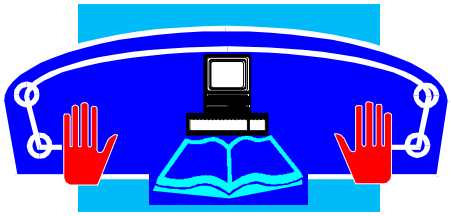

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APPLICATIONS OF TECHNOLOGY IN THE TOURISM INDUSTRY

Main Report

Prepared for

TOURISM CANADA

Submitted by

JAMES F. HICKLING MANAGEMENT CONSULTANTS LIMITED

JUNE 6, 1988

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1.0 INTRODUCTION

1.1 BACKGROUND

Tourism Canada commissioned James F. Hickling Management Consultants to conduct a study of technology development in Canada's tourism industry to assess the evolution of technology in Canada, its rate of diffusion in the tourism industry, and the barriers and accelerators to diffusion. The ultimate objective was to determine mechanisms by which small and medium-sized tourism operations could increase their level of adoption to maximize efficiency and increase the overall competitiveness of the Canadian tourism industry. A key rationale behind this study was that technological innovation in Canada's tourism industry, in terms of computerization and information systems which address these needs, did not appear to have been adopted as quickly as in other industries and other countries, nor to have spread as widely. The need for this study was felt to be even more compelling because the process of technology transfer, especially the barriers and accelerators to diffusion of innovation in this industry, was not well understood.

1.2 OBJECTIVES

The objectives of this study were to

- Identify the nature and magnitude of technology affecting tourism.
- Assess the impacts of technology on tourism.
- Measure the adoption rate among tourist operators.
- Identify the barriers and diffusion accelerators.
- Identify the future needs of the industry for technology.
- Provide guidelines to improve and increase the technological adoption rate among tourist operators.

1.3 METHODOLOGY

The methodology for this study involved a combination of methods: a general and case-specific literature review, consultation with experts, and a series of case studies. The study was divided into two phases. The purpose of Phase 1 was to obtain an overview of the technologies currently being used in the tourism industry, by sector/function, their applications and trends, as well as information on leading edge technologies currently being developed with applications for the tourism industry. The objective in this phase was to develop a refined classification grid of technologies by tourism sector/sub-sector and function/sub-function to serve as a basis for determining the sample universe for the case studies.

This classification grid, combined with a detailed discussion of the approach for the case studies and an annotated bibliography of the most important sources reviewed, formed the basis of the Interim Report. Cases were chosen, in conjunction with Tourism Canada, on the basis of their coverage in the classification grid by sector and function. More specifically, the case studies sought to choose technologies which:

- represented the use of a mainstream technology with widespread implications for a particular sub-sector or group of sub-sectors,
- were thought to have possible or existing benefits for small and medium-sized businesses, and
- served a cross-section of user needs, as defined by the functions and the characteristics of their operation, i.e., small/ large, full-service/limited service.

The final selection of case studies consisted of

- airline reservation systems
- hotel reservation systems
- free standing reservation systems
- property management systems
- room service management systems

- in-room entertainment systems
- in-room check out systems
- point-of-sale systems
- videotex
- teletex, cable TV & telco
- museum technology
- convention centre technology
- the integration of technology into the package tour.

Phase 2 consisted of the conduct of the case studies. Each case study involved a series of interviews, using a semi-structured questionnaire (attached in the appendix), with a mix of suppliers, dealers, users and experts in the area, as well as a two day visit to the new HOSTEX Exhibition in Toronto which was followed up by a number of phone and personal contacts. The line of inquiry in the case studies focused on the characteristics of the technology itself; reasons for introduction of the innovation; the functions served by the technology; the advantages and disadvantages of the technology/product; the impact of the technology on the adopting organization and on its customers; the target markets; barriers and accelerators; level of current diffusion; and future, impacts and developments. Respondents were also asked to suggest measures which could be adopted to encourage further diffusion of this technology.

1.4 THE CLASSIFICATION FRAMEWORK

The findings from the case studies were analyzed in the context of the classification framework established in Phase 1 which is briefly described below in terms of its three axis: sub-sectors, functions and technologies.

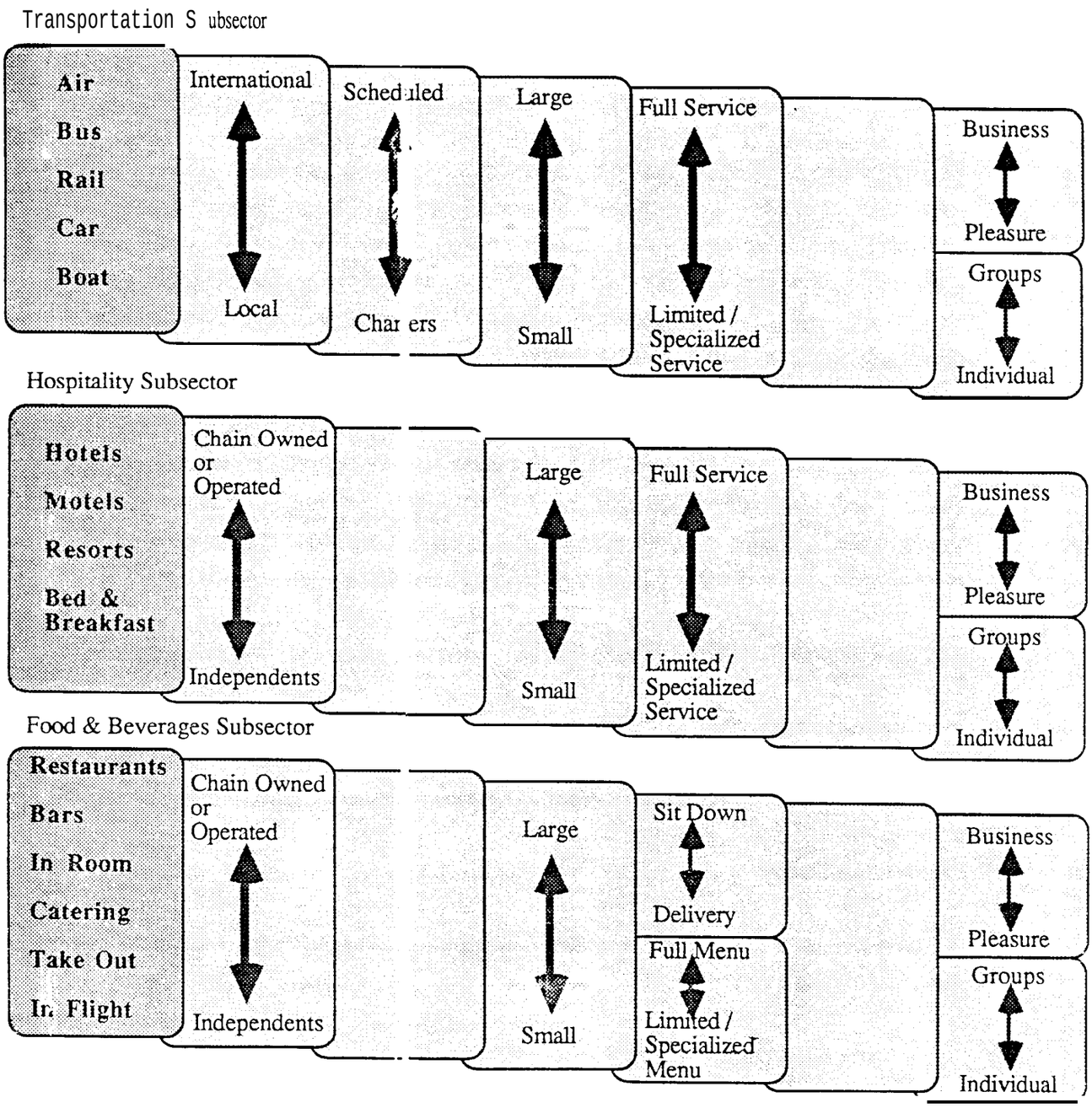
Tourism Sub-sectors

For purposes of the analysis, the tourism industry was divided into several sub-sectors (See Figure 1.1):

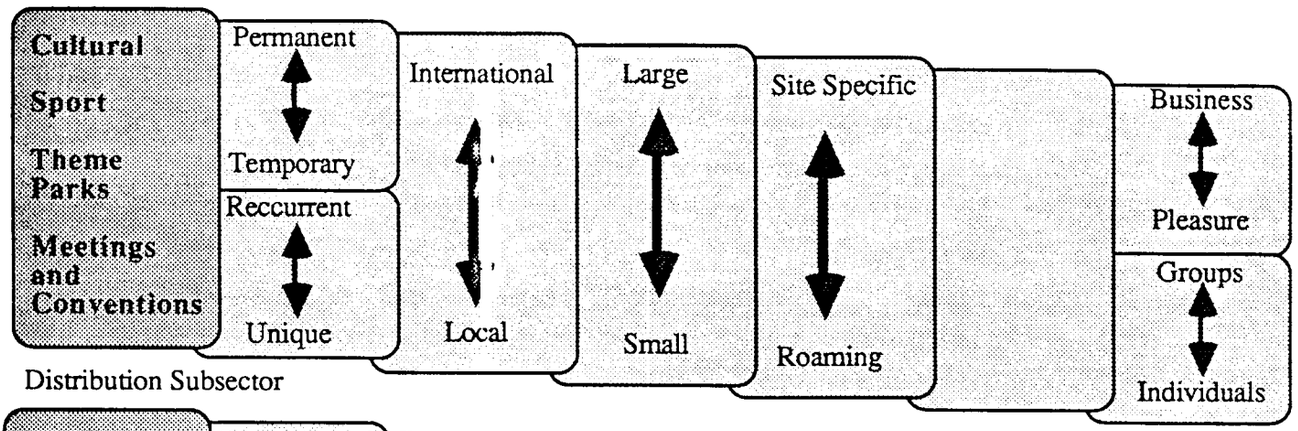
- Transportation
  All forms of transportation such as air, bus, rail, auto and boat.

