international agencies.

Introduction of the NIES program provided a focus for this networking activity. Other Government initiatives aimed at enterprise improvement have been delivered through the NIES network. For example, some elements of Commonwealth industry policy decisions to assist firms in the TCF, scientific and medical equipment, and information industries have been able to utilise the effective delivery mechanism of the NIES network at the State level. The States have also used the network to deliver sectoral programs developed under their own industry policies.

NIES Functions & Relationships



3. Enterprise Improvement Services

3.1 Introduction

NIES services are directed in three ways. First and foremost they focus on promoting sustained enterprise improvement. Second, to meet the original charter of reducing confusion in companies' minds as to the point of contact within government, a NIES Information Service has been developed. Third, it was recognised that considerable effort needed to be directed towards improving the supply and quality of private sector consulting services and expertise available to assist industry in its quest for change.

Expenditures by Governments on extension services in 1988-89 perhaps totalled around \$60 million, of which the States funded about 70 per cent. The major part of the expenditures went on infrastructure development (see Section 5).

Subsidies paid direct to target firms for consultancies amounted to about \$12 million in that year, but the proportion of expenditure going to these enterprise improvement programs is increasing. The subsidies reduce the cost to firms of accessing outside expertise; they do not go towards capital, production or other costs.

(Precise expenditure figures are not yet easy to collect due to differences between the States in definitions and organisational structures.)

Through its promotion and track record, NIES has helped to change the image of extension services. They were once often seen primarily as cures for firms' "illnesses". Now even expanding, prospering firms view such services as a key resource that should be tapped to help them maintain or accelerate their growth in existing or new directions.

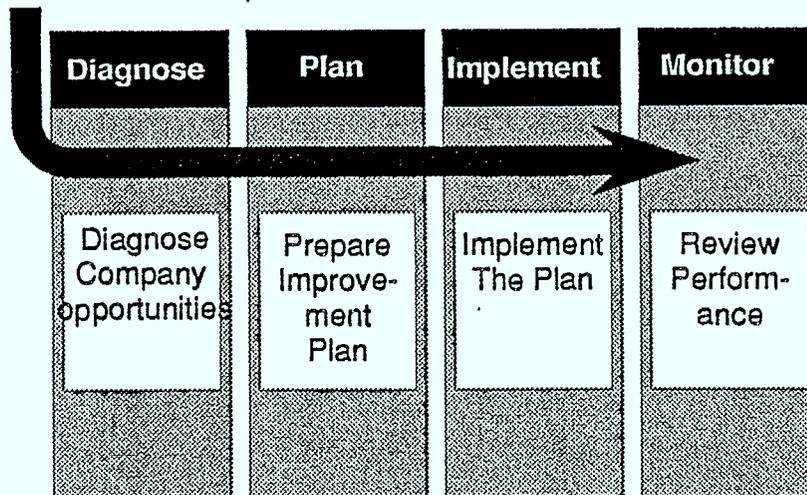
NIES' client firms have shown satisfaction with, and responsiveness to, NIES services. In Western Australia, for example, in a survey of firms that had just completed business planning consultancies, 83 per cent were at least satisfied with the NIES service and 88 per cent were satisfied with the NIES field officers' work. Concrete action to implement their newly-completed plans had already been taken by 55 per cent of the firms.

Typical NIES Road Map For Enterprise Improvement Activities

Services Options:

- Strategic & Business Planning
- Marketing
- Manufacturing
- Human Resources
- Innovation & Design
- Finance
- Quality

To assist an Enterprise to:



3.2 NIES Roadmap Of Services

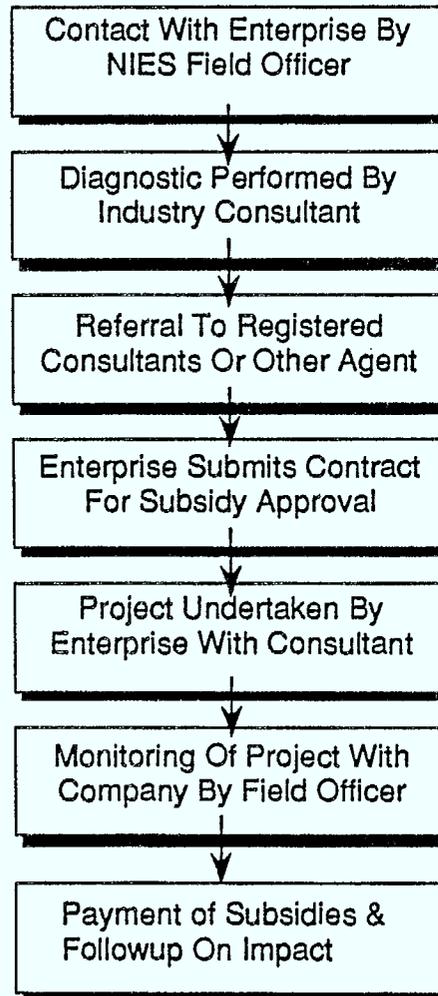
The creation of significant numbers of world class firms can come about only if individual firms are able to create a competitive advantage for their products or services. That is, firms must develop the capacity to compete more effectively than their rivals both on home and in international markets.

At the heart of sustained company improvement, regardless of the size of company, is the measure of the company's commitment to continual improvement. A comprehensive strategic plan provides the focus for *all* other company strategies. The continual improvement process relies on a well tested logic of "plan, do, check, act".

NIES services are directed at supporting this dynamic enterprise improvement cycle. The unique contribution of NIES with its network of companies, consultants, industry associations, unions and governments, is the extent to which it can foster and support this comprehensive approach.

It is recognised that firms will have immediate needs in particular areas, for example quality and design, which can be addressed by one-off consultancies. However, our objective is to involve companies in integrated programs offered through NIES which provide greater assurance of sustainable long term productivity improvements.

Typical NIES Delivery Process



3.3 Field Officer Service

A key element of the program is a Field Officer Service which comprises a *proactive* contact element to:

- identify firms that satisfy NIES target criteria;
- increase their awareness and use of the network; and
- facilitate business audits to identify firms' real needs rather than perceived wants.

and a *reactive* contact element to respond to requests for advice and assistance. As a central point of contact for firms, much rests on the capability of the NIES field officers.

It is intended that field officers - or industry advisers as they are sometimes known - provide information on available extension services, preliminary analysis of problems and opportunities, and referral to appropriate services.

3.4 Diagnostics

The objective of the diagnostic service is to provide an effective facility and incentive to help enterprises identify their competitive advantage and potentials, and to assist their development of the long term strategic planning needed to realise those potentials.

To facilitate the provision of advice, or assistance in identifying the issues requiring specific attention during a strategic planning workshop, most States subsidise an Initial Review service. This service is designed to assist firms to conduct a comprehensive analysis of their needs and opportunities. It consists of two to five day audits (dependent on firm size, etc) by private sector consultants.