FIGURE 1.1

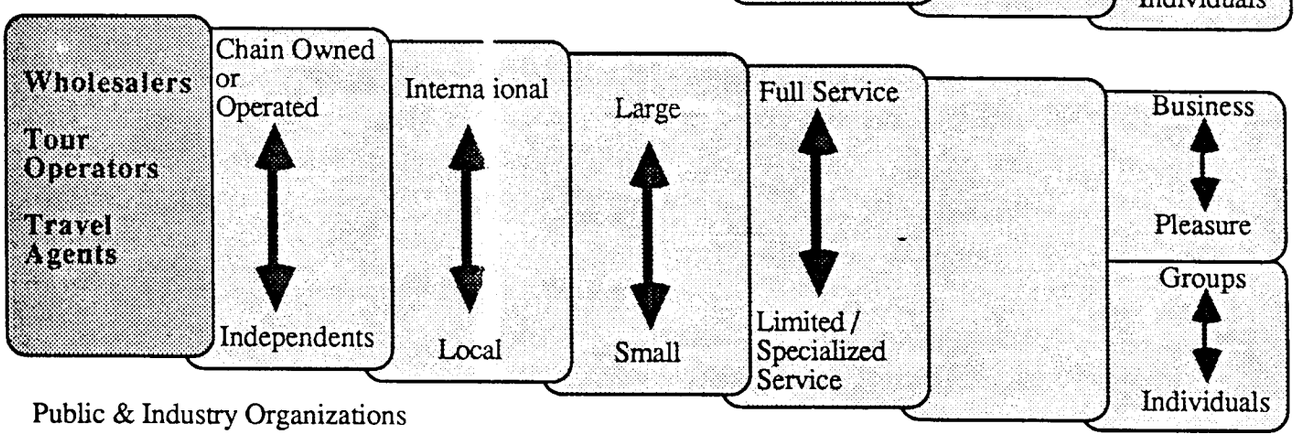
TOURISM SUB - SECTOR COMPONENTS



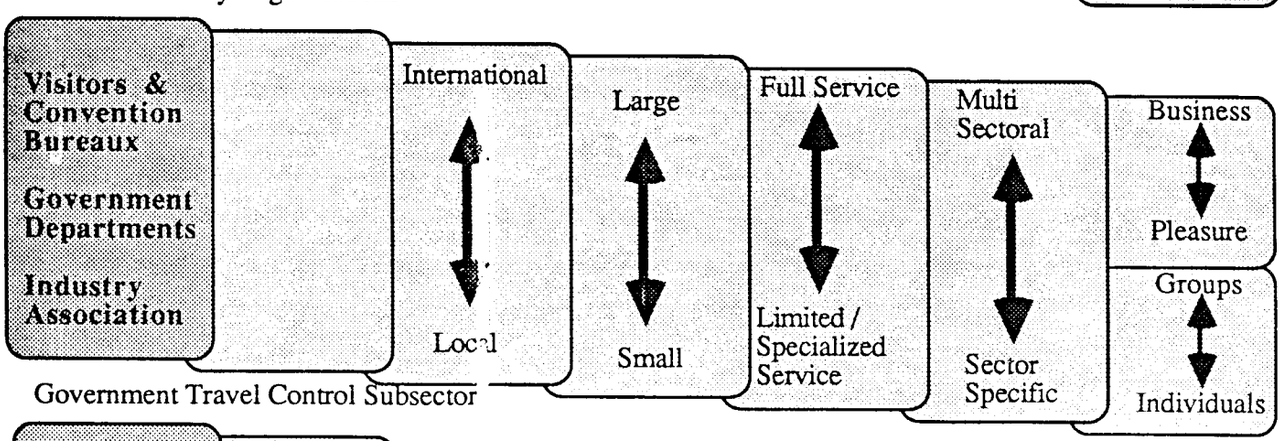
Events & Attractions Subsector



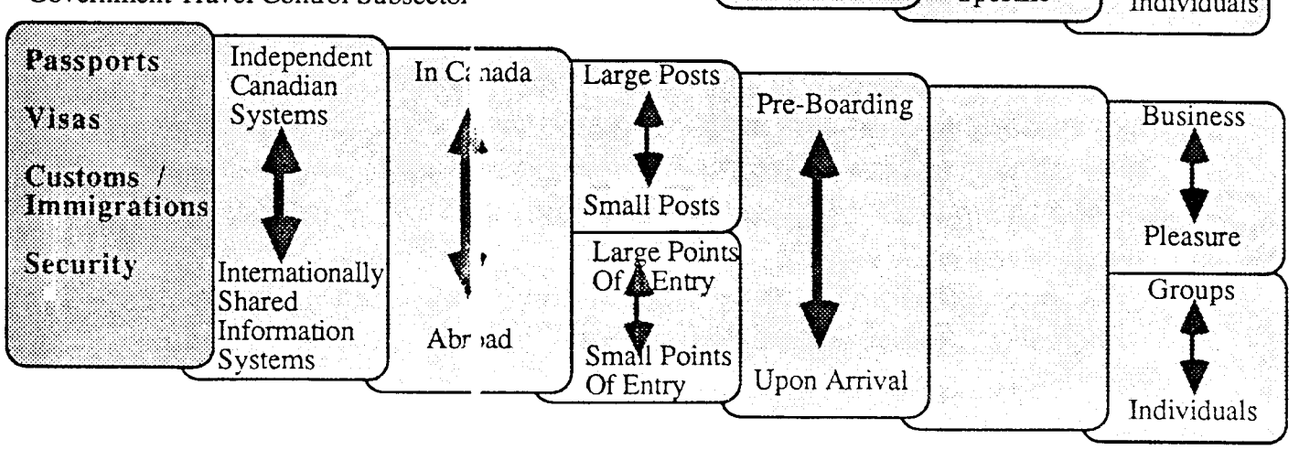
Distribution Subsector



Public & Industry Organizations



Government Travel Control Subsector



- Accommodation
  Hotels, motels, resorts, and bed & breakfasts.

- Food and Beverages
  Restaurants, bars, in-room service, catering services, take-out and in-flight.

- Events and Attractions
  Museums, cultural centres, sports, theme parks, meetings and convention sites.

- Distribution
  Wholesalers, tour operators, travel agents.

- Public and Industry Organizations
  Includes Destination Management Organizations, whose common aim is to promote their destination (e.g., federal and state or provincial tourism departments, visitors and convention bureaus) and industry associations, who coordinate activities for a specific activity, i.e., group tours, or for a specific sector.

- Government Travel Control Services
  A special sub-sector devised to account for the plethora of activity and technological applications related to immigration, passport control, issuance of visas, customs and security. While this was not an area reviewed in the case studies, its importance to the success of the tourism industry should be recognized.

The classification of the tourism sub-sectors was married with what were believed to be the key dimensions in those sectors shaping the application of technology and its level of diffusion. Dimensions or characteristics considered to be significant in the use of technology included:

- the structure of the organizations in a particular sub-sector, e.g., chain-owned, independent or scheduled versus charter services;

- the size of the operation whether small, medium or large;

- the type of service offered, e.g., limited or full service, specialized versus general services;

- the target markets aimed at, e.g., business, pleasure or group versus individual business.

For the systems examined in the case studies, these sectoral characteristics were useful in identifying the level of diffusion within the sub-sector and simultaneously served to highlight the market characteristics for which that system was best suited.

Functions Performed by Tourism Sub-sectors

The next axis of the classification grid were the functions performed by a tourism-oriented business or non-profit organization to which technology can or is being applied. (The functions are summarized in Figure 1.2.) These functions were applied uniformly to each sub-sector, although sub-functions varied by sub-sector, e.g., an airline and a hotel both have a reservation function, but only the hotel handles room inventories. The following describes these functions which were used in the case studies as a framework against which to describe the capabilities of systems.

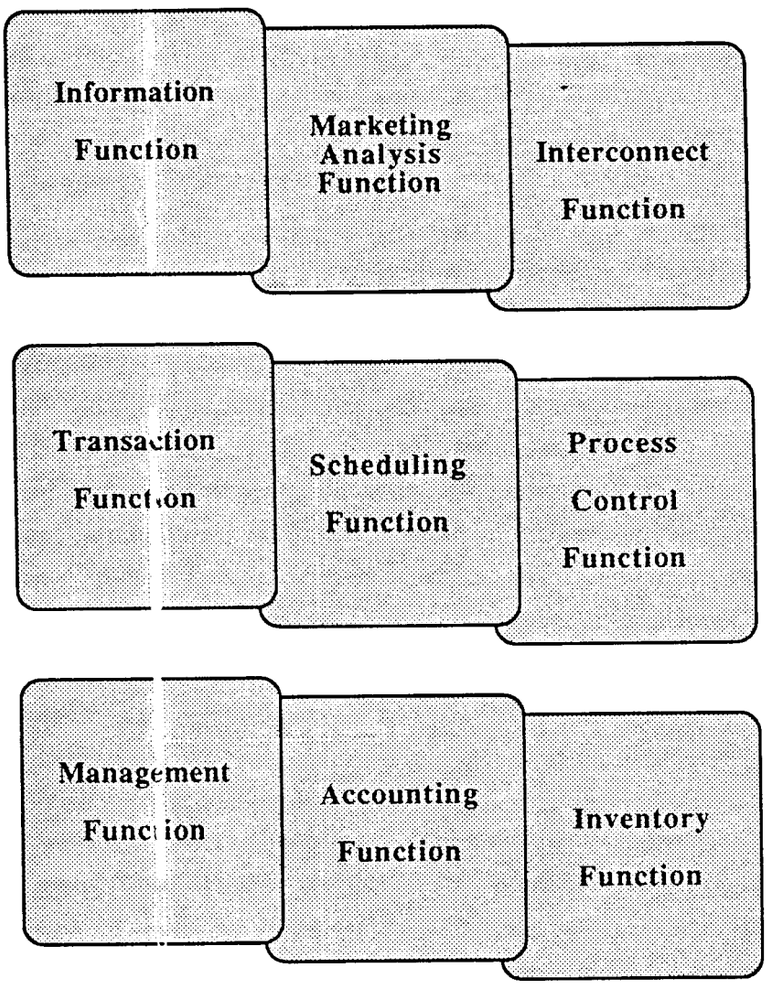
- Information

  The display or transmission of information to either consumers, other suppliers or members within an organization. Information systems vary in the coverage they provide and the extent to which they permit specific queries. Information can be provided on an interactive or non-interactive basis.

  It should be noted that information is used for a variety of purposes including marketing, assisting travelers in choosing and planning trips,

FIGURE 1.2

TYPICAL FUNCTIONS



providing operators with information on destinations, and available suppliers, attractions and entertainment.

- Marketing Research

  The collection, storage, sorting and selected retrieval of information pertaining to consumers' preferences, trip characteristics, and product successes. This is a function of growing prominence because of the capabilities of new, less expensive and faster systems which facilitate this function.

- Interconnection

  The interconnection of what are essentially non-compatible systems, to facilitate information sharing among sub-sectors, companies and systems. INet is an example of an application of technology which allows the interconnection of non-integrated systems for limited purposes. This function also refers to the growing emphasis being placed by tourism organizations on new forms of shared information.

- Transaction

  Where a prospective customer agrees to purchase a given product or service for use at a specified place and time. This function includes any sub-function related to the performance of the service which changes its status, e.g., reservations, cancellations and confirmations.

- Scheduling

  The scheduling of services (e.g., flights, hotel rooms), processing operations (e.g., orders in a kitchen) and maintenance operations (e.g. cleaning, repairs).

- Process Control

  Control of processes related to production including; cooking, bar tending, crowd control, control of mechanical rides; the environment, including safety, security and energy; and in-room entertainments.

- Management

  The planning, supervision, control and scheduling of all management-related functions including personnel.

- Accounting

  The management of receivables (timely, detailed billings), payables and general ledger.

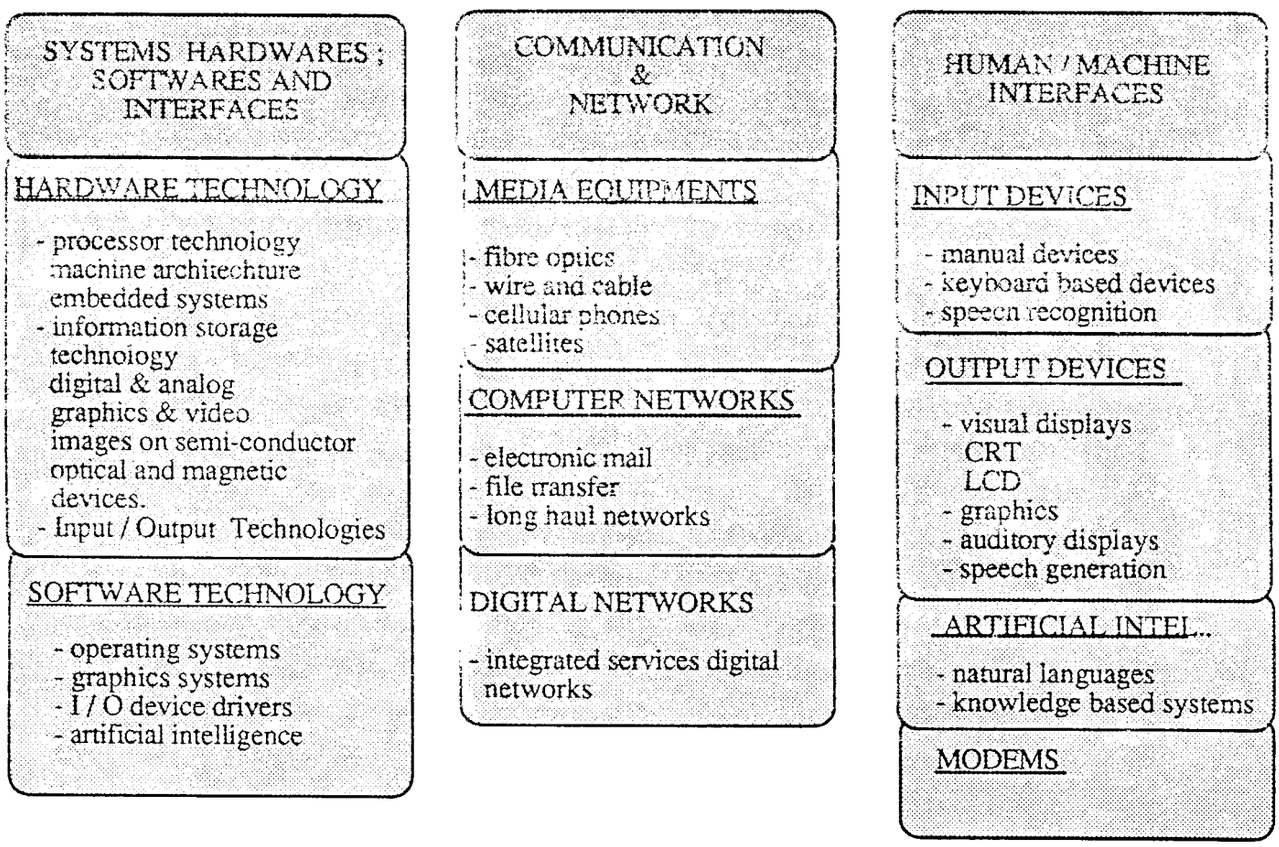
- Inventory

  Control, tracking and ordering of supplies.

The case studies showed that users were not always making full use of the range of functions available on a new system. A number of reasons were cited for this: inadequate knowledge on the part of the dealers, an unprofessional attitude on the part of the industry, the need for additional training, and the cost of the additional components or interfaces.

FIGURE 1.3

EXAMPLES OF RELEVANT TECHNOLOGIES



2.0 FINDINGS AND RECOMMENDATION

This section presents a detailed synthesis of the findings from the case studies. It begins with a discussion of the evolution of information/communication technologies which were the focus of this report and the resulting tourism systems. The relationship between these two dimensions, i.e., the underlying technologies and the tourism systems themselves, are illustrated in the subsequent section which provides a matrix guide to the technologies and systems. Section 2.4 discusses the impact of technology by function and sub-sector. This is followed by . a discussion of the barriers and accelerators associated with diffusion of technology in the Canadian tourism industry and the extent to which the Canadian tourism industry can be regarded as competitive with its major competitors. The section concludes with suggested measures to increase diffusion relative to needs.

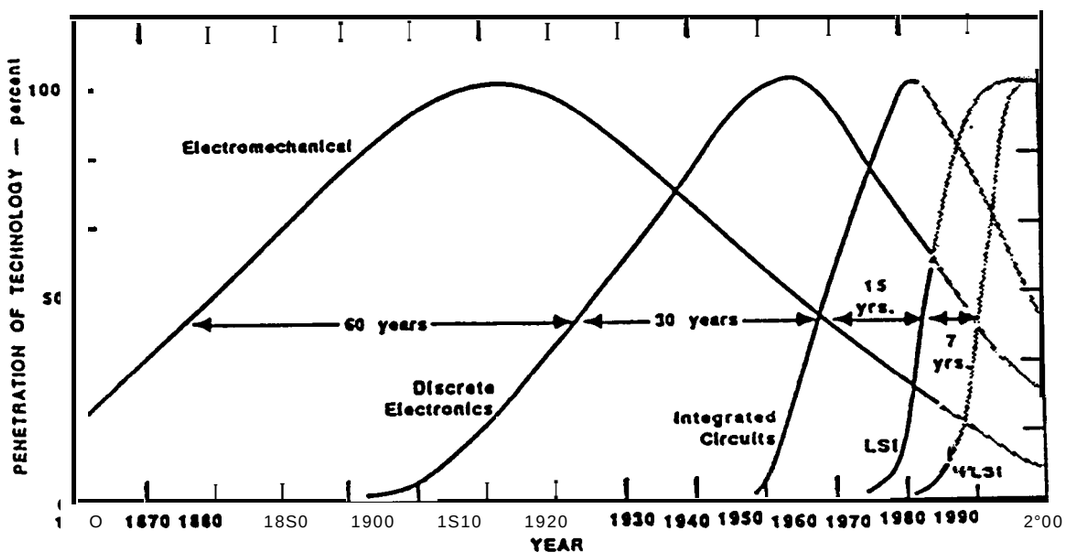
2.1 EVOLUTION OF INFORMATION/COMMUNICATION TECHNOLOGIES

Over the last couple of decades, the product life-cycle of electronic technologies has shortened considerably. As is evident in Figure 2.1, electro–mechanical technologies (dominant in the early 1900s) had a very long product life-cycle and began declining only after 50 years at which point discrete electronic technology was substituted. Discrete electronics only enjoyed a period of dominance for 30 years and experienced a much steeper decline than the technology which it replaced. By the late 1960s, integrated circuits were the new state-of-the-art technology although they faded after only 15 years. In the early 1980s, large-scale integrated circuits took over to be replaced seven years later in the late 1980s with very large scale integrated circuits. These latter circuits are expected to be supreme for some five years.

The concept of shorter lifecycles also holds true for interfacing, communication and hard ware /soft ware technologies. The pace of innovation is accelerating with new technologies requiring less and less time to shift the laboratory stage to the production stage.

This report concentrated on technologies which are already in the design and development stage and on information/communication systems as these will have the

FIGURE 2.1: THE ACCELERATION OF TECHNOLOGY PENETRATION



SOURCE: I. Darros, 1967.

most direct impact on Canadian tourism in the next five years. Technologies in the basic R&D stage are still not expected to be available for another 10-15 years despite the accelerating pace of innovation. Information/communication technologies will have a far greater impact on tourism in the next decade, in contrast to technologies in the area of industrial materials or biotechnology for example.

For the purpose of reviewing basic developments in these areas, tourism systems/technological products were reviewed in terms of their components:

- Human/machine Interfaces
- Communications and Networks
- Systems Hardware/Software and Interfaces

which are discussed below. Figure 2.2 illustrates some of the technologies associated with each of these categories. Figure 2.2.1 illustrates the position of some of these technologies along a life-cycle curve.

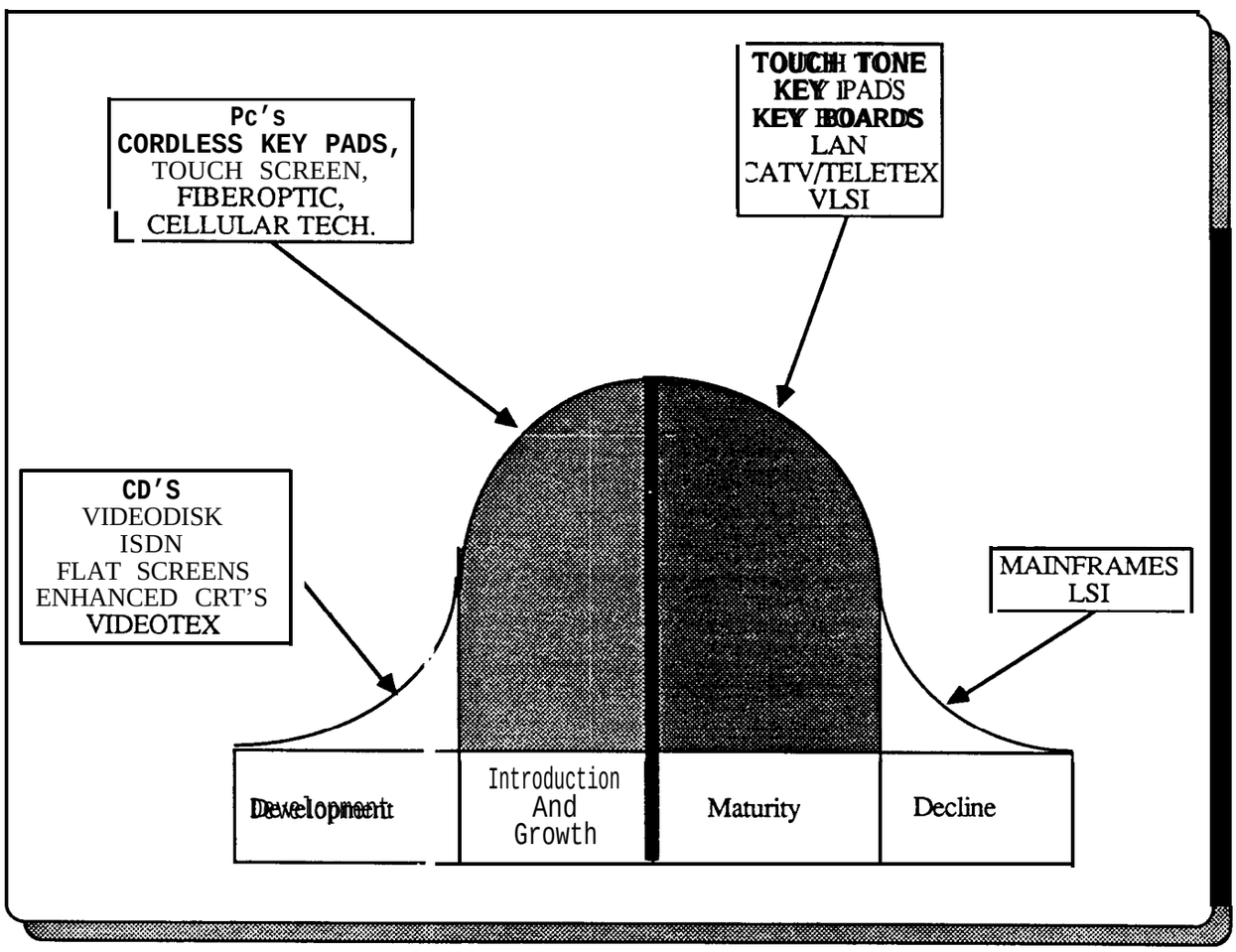
2.1.1 Human/Machine Interfaces

Human/machine interfaces can be defined as any device or process by which humans interact with a piece of equipment or computer. The case studies showed a predominance of a number of these interfaces: touchtone telephone, voice synthesizers, key pads, keyboards, touchscreens, flat touchscreens and cordless keypads.