Commentary

NIES has learnt that the Diagnostic process has assisted in overcoming the "Quick Fix" mentality by providing a comprehensive analysis of a firm's position rather than merely responding to the firm's ad hoc demands. This has saved unnecessary subsidy of lesser priority activities or the funding of practices or processes which would not make a lasting contribution to the firm's growth. These are very positive outcomes, although it is difficult to quantify them due partly to definitional differences. Both the definition of diagnostics and the role of field officers presently lack consistency across the network. These weaknesses will be addressed as matters of priority.

"Megatec Pty Ltd has gained much from the NIES business planning and subsequent detailed market planning exercises. For a young company experiencing rapid growth, the management team of computing experts gained vital management skills from the objective critiques provided by expert external consultants in each study."

Peter Spring
Managing Director
Megatec Pty Ltd
Victoria

3.5 Core Business - Enterprise Improvement

The mission of NIES is to contribute to the creation of world class firms in the internationally traded goods and services sector. It is a targeted program, aimed at creating firms with a competitive advantage in international markets. Therefore the core business of the NIES network is the provision of enterprise improvement programs.

Firms are assisted in using reputable private sector consultants to fill in-house gaps in expertise in strategic planning, marketing, manufacturing, human resources, financial planning, innovation, design and quality.

The NIES network is building links with industry associations and trade unions to ensure collective support of, and feedback to, our enterprise improvement programs. One such example of this networking support occurs in New South Wales where the MTIA and NIES jointly sponsor programs and seminars to promote this cross-referral arrangement.

Commentary

Private sector consultants are seen by NIES as the prime delivery agents of enterprise improvement services. It follows that NIES will primarily be adjudged a success (in a delivery context) only if the consultant 'delivers the goods'. Clearly NIES has a strong interest in consultancy development, consulting standards, consulting methodologies, and the interface between consultants and client firms.

Also required is a longer and more in depth association with companies which have been selected on the basis of the growth potential of their industry as an Australian strength, and on their own potential for growth and expansion into export markets. NIES must encourage them to implement integrated and appropriately sequenced enterprise improvement programs. This should maximise companies' growth opportunities as well as the return on NIES funds.

Whereas the first two years of NIES were intended to focus on the rationalisation of agencies and co-ordination of services (an inward looking perspective), there is a recognised need to maintain or increase further the strong emphasis that is now given to enterprise improvement programs.

"The booklet put out by NIES on WCM was one of the best things I'd ever read. It got us really excited.

We've recently completed the course which was fantastic and very illuminating. The most significant thing to come out of it is that it has taught us to plan.

We're virtually rebuilding the company, putting emphasis on management and staff training, knowing where we're going.

Our future prospects are enormous. I've never been more excited. We want to be a world class manufacturer and confirm the faith NIES has in us."

Graeme Heard
Managing Director
Chief Kitchenware Pty Ltd
Cavan
South Australia

3.6 Strategic Planning

Underlying all company improvement initiatives sponsored by NIES is the belief that sustained company improvement is achieved only by companies vigorously identifying their *sustainable competitive advantage* and then managing and integrating their operations in a strategic way to achieve that goal.

A review of company practices and consultants' offerings with respect to strategic planning was conducted by NACES in 1986. Serious deficiencies were identified and it was decided to commission the development of a tool to enhance this fundamental approach. "World Competitive Manufacturing (WCM) - A Strategic Planning Approach" was developed and and it was launched in October 1987.

It was not sufficient just to develop a product; the activity had to be positioned and promoted in the market place. To that end NIES developed a program, on a user-pay basis, to train private sector consultants to deliver this program. Furthermore, through NIES subsidy arrangements, firms are actively encouraged to undertake the WCM program as a start to fundamentally changing their operations. This demand and supply catalytic approach has had the following impact:

- 160 consultants trained and licensed to deliver WCM;
- More than 200 firms, represented by some 1600 senior managers, have participated in WCM workshops;
- An estimated 90% of participating companies have proceeded to the WCM implementation phase;
- In addition more than 70 academics and some 140 State and Commonwealth public servants have participated in WCM Workshops so as to be better placed to implement its principles in their own industry-support activities and to advise industry on its benefits;
- The States and the Commonwealth have particularly encouraged firms in selected industry sectors to participate in WCM Workshops, for example the scientific and medical equipment industries;

"We decided that not knowing what we were going to be doing next week was a problem. We worked very unprofessionally on the system that if your order book was full it didn't matter whether you knew where you were going.

We decided we should have a long term direction and in response to a NIES advertisement we ended up with a consultancy-driven three day seminar to establish our future path. We followed this up with a further consultancy program to improve production.

The NIES programs have certainly made the whole exercise worthwhile, with sales increasing by \$300,000 in the four months following the initial engagement of the consultant."

Simon Hanby
Managing Director
Selected Joinery Pty Ltd
Tasmania

- One measure of success of the product lies in the fact that several large corporations in Australia have embarked upon WCM without NIES subsidies. Furthermore several Government authorities, such as the Queensland Government Printer, are using WCM for their strategic planning.

It would, however, be unrealistic to expect all companies to initially accept the need for this strategic approach. NIES has therefore continued to subsidise eligible firms to undertake business plans. In 1988-89 across Australia over 500 firms received NIES assistance for overall business planning consultancies other than WCM. The NIES expenditure totalled \$3.4 million, with an average subsidy of \$6,700 per consultancy. Most subsidies were in the range of 50 to 75 per cent of the contract fee but if account is taken of the related costs firms incur, for example the time involved by their own employees, relatively the NIES contribution would be much smaller.

Firms frequently point out that the subsidies, though important, are not necessarily the aspect of NIES assistance that they most appreciate. Other benefits include the help in identifying appropriate consultants and the guidance available from NIES in their dealings with consultants.

The recent NIES publications for small firms entitled "*Preparing and Business Plan*" and "*Your Business Now: A Self-diagnostic Workbook*" have achieved sales of 5,000 and 1,000 copies respectively.

Commentary

Experience of the NIES network continually reaffirms the importance of strategic planning as the driving force for company improvement. Testimonials and to a lesser extent (because of the time lag factor) evaluation of WCM case studies provide evidence of the value of the WCM approach and its applicability to Australian enterprises and conditions. WCM will continue to be, and will be promoted as, the core product of the NIES program. Its direct impact on company improvement will be monitored over time.

New programs such as WCM have a long gestation period and as a result there must be no 'hiccups' in momentum if industry is to sustain its improvement program.

(See the C'OZ issue for August 1989 for case study materials on WCM.)

*"Receiving expert help through NIES has gone
a long way to improving our
operations.*

*We're recognised world-wide for our high
standards of engineering, metallurgy and
quality, and we already have significant
markets in the eastern states and in Japan,
Korea, Africa, the USA and Canada.*

*We've a stable workforce of 47 and
are proud of our labour relations record. "*

John Elsby
General Manager
Drilling Tools Australia
Bayswater WA

3.7 Marketing

The contribution of marketing to company improvement has been underestimated and given insufficient attention by many firms. In developing and implementing a strategic plan, marketing is perhaps the first function to address.

Marketing strategies identify the context and operating environment (particularly the international opportunities) that have a direct impact on company success.

An important partner in the NIES Network is Austrade, and firms are referred to that organisation for special assistance. Austrade also refers firms to NIES that may have potential for growth in the international arena but which may first require company improvement programs. NIES and Austrade are cooperating to train up to 20 firms in the gemstones and jewellery industry to jointly target the North American market.

NIES supported a study by the Australian Manufacturing Council of Australian firms' marketing needs and capabilities. The study found a definite link between a firm's performance and its level of marketing sophistication.

NIES also sponsored the introduction of the international marketing strategy competition, Markstrat, to Australia. In its first year in Australia, some 300 persons participated. A directory of non-award marketing courses has been produced and marketing consultants are being surveyed.

In 1988 the NIES network supported about 240 marketing consultancies. Subsidy payments totalled \$1.6 million, with an average subsidy of about \$6,500.

Commentary

This area is still inadequately addressed. Developments are underway to: alert companies to the importance of strategic marketing (eg. through booklets and videos); upgrade consultants' skills; develop a "how to" comprehensive marketing manual, and a manual and workshop guide on "Preparing Your Export Plan"; more effectively network available sources of advice and assistance for firms; investigate how to achieve more emphasis on marketing and management in accounting and engineering courses; develop better links between NIES and the export enhancement activities of AUSTRADE and State industry departments.

"It's important for any company to build up a contact base and when they aren't direct competitors there seems to be a free interchange of ideas. It's one of the real benefits of being a participant in the IM User Group."

Richard Bills
Assistant General Manager
Rokset Industries
St Marys, SA 5042

3.8 Manufacturing

In respect of the manufacturing function, NIES focuses on assisting development of company manufacturing strategies and the introduction of modern technologies and systems. Consultancy subsidies have been provided to support the introduction of computer-aided design and manufacturing, production management technique development, and the introduction of flexible manufacturing systems.

A major change in entrenched attitudes is required in most firms. The NIES message on the need for Integrated Manufacturing (IM), emphasises that success depends as much on management practices and the organisation of work systems as it does on hardware or software related technology.

NIES has been an international front-runner in the development of knowledge about how to implement advanced manufacturing technologies in general and IM in particular. Through the work of three demonstration companies, NIES has developed a wealth of practical information which is now being disseminated to other firms through the NIES network.

To accelerate the introduction of IM, NIES has established User Groups of up to 10 non-competing companies in each mainland State wherein companies can share experiences with the introduction of innovative manufacturing techniques and technologies. Some 50 Australian manufacturers are currently involved in the User Groups which are supported by NIES-funded moderators. Their experiences will eventually form the basis of information for dissemination to industry at large.

In 1988-89, 250 consultancies relating to manufacturing strategies or systems were supported by NIES, involving funding of \$2.1 million. The subsidies averaged \$8,500.

Commentary

Assistance will continue to be directed at assisting firms to plan for manufacturing improvements (with the companies bearing their own substantial capital investment costs). More importantly, NIES provides an opportunity to link companies effectively with expertise, particularly with those specializing in advanced manufacturing technologies.

Many employers have realised for a long time that there is a need to change the traditional way of doing things. If we're going to be internationally competitive and lift the standard of living of the country we have to find a better way.

But that better way hasn't been easy to find and it needed somebody like NIES to show us how.

Maurice Lubansky
Chief Executive
Stafford Group of Companies

3.9 Human Resources

The effective use of people can provide a firm with a powerful competitive edge. This is now widely recognised in Australia, as evidenced by current initiatives in award restructuring, education and training.

Technological upgrading, changes to work organisation and management methods, new production processes and total quality management, demand greater levels of skill, flexibility and contribution from the workforce.

The NIES Contribution of Labour Program builds upon networks of expertise available to provide hands-on assistance at the enterprise level to firms looking to reap the full benefits in terms of increased competitiveness from their investments in such changes.

The WCM Human Resources Strategy outlines what will be required from a firm's workforce in the future. The Contribution of Labour Program helps firms to identify, design and implement the required changes.

To date 23 firms have received assistance under the program for projects such as the enhancement of technical skills, the development of consultative mechanisms, the redesign of work systems and jobs, team development and total quality management implementation. The program is being extended and now covers five States.

Including the Contribution of Labour program, in 1988-89 NIES assisted 62 firms with consultancies relating primarily to human resource aspects of their operations. Subsidies totalled over \$0.9 million, with an average of \$16,100 per consultancy (though most were around \$7,000).

Commentary

Significant changes in awards and industrial relations at the national and industry levels provide greater opportunities for enterprise level improvements through better human resource management.

Networks of advice are needed, however, to help the thousands of individual firms apply the new conditions effectively. Expertise available to industry in this area is limited and its development will be a NIES priority.

For the first time trade unions and their members are recognising that the foundation of jobs and wages in the future will be internationally competitive companies producing goods that people want to buy.

NIES can be very helpful to a company and we're getting calls from members saying that they think their employer has a problem in his production planning so why can't they get NIES out there?

Anna Booth
Federal Secretary
Clothing & Allied Trades Union

NIES believes that improved efficiency and productivity will only be achieved when award restructuring is integrated with all aspects of a company's operations.

In addition we believe that specialist advice on contribution of labour issues is needed within the NIES network to ensure that the workforce implications of changes initiated through NIES technical programs are considered. In this way enterprise improvements will be supported and enhanced by the workforce.

Company improvement efforts must emphasise people.

"Developing new technology is not for the faint hearted. You need to love a challenge and see it through. But you must have objectives, flexibility and access to the best advice. The NIES strategic business plan was invaluable."

Terry Dempsey
Universal Engineering Development
Queensland

3.10 Innovation and Design

The focus of NIES assistance to firms has been to subsidize the development of strategic aspects of design management and to a limited extent the incorporation of product and process design improvements for efficient production.

The NACES subcommittee on Design (see Section 5) identified serious shortcomings in company practice and consultancy expertise needed to meet industry needs. Several projects were initiated, including the conduct of awareness programs to emphasise the importance of competing through product excellence. These were undertaken through the Australian Design Council (ADC), the Warren Centre and NIES(NSW).

The NIES "*Competing Through Product Innovation*" manual was developed to help firms better manage the product development process. Sales exceed 900 copies and additional effort is now being placed on using this manual as a follow-on sequenced program to WCM.

Extensive enterprise level support has also been provided in the product and process design areas through the NIES-supported activities of private sector agents such as the ADC and the Design Institute of Australia. This has addressed the needs of over 4,000 firms in areas that include product assessments (over 100 a year), Integrated Product Management programs, workshops and referrals to appropriate design consultants.

NIES was instrumental in the establishment of a Key Centre on Design which was recently announced by the Federal Minister of Education. We continued to coordinate initiatives in design education, culminating in facilitating the piloting of a British program for Managing Design in three educational institutes, at both the undergraduate and post-graduate levels.

Commentary

Increasingly firms are realising that competitiveness depends on having innovative products that meet market needs, have appeal and high value added, meet performance and quality criteria and are cost competitive. Through its role in realising these product attributes and efficient processes, design is a key to competitiveness. Increasing attention must therefore be given to the delivery of design programs to firms.

"While specific results directly related to TQM are hard to quantify, we have seen significant quality improvements and, as a result, an increase in productivity of some 18-20%.

Our tool makers, plastics technicians and quality control people all started communicating.