Touchtone was one of the first major technologies available to interface with off-site computers. With the touchtone device, the caller could contact the computer and interact directly with it by pressing appropriate keys on the telephone. This allowed the caller to complete transactions choosing among a number of options. In the hotel environment for instance, touchtone was and still is used for room maintenance management. Touchtone technology, while easy to use, has a limited scope because of the amount of information that it can send to and receive from the user. For example, in urban transportation the consumer dials a central number and upon prompting from the computer adds the number of the bus stop and the number of the bus line. The computer responds by producing voice-synthesized information about schedules. Touchtone is a fully mature technology.

FIGURE 2.2:

LIFE CYCLE POSITION OF SELECTED TECHNOLOGIES



Key pads are the electronic equivalent to the touchtone technology. They are used in connection with systems which are connected directly to a computer or through a television screen. Initially, keypads were used to choose in-room movies. The addition of interactive TV screen displays made it possible to include such services as in–room checkout, in-room breakfast ordering, etc. Keypads have essentially the same limitations as touchtone technology. They cannot be used for text input and are limited to yes/no responses and the choice of a limited number of options. To counter these limitations, keypads are slowly being replaced by more flexible human–machine interfaces such as keyboards and touchscreens. A recent innovation here is the electronic service pad which, using FM transmitter technology, can intake complicated order information at the table and relay it directly to the kitchen.

Until recently, keypads were the predominant method for communicating between the room and the hotel information system. As the population becomes more familiar with computers and as systems become more sophisticated and capable of a wider range of functions, keyboards are replacing keypads. At the same time, because keyboards are not considered user-friendly for general public use, product development has focused on alternative input devices such as touchscreen technology.

Touchscreen technology, although not widely-used and still relatively expensive compared to keyboards, is evolving rapidly. In the tourism industry, touchscreen technology is being increasingly integrated into product offerings. Touchscreen technology is perceived to be very user-friendly although technically speaking it is nothing more than an enhanced keypad. Touchscreen technology is gaining a strong presence in the restaurant and hotel business, in point–of–sale and front desk systems, as well as in tourist information systems. One of the drawbacks of touchscreen technology is that current touchscreens are bulky and somewhat conspicuous, especially when used in such environments as “fine dining” restaurants. Advances in display monitor technology are such that flat touchscreens, mountable anywhere, will soon be widely available.

Display monitors, whether touchscreen or not, are expected to go through a revolutionary period over the next several years, with large screens with very high resolution and superb colour capabilities becoming available. Flat-panel screen

displays that perform at a level that meets or exceeds today's colour CRT displays will also be developed.

2.1.2 Communications and Networking

Computer Networks and LAN

Computer networks allow communications between two or more computers, and are installed either because the computational task is too large or time-consuming for a single computer, or because different parts of the information and/or processing reside in different systems.

Local Area Networks (LAN) that interconnect computers within a building or cluster of buildings is standard in the tourism industry like anywhere else, and is the tool which allows the integration of systems within each property.

As LAN increasingly advances use in fibreoptic cables, the door will open to the delivery of more services through these networks such as digitized videos. One area of immediate application is related to in-room movies. Through the use of digitized video and fibreoptic LAN, guests will be able to choose among a great variety of movies without being constrained by pre-set schedules.

ISDN

The Integrated Services Digital Network (ISDN) is an international standard for voice, data and video traffic. The ISDN service should be available starting in 1990, combining initially only voice and data (not video) over regular twisted pair cable. However, specially designed telephone sets and telephone company switching equipment will be required. While this technology will allow even greater integration of systems, none of them are yet structured to take advantage of this technology. Features which will become available, such as being able to identify the caller before telephone pick-up and simultaneous voice and data transmission, will open up opportunities and improve the conduct of business (see reservations case study). Business will be more personalized, greater information sharing will be

possible, and transactions will be completed more rapidly. This technology is bound to become a major force affecting the development of all future systems in the tourism industry.

Fibreoptic

Fibreoptic cable is a transmission medium for LED or laser communication. It is made of ultrapore glass **fibres** a fraction of the diameter of a human hair and can carry many thousands of times the amount of information possible on a standard telephone wire. Voice, data and video are digitally encoded ' then transmitted at rates of 1 gigabit per second (10^9) or higher. Fibreoptic cable is increasingly used for telephone trunklines and for internal communication in large corporations. Estimates vary, but it will probably take 10 to 15 years before this is widely available to the home, although many small businesses will have the service by the mid 1990s.

Teletex and **Cable** TV

Teletex and Cable TV are vying for the in-home information and electronic shopping market. Cable TV is slated to win as **Teletex** has been stalled on the Canadian market.

The **Teletex** technology is fully compatible with present television broadcast systems. It only requires a NABTS (North American Basic **Teletex** Standard) decoder at the receiving end. When feedback is required, the data is carried over a separate phone line. This makes **Teletex** an awkward technology for conducting transactions. Although **Teletex** has been used successfully in Canada, i.e., during the 1988 Olympics to disseminate tourism related information, it is expected that other types of communication will significantly decrease the size of the market for **teletex** and its potential for success. Cable TV, for example, is already capable of carrying a greater amount of information since it has a larger bandwidth. Moreover, as Cable TV switches to fibreoptic cable, it will become fully-interactive independent of the telephone, thus its advantage over **teletex** will increase even further.

Videotex

Videotex is a communication technology which allows two-way communication between a user's display terminal and a large computer database. The computer-based graphics and text information is carried over a regular telephone line. The interface is through a special decoder. (New systems will allow the use of regular modems and personal computers.) Information is sent to a TV, personal computer screen or videotex monitor. At the non-interactive level, the user is able to select display frames. At the interactive level, the user can enter data such as name, address and credit card number. Videotex cannot at the present time display sophisticated animation. It is the technology behind such systems as ALEX and CETI (Canada), Minitel (France) and Prestel (United Kingdom).

The implication of the forthcoming widespread use of this technology in North America can best be evaluated by extrapolating from the European experience. In France, for example, there are now four million users and 7000 service providers and the market for this service is still growing rapidly. The importance of videotex for the tourism industry is the electronic "yellow page" capability which can be continuously updated (i.e., menus for restaurants, hotel prices, airline flight information, movie schedules, etc.) as well as the capability to allow computerized transact ions.

The growth of service providers (companies offering information or transaction capabilities for a fee) in tourism-related areas will produce a new supporting structure for the tourism industry. The current drawback to service providers in Canada for the new ALEX system, however, is that it will cost between $50,000 and $1 million to create the necessary interface. Furthermore, as opposed to the French experience, the subscriber base in Canada is not being built up by the free distribution of millions of terminals (terminals will be rented on monthly basis or bought). This may result in a "Catch-22" situation. Potential service providers may be reluctant to make the necessary investment until they are confident that the subscriber base will become sufficiently large enough to justify it and potential subscribers may find the system less attractive because of the low number of service providers and therefore be hesitant to sign-up.

Cellular Telephone

The cellular telephone is a recent and rapidly-growing innovation. The chief advantage of the cellular telephone for the tourism industry is that it not only allows mobile communication, but it also offers the capability of tracking and positioning the vehicle which carries the phone. In the future, it is expected that this positioning capability will be more fully-exploited. The case study on the integration of technology into package tours shows how cellular technology can enhance the touring experience by delivering site-specific information to tourists.

2.1.3 Computer Hardware and Software

Computer performance has increased ten-fold every five years for the past 30 years. Over the same period, the cost of computation has fallen a 1000-fold. These trends have made computers accessible to an ever-larger number of users. Computers are becoming less expensive, smaller, more versatile and more user-friendly. Knowledge of programming is no longer a requirement to use computers for day–to-day operation and more sophisticated applications. One of the most important developments is that computers have evolved from room-size, number-crunching machines to sophisticated desk-top word processors and management support tools. This evolution is expected to continue with computers being supported by artificial intelligence software with capabilities to perform managerial tasks.

For the tourism industry, the impacts of these developments in computerization have been considerable. For example, computers were first introduced into the back office which they soon dominated. Then they extended their reach to the **front–** office where they facilitated reservations, guest check-in/check-out and guest accounting. Concurrently, computers were substituted for **electro–mechanical** devices in peripheral areas, e.g., point-of-sales, in-room services, electronic bars, etc.

The next phase will see computers interfacing more directly and more frequently with the client, either on or off the premises (e.g., **videotex** for off premises and integrated property management systems on the premises).

Over the next few years, large–scale integrated circuits leading to a new category called monolithic circuits will be the most significant factor in the evolution of computers. Their impact is expected to be pervasive, making it possible to develop all kinds of control systems including systems for appliances and automobiles, as well as very high-resolution computer-assisted digital televisions and speech processing, both at the synthesizing and the speech recognition end, and finally, in the high-quality graphics application.

The tourism industry is expected to follow trends evident in other industries. The use of mainframes will decrease in importance because the performance of small computer systems will improve much faster than that of mainframes. As a result, property management and large reservation systems will tend to be based on networked small computers with distributed processing rather than large mainframes. The museum case study provides an excellent example of the shift from mainframe computer systems (to handle internal and external functions) to a more modular system composed of linked local area networks.

The most exciting innovation in the computer industry, the non–Von–Neuman architecture (the neural architecture) is not expected to have a significant impact on the tourism industry over the next ten years. The non–Von–Neuman architecture, with its strong parallel processing capabilities, will be a significant boost to the development of real time artificial intelligence and expert systems. It is one of those technologies which is still in the initial R&D phase and not likely to be available for development for another eight to ten years.