We have now extended TQM through our entire operation. "

Dr Robert Blake,
Operations Manager
Precision Valve Australia Pty Ltd
Ingleburn NSW

3.11 Quality

A major corporate cultural change is occurring in Australia, largely spearheaded by comparisons made with Japan and the newly-industrialising countries, and their use of Total Quality Management (TQM) as an integrated management tool. The development of TQM and its reliance on continual improvement through strategic planning and implementation strategies complements the NIES integrated approach.

NIES provides assistance with all aspects of the introduction of quality improvement including planning, feasibility studies and subsidized consultancy assistance. Some subsidies have been directed at developing companies to recognized quality standards.

One powerful lever towards changing a company's attitude to quality has been the action taken by most Governments to introduce qualifications to their purchasing requirements. In Queensland, since May 1989, some 2500 companies have attended NIES quality seminars which explain government requirements and offer assistance through the NIES program. In NSW, over 150 companies have received assistance; a large number of these have been prompted by their interest in Defence contracts. The NIES network intends to further capitalise upon this leverage by ensuring that quality improvement activities are seen as a step towards the introduction of TQM.

A major aspect of modern TQM principles is the relationship between supplier and client. This "market" relationship has been utilized to network firms having a common interest in achieving quality outputs, to collectively address their improvement. This "natural network" effect has been used in the automotive manufacturing sector with component suppliers; some 50 suppliers have embarked on a long term program - the Automotive Quality Assurance Process.

It is intended that this approach be expanded to the foundry industry in Western Australia, the tanning industry in New South Wales, and the plastics industry in South Australia.

Under the Vendor Qualification Scheme for the information industries, up to 20 firms are being helped through WCM and TQM to achieve international accreditation and to meet international standards and regulatory requirements.

The activities of the NIES network have helped to remove confusion in firms due to differences in terminology in the quality area and the different quality programs being delivered by consultants.

About 400 companies throughout Australia received subsidy assistance for quality improvement programs in 1988-89. Expenditure totalled \$2.9 million, with an average subsidy of \$7,400.

The efforts so far in the quality area are recognized as being a piecemeal approach. The National Quality Forum has therefore commissioned a practical generic "how to" model to assist enterprises to introduce TQM.

Commentary

Over the past 12 months enormous industry interest has been generated in Total Quality Management. The NIES network has actively promoted this change in industry and views this as providing a key to long term improvement practices. NIES quality programs and activities must remain a top priority.

The Quality Forum (through its broad membership) and NIES offices have been pleased to assist several public sector organisations in their efforts to introduce TQM. This improvement program effort should be encouraged.

"When I first heard about NIES, I was a little bit sceptical. I thought it was another Government agency which would probably duplicate what had been done before.

It hasn't really turned out like that at all. We were one of the first companies in this State who took advantage of what NIES had to offer.

We were turning over \$600,000 a year until NIES came along and now we are up to one million dollars."

Chris Edwards
Managing Director
Moonraker Australia Pty Ltd
Tasmania

4. Information Service and Promotion

The NIES Information Service was developed in response to industry concern over a confused delivery system and multiple points of access for information and referral from State and Commonwealth industry agencies.

The notion of a "one-stop-shop" for such a service has not proved as practicable as first thought. Some agencies have responsibilities primarily or partly outside the NIES area of interest and could not be entirely brought within NIES. Furthermore, different client groups had become accustomed to their pre-existing contact points and seemed reluctant to change.

An important step in addressing this failure has been the development of effective networking between a number of government providers including a streamlined referral service between agencies. Thus, within the notion of a network, a client making an inquiry at a Small Business Agency, for example, if not able to be satisfied by that agency, will be referred to one of the other partners in the network e.g. Austrade, NIES or State Industry Departments.

Important players in the NIES network are the State Small Business Agencies, which for many years have provided a service to small firms in all sectors of the economy. The importance of the partnership with them has been given effect through collaboration on particular projects, a more efficient referral arrangement between providers, and greater coverage by tapping into the regional networks of these agencies.

In 1988 the concept of the "NIES Network" and "Networking with NIES" was adopted by these major providers as part of their promotional campaigns.

Outputs include:

- links with industry associations and trade unions to capitalise on their networks of members, referral expertise and enterprise improvement programs;
- the development of a NIES logo and style of presentation which has now been recognized in the market place. In 1988, a NIES Penetration Survey was conducted in conjunction with the Bureau of Industry Economics;

"Without help from the NIES consultants and the subsidy for business plans, our business plan would have been much simpler and perhaps not as helpful.

We could not have afforded to develop such a comprehensive plan."

Bruce McKenzie
Radial Spaceframes Pty Ltd
Fortitude Valley
Queensland

- a broad and unique network of information service providers including links into the CSIRO, State Libraries, Industrial Supplies Offices (ISOs), academic institutions as well as other government sponsored information services;
- a nationally distributed magazine, C'OZ, with a circulation six times a year of 17,000 copies, which provides information on NIES and related programs for industry;
- development of databases of Commonwealth Government assistance measures, WCM consultants and NIES target companies;
- in conjunction with Film Australia, a six part television series and education kit entitled "*Last Chance for the Lucky Country*", which examined Australia's record in commercialising creativity and the steps that need to be taken to benefit from it;
- launching of the National Small Business Information and Awareness Program, which targets bankers, accountants and lawyers to offer value added managerial advice to their small business customers;
- in 1988-89, over 20,000 telephone requests for information were responded to, and about 10,000 firms attended workshops or seminars that provided information on NIES network services;

Commentary

Information Services provided through the NIES Network provide an important 'feeder-route' for companies wishing to pursue enterprise improvement. The concept of "Networking with NIES" is an important promotional tool. Opportunities to link other major industry improvement providers, who receive funding through Government programs, need to be followed up. The NIES network needs to further develop and reinforce a streamlined referral arrangement to ensure client needs are appropriately met.

The first phase of NIES resulted in creating an identity for the NIES program. The future will involve more targeted promotion of the core business.

"Based upon information provided by industry it is conservatively estimated that project design work completed by the micro-electronics centre has enabled Australian industry to achieve or project sales in the order of:

Australia \$5 - 10 million per annum
International \$50 - 100 million per annum"

Ron Tripp
Managing Director
Cima Electronics
Victoria

5. Consulting Infrastructure Development

Cultivating the demand for industry extension services has been an important outcome for NIES. Servicing industry needs must continue to be our first priority. Earlier reviews of the need for a national program, however, identified significant weaknesses in the full range of expertise available to meet the comprehensive requirements of industry.

The NIES network has approached this "supply" problem at two levels. First the State NIES arrangements have reviewed their local infrastructure and the gaps that exist. Second, at the national level, sub-committees of NACES have been established to identify firm needs, available extension services and gaps in those services which can best be met through collaboration by the national partners.

State Activities

A comprehensive list of the consulting infrastructure supported by the NIES network is contained in Table 5 in Appendix B. In all instances the NIES funding is directed in a catalytic way and for a limited period. The agencies/organisations receiving support are expected to move significantly to a self-funding and user-pay arrangement. With this approach NIES funds have been used to:

- develop entrepreneurial expertise through Centres for the Development of Entrepreneurs and the National/State Enterprise Workshops. Since the start of the Enterprise Workshop over 1,000 persons have participated. An independent review of the impact of this program in 1988 indicated that it had contributed to the creation of over 500 jobs, 60 new enterprises and over \$27 million in sales;
- assist with advice, referral and, in a limited number of cases, the commercialisation of innovative products and processes. This is mainly carried out through the Innovation Centres. By 1988, some 9,000 enquiries had been assisted through these networks, over 100 enterprises or joint ventures established, 96 new products commercialised, 238 new jobs created, and \$23 million of turnover generated;
- both the Enterprise Workshop and Innovation Centres were found to be returning close to 100 per cent of their public start-up costs each year through taxes on the profits generated;

- provide a focus for the networking of individual consultants, specialist centres and other industry support services offered at the State level;
- seed fund the development of specialist centres in advanced manufacturing and applied electronics to meet the highly individual and sophisticated needs of manufacturers. These high cost application centres would not have been provided without some form of government support;
- promote links with expertise hitherto underutilized in tertiary institutions and direct that expertise to meet industry requirements. Good examples of this activity include jointly funded projects with TASC (Wollongong) and RMIT (Victoria).

National Activities

One of the major successes in the National NIES program has been the extent to which efficiencies of scale can be utilized in the otherwise high cost area of product and service development. There is a willingness by all NIES partners to collaborate. This goodwill and efficiency can be illustrated in the outcomes of the NACES sub-committees which have now operated for up to two years. Highlights include:

- the development and implementation plan for WCM;
- the conduct, in partnership with the AMC, of a national survey into the marketing practices of companies;
- agreement by all State and Commonwealth Ministers of Industry to establish a National Quality Forum, to spearhead our national interests in quality, accreditation and standards. This Forum, established in 1988, has helped to coordinate the activities of private sector quality groups and has taken a number of significant initiatives including: the development of new curricula to incorporate TQM principles within the TAFE system; establishment of a consultancy, managed by Standards Australia, to develop a National Accreditation System for quality management systems; and commencement of a project to develop a model to implement TQM within enterprises;
- input and continuing advice provided by the national network to the priorities of Key Centres in Strategic Management and Quality which are now established;

"With the subsidies the business plan only cost us about \$2500, but it has meant many times that much in terms of business. We've trebled in size in the last year and look set to treble again."

Russell Yardley
ASI Decision Engineers
Victoria

- design initiatives which include the establishment of a National Design Forum; holding of the first Australian Design Summit; ongoing work in the development of a capable design infrastructure; sponsorship of the Australian Design Services industry at the First International Design Forum Conference in Singapore in 1988; and the networking design elements of major tertiary institutions to develop responsiveness to future industry needs;
- development and promotion of the importance of the contribution of labour to company improvement. This has been achieved through awareness campaigns, commissioning training materials, developing networks of expertise nationally, promoting demonstration companies as joint initiatives with other Commonwealth and State departments including the Award Restructuring kit, and delivery of the Contribution of Labour program in Queensland by the Ministry of Labour;
- continued effort to pursue national, professional accreditation for consultants. These efforts are directed at the priority areas of general management, design and quality.

Commentary

In a country the size of Australia with its relatively small industrial base and consulting infrastructure, the only effective way to ensure industry access to, and quality of advice, is to rely on effective networking. The NIES network provides an opportunity to develop those links both within and across State boundaries and between Australia and the international networks.

The dedication of industry leaders and other professionals in providing their time and expertise is critical to the success of the network. We have the commitment of hundreds of them to continue supporting the development of extension services in this way.

The network is also enhanced by its national orientation - it is structured to ensure local needs are met through State NIES arrangements and, just as importantly, that common needs are addressed through the Commonwealth - State partnership arrangements. It is a National Industry Extension Service, not a disparate collection of industry extension services.

"Consultants add another brain to the business. They provide an overview, offering me commonsense solutions I couldn't see because I was too close to day-to-day activities."

Dr John Lamberth
Mavlab Pty Ltd
Queensland

6. NIES Management

At the national and State levels, NIES has management and advisory arrangements.

From its inception, NACES has had a nation-wide management function even though its name points to an advisory role. The non-government members played a leading role in contributing advice from the perspectives of company managements, unions and small business as well as from their own personal experience.

Furthermore, as the only forum in which senior Government Officials responsible for the administration of the NIES program met together regularly, it was inevitable that NACES assumed such a managerial function. Decisions taken by the Committee were only binding to the extent that they were achieved by consensus.

Individual NACES members were also actively involved in the work of sub-committees established to identify firms' needs, available extension services and gaps in existing services. These sub-committees also advised on how to identify the gaps in ways most appropriate to the needs of firms and their employees. Membership of these sub-committees included outside experts who willingly gave their time in recognition of the national benefits of NIES programs. Some of these sub-committees have been wound up on completion of their tasks, others are well advanced, while the nature of two - Quality and Design - have been adapted to address new opportunities.

As NIES progressed from its early formative days, the need for a clearer separation of national management and advisory functions became apparent. In 1988, meetings commenced of State and Commonwealth officials responsible for NIES administration - the NIES Management Group, allowing NACES to concentrate on its strategic policy and operational advisory role. It is intended that a larger proportion of participants in future NACES meetings will come from the private sector.

Further enhancing our common goals are regular meetings of State and Commonwealth officials responsible for particular areas of the program. This nation-wide linkage serves to provide a forum for the exchange of ideas and experience. The related costs are paid by the participating departments and agencies.

*"We've increased our productivity, produced
a world class product and opened up export
markets."*

Daryl Burkett
Managing Director
Burkett Industrial Equipment

In each State, NIES operations are managed by an Executive Committee comprising State and Commonwealth government officials. These include in all States, representatives of State industry departments, small business agencies and the Commonwealth through DITAC and Austrade. This combined management approach ensures more effective use of public funds and avoids unnecessary duplication.

The actual administration of NIES services is carried out by the State agency. This rationalisation and co-operation between the two levels of government gives effect to the NIES partnership arrangement and is moving from strength to strength .

Advisory mechanisms at the State level are determined by each State and often take innovative forms. In some cases there is a stable membership of the advisory committee while other States vary the private sector participation from one meeting to another in order to get a wide range of advice, or specialist advice on particular issues, or to widen the awareness of NIES in the community. In South Australia, representatives of employers and unions are formally included on the Executive Committee.

Commentary

The advisory mechanisms at the State and national levels serve an important role in keeping the NIES program relevant to industry needs. Private sector representation on the national Committee should be expanded to give increased emphasis to the views of enterprises, and at this stage in the development of the operations and management of NIES it is now appropriate to appoint a Chair from the private sector.

7. NIES and Government Industry Policy Objectives

The Commonwealth and State Governments have seen the NIES network as an effective vehicle to deliver enterprise improvement aspects of industry policies developed to meet other industry development objectives.

The NIES network is well placed to further respond to the spin-off effect of major Government contracts (e.g. frigates and submarines) and Government international investment attraction schemes. Firstly through its close association with a wide cross-section of firms, NIES is able to identify those enterprises most capable of taking up the opportunities afforded by those projects. On the other hand these broad programs provide a very powerful lever which can be better utilized to induce companies to the need for change, and the assistance available through the NIES network.