Information storage technology is an area which holds the greatest promise of yielding revolutionary innovations over the next five years. Storage technology is evolving in two parallel areas: magnetic and optical storage technologies. Magnetic storage technologies are more mature than optical and although their performance is expected to continue to increase, the prognosis is that optical technologies will eventually dominate the storage technology field.

Over the past seven years, maximum storage capacity of a magnetic 5 1/4” hard disk has grown from 50 megabytes to more than 700 megabytes. Over the next five

years, storage capacities will exceed one gigabyte, with multi-platter disk systems reaching into the 20–100 gigabyte range.

At present, optical storage systems are already capable of storing large amounts of data but are constrained by the fact that it is difficult to erase data and reuse the disk. The first major technology to become widely available is the compact disk Read Only Memory (CD-ROM). The most immediate use for this technology is as a storage medium for large, archival data bases, where text, graphics and still life images are the key requirement. The museum case study illustrates the application of the more basic videodisc, which is suitable for full motion' and still life, as a pictorial inventory of collections. CD-ROM and videodisc are not compatible with interactive systems because they cannot be easily updated and they have a very long access time. Erasable optical discs should be on the market within two to three years. They will have the advantage of sizeable storage capacity plus write and erase capabilities. It is not known if the slow access drawback will be corrected.

Compact Disc - Interactive (CD–I) integrates the function of an audiodisc and a videodisc and, because of its pre-programmable features, can function as a free–standing videotex system and display selected frames in response to specific user requests. Current CD-Is lack full-screen, full–motion capability, as full-motion capabilities are being restricted to one-sixth of the screen.

With respect to the tourism industry, the improvement of mass storage media will create a vehicle for the handling and dissemination of vast amounts of tourism–related information. Since the desire for additional information on the part of tourists seems to be insatiable, it is realistic to forecast that competitive pressure will require the tourism industry to make use of this capacity. As the information to be conveyed does not presently exist in the format required for video and compact disc display, one could logically forecast the development of a new industry sector focusing on the gathering, formatting and storage of tourism-related information for optical devices. Magnetic storage devices have already spawned a growing industry providing on-line tourism data banks of many different varieties (see videotex case study for examples).

2.1.4 Wrap-up

Diffusion of innovation depends, to an extent, on the reduction of complexity. As technologies become less complex, at least on the surface, and more transparent, consumers become more comfortable using them and more willing to adopt them. While equipment interfaces, communication technologies, and hardware/software are becoming vastly more complex internally, the user interfaces are doing the opposite and becoming more humanized. Although ergonomic improvements necessarily lag behind technological advances, the trend towards the humanizing of interfaces has been firmly established. For example, one can expect that within a generation, voice instructions for locking and unlocking doors and adjusting temperatures should be a reality.

2.2 THE EVOLUTION OF TOURISM SYSTEMS

The previous section discussed trends related to the technologies driving the "tourism systems" analyzed in the case studies. Alternatively, this section outlines key trends derived from the study of tourism systems in the case studies. In doing so, it sets the stage for the ensuing analyses including the impact of technologies and systems by sector and function, barriers and accelerators to diffusion, needs of the tourism industry, and guidelines to increase diffusion.

Increasing Overlap of Systems

Systems which can perform reservations, point-of-sale, tourism information, and property management functions are becoming increasingly integrated in two ways, they:

- perform more functions which previously required an additional type of system or software.

  For example, airline reservation systems now offer users a number of additional complementary services and managerial functions such ss tracking of corporate travel accounts, accounting spreadsheets and word processing.

The front office system in hotels has developed into the core of a Property Management System (PMS) which is quickly integrating other formerly independent systems. In addition to front desk functions such as registration, guest accounting and room management, the system now performs all the back office functions such as accounting, payroll, and word processing.

- have greater capabilities to interface with other systems.

The expansion of current PMS is occurring through interfaces with other systems such as point-of-sale which control restaurant and bar operations, off-site central reservations systems, in-room entertainment systems and security systems.

Reservation systems interfacing with other reservation and booking systems are also being developed to the point that direct access to inventory among systems is now feasible. This capability will serve to push reservation systems into the next generation. Previously, for example, central hotel reservation systems tended to work on the block inventory or flow through basis. In a block inventory mode, a given property assigns a certain block of rooms to a central reservation system be it an airline, a corporate reservation system or a third party central reservation system. When operating under the flow-through mode, the reservation system will pass on requests to the hotel and await a later confirmation. Direct access offers a considerable advantage over earlier methods. All reservations are made from the base inventory which avoids the problem of over-capacity at one end of the system and over-booking at the other. Second reservations can be specified in more detail and matched with detailed customer preferences.

Direct access booking requires greater sophistication because centralized reservation systems must interact with each hotel or attraction for each reservation in real time, a feat which was not required when bookings were made using a separate block inventory or flow-through inventory.

The outcome of these trends has been the development of increasingly overlapping but competing systems, a situation which has increased the difficulty experienced by prospective users in deciding on a system or its course of future development. For example, small and medium-size hospitality properties wishing to participate in airline or other large off-site vendor reservation systems will have to choose between continuing to expand their property management system or using the reservation system developed by third-party vendors. Choosing this latter approach would limit their involvement to adding options and local interfaces.

The problems associated with overlapping systems in the hotels and airline sub-sectors are unlikely to occur in the distribution area as travel agencies (with some notable exceptions in Europe) are not developing strong independent systems and are making increasing use of vendor-supplied features attached to centralized reservation systems.

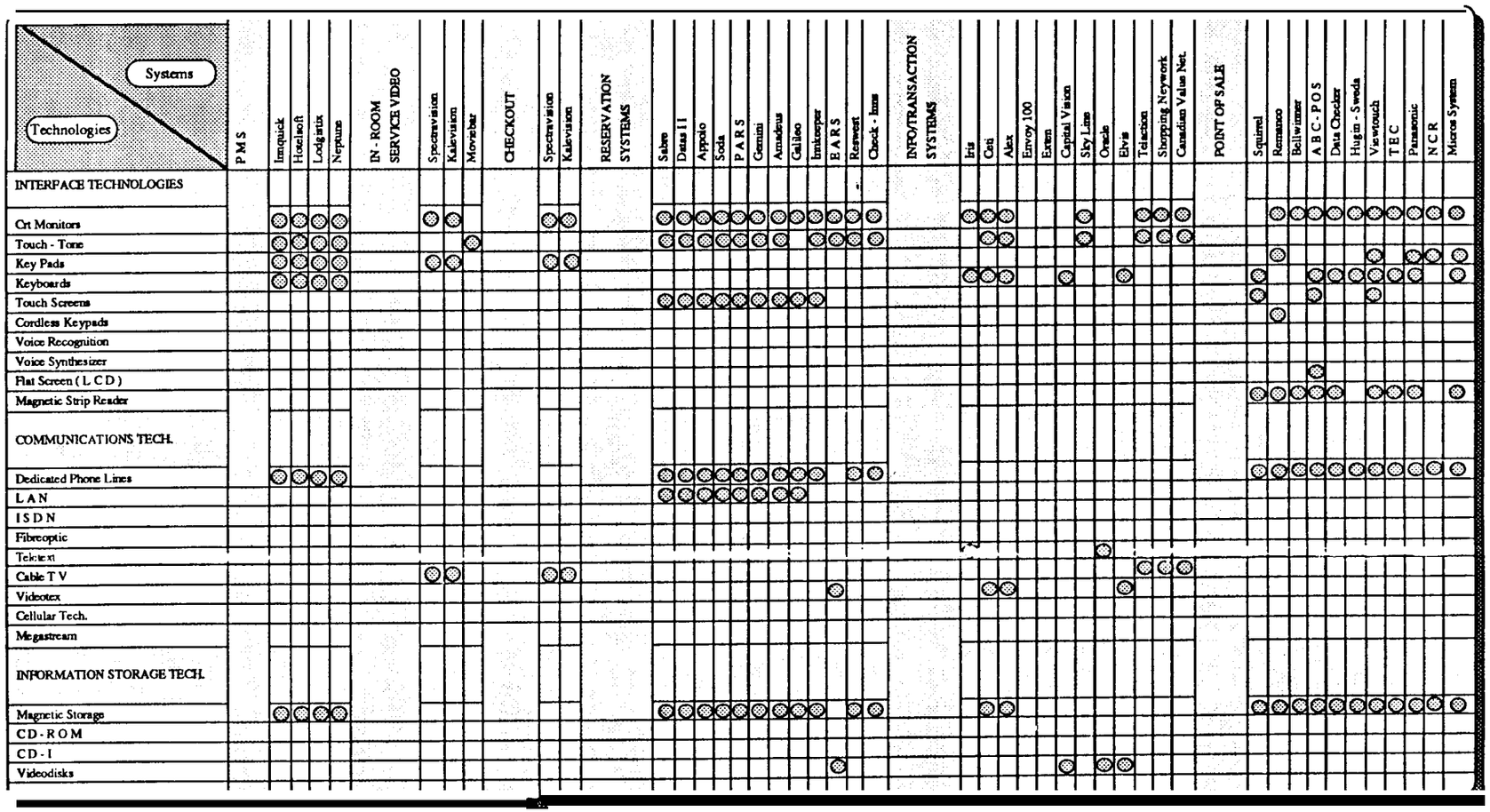
From Plant Management to Business Management

Future systems will take on a greater role as a business management tool. Through the application of artificial intelligence, property management systems will accept criteria which will automatically determine marketing and promotion actions aimed at maximizing revenue and performance. At that point, at least in the accommodation sector, reservation and PMS systems will have reached a point of considerable overlap.

2.3 TECH NOLOGY/SYSTEM MATRIX GUIDE

Figure 2.3 summarizes, in a cross-tabular format the technologies and tourism systems considered in this study. It is evident that most systems which have a similar purpose, e.g., reservations or point-of-sales, tend to use the same technologies if communications, networks or information storage technology are considered.

FIGURE 2.3: TECHNOLOGY MATRIX GUIDE



System homogeneity appears to breakdown, however, in the case of interface technologies where, for systems of a similar purpose, a much wider variety of interfaces is evident (with the exception of airline reservation systems). Figure 2.3 also highlights the extent to which currently available Canadian tourism systems use mature technologies rather than emerging technologies, i.e., ISDN, fibreoptics, voice recognition, voice synthesizers, etc.

The use of mature technologies is due to different causes in large and small systems. Large systems, such as airline reservation systems, were developed beginning in the 1960s. Airline reservation systems have very substantial investments in their current software and are tied to a very large existing hardware base which has limited technological capabilities. Since the beginning, evolution was by accretion rather than substitution. The key is to retain compatibility with the existing hardware /software base. Even Gemini is built to retain compatibility with previously existing systems.

Smaller systems, such as PMS and POS are much more recent. They are not tied to established hardware bases but they are generally developed by relatively small- and medium-sized operations which lack the capital and technical resources needed to incorporate leading-edge technologies in new product lines. Furthermore, as shown in the case studies, cost is a major barrier to adoption - another factor favouring more established technologies.

The situation described above is not expected to change in the near future. Information from system developers indicates that the next generation of tourism industry-related systems will not be radically different from the existing ones and will be a refinement of present systems. For instance, no PMS, POS or reservation system supplier indicated that it was in the process of developing a system compatible with ISON, fibreoptic technology or with supporting systems such as ALEX or CETI which will be available in Canada on a test basis this fall.

2.4 IMPACT OF TECHNOLOGY BY FUNCTION AND SUB-SECTOR

As explained in Section 1.0- Methodology, the next axis of classification concerns the functions performed by the various sub-sectors in the tourism industry. The impact of technology by function and sub-sectors, with examples from the case studies, is presented below.

2.4.1 The Information Function

In the interface technologies, display of information is being facilitated by the development of high-resolution, flat panel and touchscreen displays. In the area of communications, the transmission of information is being revolutionized by the introduction, over the last few years, of three major technologies; local area networks, fibreoptic and cellular technology. Communications in Canada will be further revolutionized by the imminent introduction of ISDN and videotex technologies.

Interface and communication technology developments could not achieve their full impact if it were not for the supporting developments in videodisc and compact disc technologies. Rapid evolution in personal computers will make it possible to take full advantage of the above development- in a cost-effective manner.

The way in which information is being delivered is changing as a result of new technology. In the museum context, information delivery is being transformed from a passive, all-purpose delivery mode to an interactive, customized approach. In package tours, there are two possible options in the provision of information. One is based on utilizing on-board, free standing mass storage technologies. The tourist, using a flat screen display at his seat, will be able to interact with the system and extract the desired information. The second more remote option includes the addition of a navigation system such as a Global Positioning System (GPS) which will allow the on-board computer to recognize the exact position of the bus in relation to its environment and to provide relevant local information without prompting. This system could take over the guide function of the on-board staff.

2.4.2 Marketing Research

The case studies indicated that the market research function - consisting of the collection, storage, sorting and selected retrieval of information pertaining to consumers' preferences, trip characteristics and product successes - is embedded in many of the newer systems now available on the market. For example, point-of-sale systems collect information on sales per item, over any period of time. This information is then tabulated in a directly-usable report format. This capability allows management to judge the popularity of certain items, to analyze pricing strategies, and to fine-tune menus and prices for time of day, day of week and so on. Property management systems perform the same function but in relation to a wider range of products and services, especially when the property management system interfaces with reservation and in-room entertainment systems. Reservation systems permit the accumulation of traveller's preferences and past travel habits in one file. These files, comparable to the frequent flyer files, permit market researchers to develop specifically-targeted products and services.

Only recently have the museums gone beyond manual head counts. The National Gallery of Canada, for example, has installed a point-of-sale system which allows them to input information on each visitor buying a ticket for later market analysis. The Quebec Museum of Civilization appears to be in the forefront in this regard, having installed an electronic opinion polling system, which allows 20-30 visitors at a time to watch a computer-generated, room-sized screen and to provide answers through a keypad to marketing-related questions such as preferences for certain exhibits or interests in certain areas, level of satisfaction, etc. The same type of service could be made available at convention centers for use in conjunction with trade shows. This would create the opportunity for omnibus type market research.

2.4.3 Interconnection

Almost all systems reviewed in the cases were initially unconnected. Early systems were developed as self-standing systems. PMS systems had no automated posting capabilities and did not interface with either telephone accounting or centralized reservation systems. Data had to be re-imputed when transferred from one system to another. Early systems also tended to be single function oriented. This lack of

interconnection is disappearing very rapidly. Current systems tend to be, not only interconnected, but overlapping with two or three related systems capable of performing the same functions. For example, airline reservation systems are offering travel agency accounting functions as well as access to a series of management-related reports. Both POS and PMS can handle the inventory function and most of the accounting functions. In the future, with newer communication technologies coming on-stream, the interconnection between systems and the potential functional overlap is bound to be increased, leading to an additional sub-sector competition.

2.4.4 Transaction Function

The definite trend, supported by the newer technologies, is for more decentralized and automated transactions. The use of credit cards in connection with phone billing and the use of automated teller transactions appear to be major factors in this acceleration.

This evolution is affecting all major industry sub-sectors. The transportation sub-sector is introducing self-standing, credit card driven, automated ticket issuing machines. Hotels are offering in-room check out. The events and attraction sub-sector has already adopted the decentralized concept incorporated in the Ticketron system. Automation is probably not far behind.

The transaction function will undergo another quantum jump with the introduction of the ALEX and CETI systems. These systems, based on Teletex technology, will, for the first time, allow everybody to have access to reservations and purchases by phone without the intervention of an operator. Because consumers are already accustomed to getting information and completing transactions over the phone, this technology is expected to have more impact than the television-based transaction systems.

2.4.5 Scheduling and Inventory

It is well known that the tourism industry in general, be it transportation, hospitality, food and beverages or attractions and events, deals in a very perishable,

time sensitive commodity. Controlling inventories and matching inventories to real demand through efficient scheduling is a key element of profitability for all tourism industry sub-sectors. The information gathered from the cases shows how the available technology is being utilized to that end.

Property Management Systems, through their Room Management modules, now allow the optimization of room maintenance and scheduling. Current POS maximize waiter's time on station by improving the pick up scheduling. They also allow detailed inventory control In-room breakfast ordering systems keep track of demand and rearrange menus to allow for a better match · between sales and inventory.

Future POS and PMS systems are expected to go even further. Through direct interconnections with suppliers, it will become possible to operate in an environment resembling the "just in time" philosophy which has made Japanese companies so successful.

2.4.6 Process Control

New technologies are impacting on **all** aspects of process control. Bar tending, for one, is becoming fully automated and computerized. The Easy bar Beverage Control System is a good example of this evolution. This system is capable of handling up to 128 different brands of liquor (or other liquids). It can dispense up to 64 preprogrammed, different types of cocktails, each with up to five different ingredients. The accuracy per pouring is better than one 32nd of an ounce. The system is fully automatic, interfaces with all POS and PMS, and will issue reports on site or at remote locations.

Another process which is being fully automated is the guest call routing and accounting.

In response to high heating and cooling costs, Betawatt has developed a fully automated in-room temperature control system which, once set, does not require any further manipulations. The system has three settings lights on/occupied; lights

out/occupied; and empty. It senses the room status and sets the temperature accordingly.

The above are but examples of advances in process control technology with direct applications on specific tourism industry sub-sectors. It is important to note that newer systems tend to require less and less user input to perform their tasks.

2.4.7 Management and Accounting

The accounting function is rapidly evolving into an MIS function. All systems now have the capability to accumulate information usable for billing, payroll and tax purposes, but they can also display information of direct use for management purposes. POS can rank menu items by profit margin and volume (as well as per period shift and per server) giving management the opportunity to adjust prices and menus. New reservation systems will incorporate revenue maximization rules which modify room rates depending on reservation levels 30 days, 14 days and one week before a given date (or at any other interval specified). Frequent flyer programs are giving rise to frequent stayer programs. Both are using accounting-related information for marketing/management purposes.

The linkage between the MIS function and the management function is likely to be the first area of application of artificial intelligence to the tourism industry sector.

2.5 BARRIERS AND ACCELERATORS TO DIFFUSION

Figure 2.4 presents an overview of the various technologies and systems examined in the case studies and the key barriers and accelerators associated with their diffusion in the Canadian tourism industry. The dimensions along which these technologies have been assessed are

cost - High purchase and installation costs can be a significant barrier especially for small and medium-sized businesses, regardless of the future benefits or profits that the technology or system may generate.

Comparative Advantage - The greater, the more immediate and the more visible the advantages of a new system over the presently-used methods, the more

FIGURE 2.4:

DIFFUSION CHARACTERISTICS OF TOURISM - RELATED TECHNOLOGIES (CANADA 1988)

Technologies \ Diffusion Related Factors	Cost	Comparative Advantage	Compatibility	Communicability	Trialability	Complexity	Reliability	Awareness
Property Management Systems								
Early	○	◒	●	●	◒	○	○	○
Current	○	●	●	●	●	◒	●	◒
Intelligent PMS	●	●	●	●	●	●	●	◒
In-Room Systems								
Current	○	●	●	●	●	●	●	○
Future	●	●	●	●	●	●	●	○
In-Room Video Systems								
Current	○	.	○	●	●	●	●	○
Future	●	●	●	●	●	●	●	○
In-Room Check-Out								
Current	●	○	◒	●	●	●	○	○
Point of Sale								
Early	○	◒	◒	○	◒	○	○	○
Current	◒	●	●	●	●	●	○	◒
Future	●	●	●	●	●	●	●	●
Airline Reservations								
Early	○	○	○	○	◒	○	◒	○
Current	○	●		●	◒	○	●	●
Future	◒	●	●	●	○	◒	●	●
Hotel Reservations								
Current	○	●	○	●	●	○	●	●
Future	○	●	○	●	●	●	●	●
Independent Reservations Systems								
Current	○	○	○	◒	◒	◒	●	○
Enhanced	○	◒	○	○	.	.	●	○
eletext and Cable TV	◒	○	○	●	.	.	●	○
Videotex	○	◒	○	●	●	●	●	○
Video and Compact Disk	○	◒	○	●	●	●	●	○

○ Negative
◒ Improving
● Positive

likely it is to be adopted. Comparative advantages are normally determined in terms of contribution to profitability and speed. If a system is capable of offering more or better services, especially revenue-generating services, then its comparative advantage increases.

Compatibility - Systems which do not require significant changes in work habits or managerial objectives are more easily integrated into the operation and hence more likely to be adopted.

Communicability - The ease with which the benefits and comparative advantages of possessing the system can be communicated to prospective adopters.

Complexity - The adoption of a system is directly related to the ease with which it can be learned and used. Moreover, the current **ideal** of **user–** friendliness is being replaced by transparency. For example, a **point–of–sale** system with a **touchscreen** is regarded as a user-friendly system. An inventory control system which automatically reorders items is a transparent system, not requiring the user to issue a specific command.

Trialability - A prospective purchaser considering a commitment to the system is more likely to adopt a system that can be tried out beforehand.

Reliability - Prospective purchasers want to know if the system will do what it is supposed to do, on a consistent basis. The shift from paper-breed systems to computer-based systems with virtual memories created concern over the reliability of systems, even though in reality most of today's systems have fail–proof systems.

Awareness - In order for a purchaser to consider adopting a system, they obviously have to be aware of its existence. Once this has been established, awareness associated with the capabilities and impacts of the system becomes the next potential barrier or accelerator.