Industry development policy objectives will not in isolation secure a growth in the number of Australian enterprises able to compete internationally. Enterprise improvement initiatives are a necessary component of, and provide a useful intelligence and feedback connection to, macro and micro-economic policy development.

The network is readily available and has a track record of delivering services to firms efficiently and effectively. There is a need to continue to use this delivery mechanism wherever appropriate. There have been considerable savings to Governments by including new initiatives within NIES.

States that have identified particular target industries, or categories of firms, to target on industry policy grounds have used the network as an important means of achieving objectives other than only the international competitiveness of the enterprises concerned. At the national level, the Commonwealth relies on the network to deliver elements of sectoral programs, notably those for the TCF, information industries, and scientific and medical equipment industries.

More broadly, NIES sees as a key strength its ability to network with any other agency that directly or indirectly has a role to play in improving the international competitiveness of firms. NIES therefore continues to develop linkages with other agencies established under government industry and related policies, eg. educational and training institutions. Databases enable NIES field officers to refer firms to appropriate contact points in a wide range of agencies.

8. Evaluation

Integral elements in any assistance program such as NIES must be effective monitoring and evaluation arrangements.

There is a nation-wide management information system that collects data on the activity levels of NIES offices. Weaknesses in this system have been identified and steps are being taken to achieve improvement.

More importantly, some States have implemented or are developing systems to evaluate the effectiveness of the services delivered to firms. There are difficulties in trying to assess the impact of NIES on firms' international competitiveness due to the existence of many other factors influencing such competitiveness (for example, exchange rates).

Furthermore, the NIES program does not provide "quick fixes". Its achievements will only be seen over the longer term as more of its target firms gain international competitiveness and penetrate export markets (or displace imports).

In order to assist the development of a consistent and appropriate methodology for the program as a whole, the Commonwealth has asked the Bureau of Industry Economics to advise on appropriate evaluation arrangements.

An increasing number of firms, however, are already attributing improvements in their competitiveness to the advice or other assistance they have received through the NIES network. What many have most appreciated is not so much subsidies as the improved access to outside expertise. Some of the comments by firms regarding NIES help are reproduced elsewhere in this report.

One measure of NIES' success is the extent to which firms come back for additional services. For example, a Western Australian survey showed that 65 per cent of target firms that received a NIES service had sought and received more than one service.

NIES is a cost-effective program with low administrative costs and a good balance between public and user-pays funding.

9. Future Directions and Recommendations

9.1 The Program

The NIES Program is a partnership between the State and Commonwealth Governments in their bid to ensure an internationally competitive Australian industry. This Report and the comprehensive strategic planning process that is underway are good examples of how effective such a partnership can be.

Our assessment of the NIES program to date can be summarised as follows:

- a solid partnership foundation has been built between Governments and the private sector, and between the Commonwealth and State Governments;
- many thousands of firms are using the NIES Service, many for a second or further time (indicating they are satisfied customers);
- the network between Governments and the private sector consultancy industry is established and confident
- the momentum for change within the industry community is taking hold.

The NIES network of Government agencies, private sector consultants, industry and unions presents Governments with a unique opportunity to accelerate change. It would be naive of us to paint a rosy picture. If nothing else the NIES program has provided knowledge of the will, resources and dedication needed to effect company improvement and the time required to see that change reflected in company profitability.

More needs to be done More Quickly.

9.2 Recommendations

NIES is a targeted enterprise improvement program promoting continual refinement and development of networks. It presents an opportunity to enhance Australia's international competitiveness. Critical to this concept are that:

- companies are able to access the full range of expertise available to build on their capabilities;

- a critical mass of companies can be effectively achieved through strategic alliances facilitated by NIES;
- networking within the consulting industry promotes the professionalism of that industry; and
- networks between Governments ensure objective and rational priority and expenditure decisions resulting in more effective use of government funds.

Recommendation 1:

Ministers agree that the necessary Government approvals be sought for the renewal of the Commonwealth - State NIES agreements for the next five year period, to 30 June 1996, with appropriate resources made available to the program.

State and Commonwealth Governments are responsible for developing industry policies directed at overall improvement in Australia's international competitiveness. To date several Commonwealth and State policy initiatives have been given effect by utilizing the delivery arrangements of the NIES network. This should continue.

There are considerable savings in administrative overheads to be had by building new initiatives upon the foundation of this existing delivery arrangement wherever appropriate.

Enterprise improvement programs are a necessary component of, and provide a useful intelligence feedback mechanism for, macro and micro-economic policy development.

Recommendation 2:

Ministers agree that Governments build upon the foundation of the NIES network in their efforts to enhance structural change, and channel new industry initiatives through the existing NIES delivery mechanism wherever appropriate.

The NIES Network and its companies provide a unique opportunity for intelligence gathering which would be useful input into government industry policy considerations. This opportunity needs to be taken up.

Governments exert considerable influence on industry development through purchasing and major capital projects. The leverage afforded by this has successfully been used to induce companies into enterprise improvement programs. These opportunities need to be more fully taken up.

To date, too little has been made of the potential for closer links between government programs. For example, better linkages need to be established with innovation programs, offsets arrangements and State and Commonwealth initiatives in export promotion and international investment.

Recommendation 3:

Ministers agree that as NIES is central to achievement of government industry policy objectives, Ministers promote the strengthening of links between NIES and other Commonwealth and State programs.

Advisory mechanisms at the State and national levels serve an important role in keeping the NIES program relevant to industry's needs. Private sector representation on these bodies needs to be as extensive as is appropriate to each particular body. In the case of the national body - NACES - the government and non-government members consider that at this stage in NIES' development there is need both to increase the private sector representation in order to enable NACES to operate effectively and for the Chair to be held by a private sector member.

Recommendation 4:

Ministers agree that the National Advisory Committee on Extension Services (NACES) continue as the key tripartite advisory mechanism in NIES, that private sector representation on NACES be expanded by four members, and that NACES be chaired by a private sector member.

9.3 Other Changes and Operating Principles

Ministers are asked to note the following key changes proposed to the NIES program, and the other operating principles listed below as necessary for its successful operation beyond 1991. These changes have been, or will be, taken up through the NIES Management Group.

Core Business - Enterprise Improvement

- NIES core business will increasingly be enterprise improvement, which will require increased funding within NIES budgets relative to infrastructure development and information and promotion.
- NIES targets will need to be more effectively identified.
- Greater penetration of identified target markets will be required.

The Service

- Continued acceptance of the central role of strategic planning to company improvement is essential.
- The NIES services and products will need to be better integrated and sequenced to give effect to long-term company improvement.
- Performance measures and the collection of company impact data need to be further incorporated into the service cycle.
- Gap identification of services and products is best achieved at a State level and best addressed, in the first instance, by reference to the national network. Product development is costly, with clear advantages in pursuing it on a cooperative, nation-wide basis.
- Experience to date has demonstrated the value of meetings of service and product managers. However, further regularisation of program coordinator groups is necessary.