Each of the above dimensions has been used to evaluate the diffusion potential of the various technologies and systems reviewed in the case studies, as illustrated in Figure 2.4. This figure reflects the evolution of the diffusion characteristics of each technology/system over time. Notably, successive generations tend to have more positive characteristics, as manufacturers gain a greater insight regarding demand characteristics and as the underlying technology matures.

Findings related to barriers and accelerators included the following

- Larger organizations are less deterred by the cost factor and are more likely to have on staff specialized employees who are capable of handling more complex systems. They can also afford more formalized training. Thus for ail of these reasons, innovators, at least in the tourism industry tended to be major organizations.

- The adoption of Property management systems by small and medium-sized operations was held back by the substantial costs involved. While costs are still high, complexity and unreliability have been reduced.

  In the final analysis, newer systems have more comparative advantages, which are also easier to communicate. Examples of these include automatic posting of guest expenses, the increased speed of handling front-desk functions and guest billing and the capability of interfacing with ever-larger numbers of peripheral systems which generate extra revenues.

- In-room video system is an example of technology which is being held back by a problem of compatibility. Movie viewers want maximum flexibility in time of viewing and movie selection. Present systems cannot satisfy this need. (Cost has never been a factor.) Future systems, however, based on digital technology will allow the user a much greater selection of movies at the time of his choice.

- An interesting barrier to adoption of in-room check out systems has been reported mis-use of these systems. In many instances, guests, through mis-use or handling by children, checked themselves out unintentionally. This problem is now being addressed through various system prompts which query the user as to his real intentions, i.e., "do you really want to check out".

- Diffusion of early point-f-sale systems was slowed by high costs and mixed reviews with regards to their complexity, compatibility, reliability and so on. Current systems have by' their design erased most of these problems, although the initial cost to many users, especially small and medium-sized users is still perceived to be high.

  Adoption is expected to accelerate in the near future with the development of more inexpensive systems, which are totally reliable, with back-up power supplies and more than one central processor.

- Early airline reservation systems were expensive both to produce and to participate in. Moreover, choice of systems by users was hampered by the incompatibilities among systems. Systems were complex to use and required a considerable amount of training, but their leverage in terms of marketing power mandated their adoption. Future systems, while remaining expensive, will be even more cost-effective to users because they reduce manpower costs and allow the sale of additional services, apart from airline tickets. As far as airlines are concerned, their ticket reservation services are a higher yield profit center than the operation of airlines themselves.

- The major drawback of hotel reservation systems is that most of them still interface with travel agents by phone or through airline reservation systems.

- Teletex and Cable TV are not very expensive to use, but do not have an obvious comparative advantage in the tourism industry at this time because of the growing number of PC-accessible data bases

and the imminent introduction of videotex. Although in-home shopping has developed through this technology, it is not clear for the above reason that this success will be transferred to the tourism industry.

- Independent reservation systems are costly to install and may also be costly to operate depending on the number of information providers and users. Current systems are not integrated with large, centralized reservation systems. This incompatibility reduces their comparative advantage.

Given that the following technologies are only now being introduced in Canada, estimating current diffusion is not possible. But the following observations regarding the probability of future diffusions are offered

- Although videodisc is already being used by the tourism industry, compact disk and compact disk interactive which holds the greatest promise is not yet available. Although it is expected that these technologies will be very attractive to the tourism industry, especially to create electronic full motion brochures, their diffusion will be held back, at least initially, by the cost of the pay-back units, the low availability of disk stored material and the difficulty of changing or updating tourism material.

- The diffusion characteristics of videotex, soon to be introduced in Canada as ALEX and CETI, can be inferred from the European experience. It is expected that, upon introduction of the system here, that costs, both to information providers and users, will be perceived to be high (between $50,000 to $1 million for the information provider to obtain the necessary interfaces and charges of between $7 to $25 a month for users on top of their regular telephone bill). These costs are likely to be an initial deterrent to immediate and rapid diffusion. Comparative advantage and compatibility with existing practices may also prove problematic in the initial stages. Consumers now obtain their information through other channels and old habits die hard. Also, the base of information providers

in the beginning will be relatively small, decreasing the perceived comparative advantage.

To conclude, Figure 2.4 illustrates that the major barrier to the diffusion of new technologies is cost. Figure 2.5 supports this conclusion by showing that small operations in all sectors which are the most sensitive to cost, had a lower adoption rate for every technology /system reviewed. When high-cost is combined with a low comparative advantage, diffusion is low among large and small operations. For example, see independent reservation systems which have a relatively high cost and a relatively low comparative advantage as well as a low diffusion rate. Alternatively, hotel reservation systems with a high cost, but a high comparative advantage should have a high diffusion rate among larger hotels.

In-room check-outs are a sub-system, interfacing with property management systems. Interestingly, in-room check-out only have a distinct comparative advantage for those hotels which deal with business clients. On the other hand, as stated in the case, current in-room check-out systems still suffer from a compatibility problem and are prone to error. AS a result of these barriers, in-room check out systems appeared to have a lower diffusion rate than property management systems.

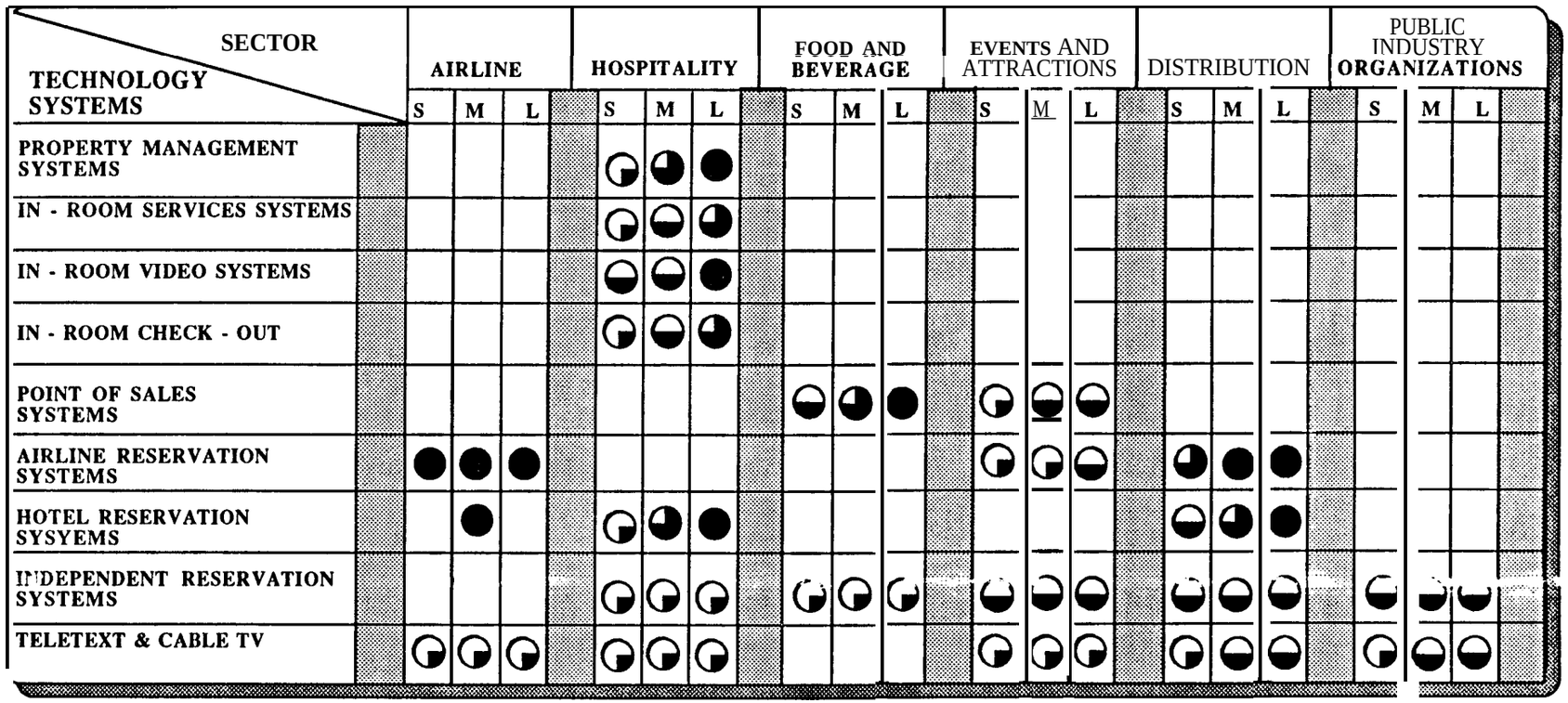
Communicability does not appear to be barrier to diffusion, although current independent reservation systems have a level of complexity which still leaves many small and medium-sized operators uncomfortable.

Although it would appear that the advantages of tourism systems are easy to communicate to prospective users, the case studies revealed a certain skepticism on the part of tourism operators with respect to the quality of information passed on by suppliers and manufacturers.

Trialability does not appear to be a significant barrier holding back diffusion of innovation in the tourism industry; most of these systems can be experimented with or viewed in operation before purchase.

Complexity and reliability used to be problems in point-of-sales, reservation systems, and property management systems, but current generations have, in most cases,

FIGURE :2.5 OVERVIEW OF TECHNOLOGY DIFFUSION BY SECTOR *
(1988, CANADA)



* The Technologies Reviewed In This Chart Are Limited To Those Covered In The Case Studies.

overcome these barriers. In fact, the only current case of a reliability problem appears to be in in-room, check-out systems.

An important barrier seemed to be lack of awareness, not at the level of the existence of the system itself, but in terms of its capabilities. Small and medium-sized hotel and restaurant operators have had little previous exposure to computerized or automated systems. Their first instinct is to look at a given system in terms of how it can do what they do now cheaper, faster and better. The advantages in terms of increased capabilities and better marketing intelligence do not appear to play an important role in the initial adoption decision.

Present systems are efficient, and payback can be very fast. But even in these cases (such as the more advanced point-of-sales), a considerable proportion of the benefits come from enhanced capabilities, not straight substitution. It is interesting to note that many users of these systems, even after a significant period of time, do not make use of the enhanced capabilities available on the system and tend to focus on the automation of functions previously performed manually. Thus, it is a the awareness of these additional benefits, not the existence of the systems themselves which is missing.

2.6 INTERNATIONAL TECHNOLOGICAL COMPETITIVENESS OF CANADIAN TOURISM

International competitiveness can be assessed along two different dimensions. One is a global dimension in which competitiveness is assessed in terms of number of tourists attracted, market share, revenues, growth, etc. The other focuses on the functions which are performed by each industry sub-sector and is an attempt to derive an explanation of why one country's tourism industry is more than successful than the other. The latter is the approach taken here.

foreign airlines'. Figure 2.5 illustrates our assessment of the international competitiveness of the Canadian tourism industry by **sub–sector** and function.