The Delivery

- The role of the NIES field officers needs to be further clarified and their ability needs to be enhanced. As a central point of contact for companies, much rests on the capability of the NIES field staff.
- Accreditation of private sector consultants remains a thorny issue. There is a need to accelerate moves in appropriate organisations towards professional accreditation. In the meantime the NIES registers of consultants should be continued.
- Identification of gaps in private sector consultancy expertise has been carried out on a national basis and serious deficiencies exist, particularly in the areas of design, quality and human resource consultants. These must be addressed as a matter of urgency.
- More effective networking of consultants is required to ensure comprehensive expertise is available to meet a company's needs.
- Continued attention needs to be paid to streamlining the referral of clients between appropriate agencies within the NIES network and beyond.
- Other countries' programs should be examined with a view to enhancing our core business initiatives.

Program Management

- While a Management Information System has been developed, improvements should be made to meet priorities identified by NACES. This System should be enhanced before the end of the 1989-90 financial year.
- Program review measures are in place or are being adopted, and six monthly reports to NACES on program management should continue.
- The new NIES Management Group should meet about twice a year once the present strategic and operational planning phase is complete.

Promotion

- The future will involve more targeted promotion of the core business.

Information Service

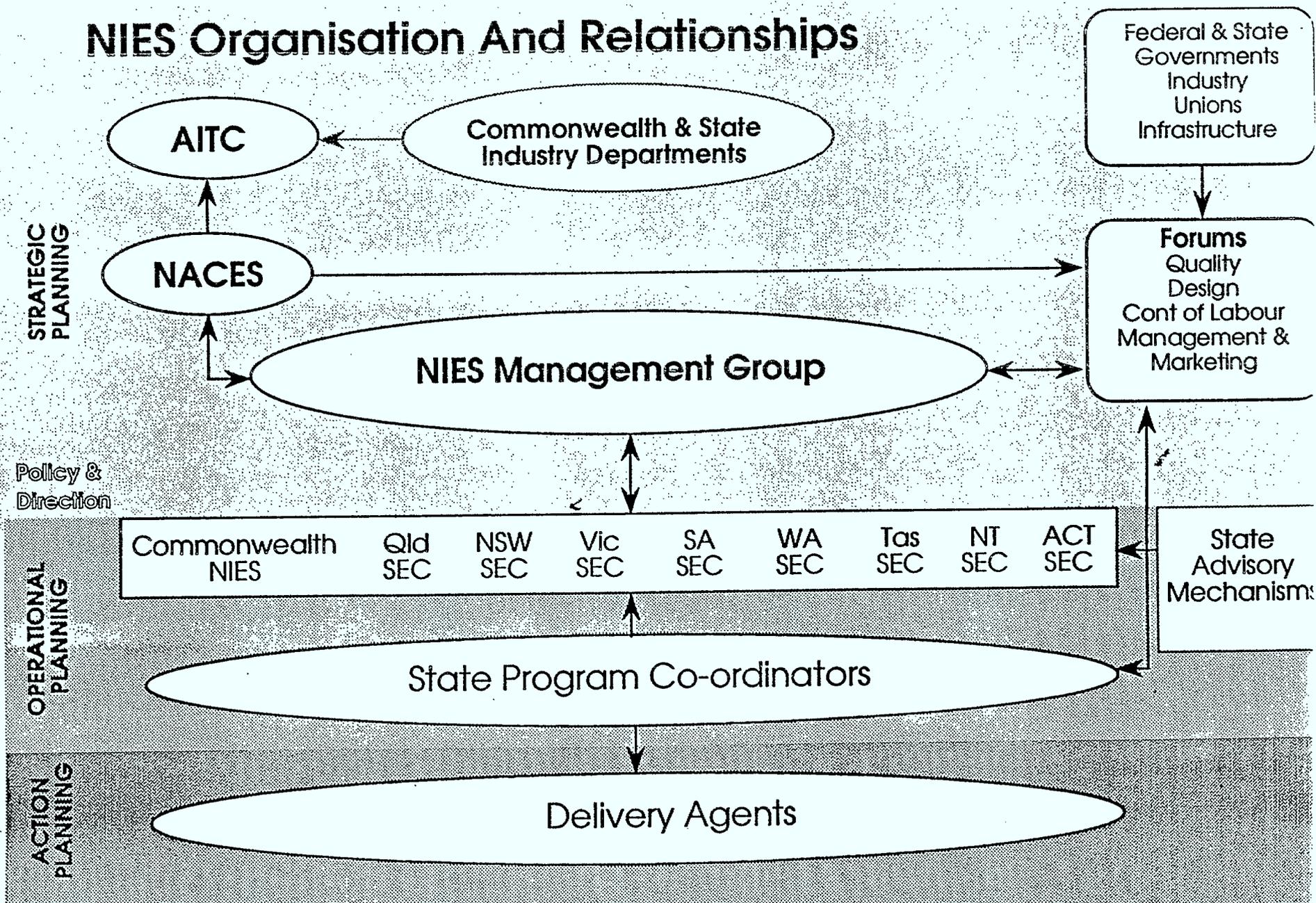
- The information service should continue in so far as it supports our core business of enterprise improvement.
- Emphasis on this function should be reviewed in the light of our commitment to focus attention on enterprise improvement.
- More effective use should be made of new technology, and of information sources and providers existing in the community.
- Databases are currently being updated and enhanced.

Consulting Infrastructure Development

- There is a continuing need for State rationalisation, particularly directed at Centres of specialist expertise. Co-location of centres and agencies should be encouraged in an effort to reduce overhead costs and improve networking.
- There is an urgent need for a national capability study of specialist expertise available in government-supported technical Centres to meet industry needs. This study would:
 - serve to raise awareness in companies of what expertise is available;
 - be used as a basis for gap identification and further rationalisation of Centres, if such is required.
- An immediate need exists to more effectively network the major consulting infrastructure in Australia. To this end it would be useful to more fully investigate the German model of industry support arrangements.
- More effective links need to be made between tertiary institutions and specialist centres. This should be actively promoted by the NIES network.

- Specialist Centres and individual private sector consultants need to develop synergies. The capability study mentioned above would enhance this development.
- NIES as a network needs to make more effective use of international linkages to meet industries' future extension service requirements.

NIES Organisation And Relationships



NATIONAL ADVISORY COMMITTEE ON EXTENSION SERVICES
(NACES)

MEMBERSHIP

Convenor : Mr A. Godfrey

Ms J. Uhr
Dr R. Webb
Mr S. Rumble
Mr C. Tuohey
Mr G. Cooke
Mr A. Davies
Ms S. Eccles
Mr R. Brand

Mr B. Cavanagh
Ms R. Brunckhorst
Mr G. Chalker
Mr L. Carmichael
Mr K. Cashman AM
Mr T. Johnson
Mr J. Boorne AM
Mr B. Powell

Secretary : Mr I. Cook

TERMS OF REFERENCE

To monitor and review extension services on a national basis.

To identify changing or emerging needs in the area of extension services.

To report annually to AITC Ministers on progress, identifying priorities.

ENTERPRISE IMPROVEMENT PROGRAMS
SUBSIDY ASSISTANCE TO NIES TARGET FIRMS
IN 1988-89

Type of Service	Number of Consultancies (a)	Total Subsidy Expenditure \$000	Average Subsidy \$000
"World Competitive Manufacturing	111	507	4.6
Other Business Planning	511	3424	6.7
Marketing	238	1552	6.5
Manufacturing	246	2094	8.5
Human Resources	62	997	16.1
Innovation and Design	165	571	3.5
Finance	41	130	3.2
Quality	396	2945	7.4
Other	8	8	1.0
TOTAL	1778	12228	6.9

(a) Some target firms may have received subsidy assistance for more than one consultancy.

TARGETING* OF FIRMS IN THE MANUFACTURING SECTOR (a)

STATE	Total Number of Manufacturing Establishments (b)	Establishments with more than 4 Employees (b)	Estimated Number of Potential Target Firms	Estimated Number of Priority Target Firms
New South Wales	14645	9812	5900	2000
Victoria	12834	9101	4600	1500
Queensland	5957	4087	2000	700
Western Australia	4057	2654	1300	400
South Australia	3299	2245	1500	500
Tasmania	948	631	300	100
Northern Territory	200	133	70	40
Australian Capital Territory	187	132	90	60
TOTAL	42127	28795	15760	5300

* NB: The last two columns, which seek to indicate the likely number of target firms in the manufacturing sector, are very approximate and are provided only to give some impression of the way NIES focuses its attention on a relatively small proportion of firms in order to maximise the return on its resources. They are derived from estimates, not the precise identification of target firms.

- (a) Most States have also targeted some service-industry firms, for example those whose services are important inputs to manufacturing firms.
 (b) Source: ABS Survey of Manufacturing Establishments in 1986-87

TABLE 3
Appendix B

SUPPLY OF CONSULTANTS

B = Balance
O = Over supply
U = Under supply

Type of Service	New South Wales	Victoria	Queensland	Western Australia	South Australia	Tasmania	Northern Territory	ACT
Strategic Planning								
WCM	U	B	B	B	B	U	..	U
Other	O	B	B	B	..	B	..	U
Business Planning	B	B	B	B	B	B	..	..
Marketing	O	B	B	B	U	O	..	U
Manufacturing	B	B	U	U	B	B	..	U
Human Resources	B	B	U	U	B	U	..	U
Innovation and Design	U	B	U	B	U	U	..	U
Finance	O	B	B	O	O	O	..	U
Quality	U	B	U	U	U	U	..	U
Other	O	B	..	..	U	B	..	..

NUMBER OF REGISTERED CONSULTANTS
BY STATE AND SKILL AREA

Type of Service	New South Wales	Victoria (a)	Queensland	Western Australia	South Australia	Tasmania	Northern Territory	ACT
Strategic Planning								
WCM	23	) 143	8	8	22	3	2	-
Other	210		(53	123	-	18	-	-
Business Planning	105	65	53	117	32	13	9	35
Marketing	371	131	53	120	8	29	5	12
Manufacturing	485	26	18	116	35	5	4	12
Human Resources	250	39	5	119	6	3	2	17
Innovation and Design	51	-	17	122	6	3	-	-
Finance	359	35	27	Many	120	23	11	16
Quality	120	32	28	120	15	3	3	-
Other	408	..	..	..	2	1	1	-

(a) Excludes data for sectoral programs due to the risk of double counting.

INFRASTRUCTURE DEVELOPMENT EXPENDITURES (a)

TOTALS FOR THREE YEARS 1986-87 TO 1988-89

	Thousand Dollars		Thousand Dollars
NEW SOUTH WALES			
Applied Electronics Technology	830	SOUTH AUSTRALIA	
Automation Ext. Services	390	Centre for Manufacturing	1799
NSW Uni. Mfg Compt. Program	246	Adelaide Micro-Electronics Centre	753
Sydney Uni. - New Horizons	583	Small Business Corporation	60
Innovation Centre	224	Innovation Centre	524
Enterprise Workshop	75	Enterprise Workshop	30
Young Achievement Australia	50	Young Achievement Australia	30
Quality CEO Awareness Program	1	Australian Design Council	315
Integrated Manufacturing	..	TOTAL South Australia	3511
National Design Forum	113	TASMANIA	
Training in MMS	343	Innovation Centre	680
TASC	41	Centre for the Dev. of Entrepreneurs	440
Adv. Mech.	1	Industrial Supplies Office	20
TOTAL New South Wales	2897	Technopark	367
VICTORIA			
Australian Electron. Dev. Centre	1000	TOTAL Tasmania	1507
National Protocol Support Centre	600	NORTHERN TERRITORY	
CIMA Electronics	1774	AUSTRALIAN CAPITAL TERRITORY	
RMIT's M&M Technology Centre	400	Enterprise Workshop	73
Innovation Centre	627	New Enterprise Incentive Scheme	120
Enterprise Workshop	80	Canberra New Business Centre	45
Centre for the Dev. of Entrepreneurs	365	Industry Training Committees	100
Young Achievement Australia	30	TOTAL ACT	338
Centre for Tech. Policy and Management	60	COMMONWEALTH (DITAC)	
Advanced Manuf. Tech. Centre	5029	Strategic and business planning	728
Cima Electronics	688	Marketing	106
Centre for Manufacturing Management	60	Manufacturing	
Centre for Robotics and Automation	103	Technology Transfer Council	1978
TAFE Small Business Centre Network	107	Integrated Manufacturing	3142
TOTAL Victoria	10923	Other	582
QUEENSLAND			
Innovation Centre	560	Human Resources	704
Enterprise Workshop	113	Innovation and Design	
Centre for the Dev. of Entrepreneurs	410	Australian Design Council	756
Small Business Development Corp.	95	Other design activities	332
Australian Marketing Institute	63	Product Dev. Procedures Manual	156
Industrial Supplies Office	359	Innovation Centres	39
Business Advisory Centre, Townsville	290	Centres for the Dev. of Entrepreneur	14
National Assoc. of Testing Authorities	34	Enterprise Workshops	205
Technology Transfer Council	255	Graduate Enterprise	50
Australian Productivity Council	85	Other Innovation	155
Australian Design Council	170	Quality	1294
Aust. Organisation for Quality Control	20	Australian Productivity Council	1794
Queensland Quality Centre	140	National Information Tech. Council	210
TOTAL Queensland	2594	National Register of Ind. Capacity	200
WESTERN AUSTRALIA			
Australian Design Council	170	Standards Australia	9802
Product Innovation Centre	480	National Assoc. of Testing Authorities	2738
Enterprise Workshop	129	TOTAL Commonwealth (DITAC)	24985
Young Achievement Australia	10	STATES & COMMONWEALTH TOTAL	
Industrial Supplies Office	675	48275	
National Assoc. of Testing Authorities	55	(a) Including expenditures that are not from the NIES	
Assoc. Multiplier Agency Liaison Group	1	joint accounts but which are supported by the	
TOTAL Western Australia	1520	Commonwealth or State Governments in the interests	
		of Consulting Infrastructure development (though	
		not necessarily all such expenditures).	

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