A quick glance at the chart indicates Canada's tourism industry seems to be especially lagging its competitors in terms of the provision of information, marketing analysis capabilities, and interconnection among systems and data bases. These are the functions which are most prominent in terms of the industry - tourist interface. Therefore, the shortfall in these areas will be most evident and affect perceptions and actual competitiveness most directly.

The following findings were gleamed on a sub-sector by sub-sector basis.

Canadian airlines, in general, are at a disadvantage compared to European airlines because they cannot, for the moment, make use of information dissemination systems such as **Minitel** and **Prestel.** It will take at least five years for such systems as ALEX and **CETI** to achieve the same level of diffusion as **Minitel** and **Prestel** have achieved in Europe. With respect to interconnection, Canadian airline reservation systems are not as integrated as European airlines, which have formed their own consortium. Also, European airline reservation systems allow travel agents to interface directly with the hotel. In addition, Canadian airlines have not achieved the degree of interconnection offered by new versions of CRS, such as **Sabre** in the U.S. which can provide direct links to cultural events, attractions and hotels in the Us.

The hospitality industry is doing as well as the competition in terms of accounting and inventory management, although it appears that some Japanese systems have recently made considerable advances in the inventory management area by integrating the inventory management system with their suppliers and thus automating their **re–ordering** function.

FIGURE 2.6

INTERNATIONAL TECHNOLOGICAL COMPETITIVENESS OF CANADIAN TOURISM INDUSTRY BY SUB - SECTORS AND FUNCTION

Sectors / Function	AIRLINES		HOSPITALITY		F & B		E & A		DISTRIBUTION		P & IO	
	S&M	L	S&M	L	S&M	L	S&M	L	S&M	L	S&M	L
Information	◔	◔		◔	◔	◔	◔	◔	◔	◔	◔	◔
Marketing	O	O		◔	Q	◔	◔	◔	Q	◔	◔	◔
Interconnect	◔	◔		◔	◔	◔	◔	◔	◔	◔	O	O
Transaction	◔	Q		◔	◔	◔	◔	◔	◔	◔	O	O
Scheduling	O	O	O	◔	◔	◔	◔	O	O	O	O	O
Automation	O	O	◔	◔	O	O	O	O	O	O	O	O
Management	O	O	Q	◔	◔	◔	◔	◔	◔	◔	◔	◔
Accounting	O	O	◔	◔	◔	◔	O	O	O	Q	O	O
Inventory	O	O	◔	◔	◔	◔	O	O	O	O	O	O

O	This Category Does Not Apply Or, Insufficient Data To Determine Competitiveness
◔	Canada Is Less Advanced
Q	Canada 1s Roughly At Par
●	Canada Is More Advanced In This Area
S	- Small Operation
M	- Medium Operation
L	- Large Operation

hospitality operators are behind the Japanese, where automation in terms of check-in, check-out services has advanced very rapidly in the last decade, especially with the latest developments in self-service check-in systems.

The greater number of smaller, independent restaurants in Europe lends a technological advantage to the Canadian situation, where restaurants tend to be somewhat bigger and more often part of a chain. Canadian food and beverage operations have the technology to be more competitive in management, marketing, and production terms. What is uncertain, however, is the extent to which smaller Canadian operators are taking full advantage of their point-of' sale systems which may reduce their potential level of competitiveness on this score.

No attraction in Canada, not even the West Edmonton Mall, can compare with Disney World and some of the major theme parks. On the other hand, Expo 86 and the Winter Olympics revealed that Canada is capable of organizing ad hoc events at least as well as international competitors.

Figure 2.6 presents an assessment of permanent events and attractions in which Canada appears less advanced especially among the smaller attractions. Many of the Canadian attractions operate on a seasonal basis, which may be one of the reasons why they are less computerized than their major competitors. It should be noted, however, that Canada's new wave of museums, especially the Canadian Museum of Civilization, promise to be among the most technologically advanced in the world which may serve to attract a whole new market segment of technological of ficionados as well as upgrade Canada's image in relation to its international competitors. Canada's convention centres, another area examined in the case studies, do not appear to be as advanced as their U.S. competitors in terms of the use of technology. While this gap is not yet cause for serious concern, it may prove to be a more serious problem in the 1990s as the growing number of convention centres vie for markets based on their technological edge.

In the area of distribution which includes travel agencies, tour operators and wholesalers, Canada lags in the development of information data bases on available products and in terms of the interconnection of these data bases among the consumers, tour operators, airlines and travel agencies. England is an example

where the diffusion of videotex has resulted in full-scale integration of the tourism product and the concomitant development of far more powerful, technologically-driven marketing channels.

2.7 MEASURES TO INCREASE DIFFUSION

Adoption of technological products or systems depends on the diffusion of information and the reduction of both risk and the perception of risk. The adoption process involves a series of steps on the part of the prospective user, each of which results in a decision to either continue to the next step or to halt at that particular step. These steps are:

- Awareness
- Interest
- Evaluation
- Decision
- Action

Each stage of the process is associated with unique information requirements. Information will vary in terms of content (features, performance, price, location, etc.) and sources tapped (suppliers, experts, peers, advertising, etc.). Information requirements will also differ according to purpose, which can be to:

- raise the awareness level of the existence of a given system among a specific group of people;

- impart factual information on the characteristics, purpose and costs of the system to stimulate increased interest;

- facilitate the comparative evaluation of two or more competing systems to assist in the decision-making process. (In this case, the credibility of the source is at least as important as the information being conveyed.);

- provoke the purchase **decision** by creating a favorable opportunity (i.e. a special sale);

- reassure purchasers that they have made the correct decision.

The proposed guidelines and measures to increase diffusion in the tourism industry follow the sequence of steps presented in the model of adoption. Findings from the case studies highlight the information gaps relative to each of the above steps which appear to be constricting or holding back the adoption process of technology generally or in relation to specific systems. Using these five steps to highlight the guidelines also indicates at which stage prospective users may benefit from interventions aimed at reducing risk or the perception of risk.

Guidelines are posed in terms of the type of actions which could be taken by Tourism Canada, individually or in cooperation with third parties to expedite diffusion of technologies which offer a high payback. The assessment of Canada's international technological competitiveness discussed in an earlier section highlighted priority areas for action which would allow Canada's tourism industry to maximize its return on an international scale.

Awareness and Interest

Awareness in this context is defined to mean the extent to which a prospective user is aware of the existence of a product. Awareness defined in this manner does not appear to be a major problem in the tourism industry as even small property operators know of POS, PMS, reservation systems and other products of technology reviewed in the cases. In reality, however, one could argue that the awareness is not complete until the prospective user has a solid understanding of the range and variety of systems available and their respective capabilities.

Knowledge of functions, characteristics, benefits and limitations of technology are normally acquired during the "Interest" phase. Theoretically, obtaining this additional information is typically regarded as a step beyond "Awareness" because it requires a pro-active effort on the part of the prospective user to acquire this additional information. Passing through the awareness and interest phases of adoption go a long way towards facilitating the adoption of technology.

Tourism Canada, individually, and in association with industry and supplier groups, can play an important role in creating a climate favouring awareness and in establishing the appropriate communication channels to support the interest phase. Listed below are several examples of activities which could be undertaken, accompanied by an assessment of their possible impacts on diffusion.

- **In cooperation** with the appropriate industry associations, provinces and system manufacturers, Tourism Canada should organize a series of workshops at which specific systems such as POS, PMS, in-room management systems or independent or chain reservation systems could be demonstrated by various manufacturers and discussed by panel experts.

  The aim of these workshops would be to increase awareness of systems geared to the needs of small and medium-sized operations, and their capabilities and payback periods.

  These workshops would have the advantage of allowing users to participate in discussions with peers and association representatives. This last step is considered crucial in the decision-making process because peers' opinions about the product tend to greatly influence the diffusion process and hence the adoption rate among small business operators.

  To maximize effectiveness, workshops should be held on a regional basis and have a relatively small number of participants to promote greater participation by individuals in the discussions.

  In relation to hotel operators, PMS should be the primary focus as its core role determines the diffusion of other peripheral systems and hence the overall international competitiveness of the industry. As indicated earlier, small and medium-sized Canadian hotels are less computerized than their international counterparts.

- **Tourism Canada should create a "Technology Diffusion Registry", which would contain accumulated statistical information on who is purchasing what system with what features. The objective would be to increase**

interest by informing prospective adopters of the extent of existing adoption of a given system or feature among users with similar characteristics in terms of; type of operation, size of operation, geographical location, etc.

Various studies on diffusion of innovation have established that small business people are, by necessity, risk avoiders and that before they make an important purchase decision they need not only technical and economic information but also the reassurance that they are not doing something "out of the norm". Having access to the "Technology" Diffusion Registry" would assist them in making their decision.

The introduction of the ALEX and CETI videotex systems represents a unique opportunity for the Canadian tourism industry to catch up with the Europeans whose tourism industry has benefitted tremendously from the widespread diffusion of videotex. Although Bell Canada and CETI will promote their systems:

- **Tourism Canada should take on the responsibility of accelerating the diffusion of videotex technology in the Canadian tourism plant. As a starting point, it should attempt to meet the following two objectives:**

  1. To promote the integration of this technology into existing and new system.

     This could be accomplished by launching an awareness campaign among system developers and producers, none of whom appear to be aware of its imminent introduction and the potential opportunities to be gained from interfacing with videotex. The content of this campaign should include success stories drawn from the European experience.

  2. To promote the proper use of this technology by tourism industry operators.

Training prospective users on the appropriate content and communication techniques would reduce the risk that successful diffusion would not occur among small and medium sized tourism operators wishing to be information providers.

Tourism Canada should fund a study of the cost-effectiveness of the use of videotex technology as a tool to promote tourism activities. The study should include a number of participants representative of the tourism sub-sectors. The resulting findings would be published with the objective of reducing risk perceptions among small users.

- **Meeting planners must work with extremely tight deadlines and cannot afford glitches and delays.** As **a result, they will only use technologies which are fail-proof. It is in the interests of the convention centers to accumulate data, testimonials and reports on the reliability of technologies that they are proposing to meeting planners.**

Convention centers derive additional revenues when technology is used in conjunction with any event held; thus, the managers would benefit from any strategy which sought to increase the use of technology and indirectly (through revenue generation) and directly (through attracting markets) increase their level of competitiveness.

- **Two measures can be taken to increase diffusion of technology among museums. The first would be to promote awareness of what the more advanced museums are doing, as the first step towards adoption is awareness of the existence of a system. The second measure would be to support impact studies of two types:**
  1) the effect of the introduction of a given technology on frequency of visit and on the level of satisfaction experienced by visitors, and 2) the economic payback as a result of the introduction of new technologies.

These types of impact studies would better position the museums to make an educated choice as to whether or not they should adopt a given technology, the amount that should be spent on that adoption and the

role that new technologies could play in operational and marketing strategies.

The need for these impact studies becomes more compelling if one considers that until very recently the level of computerization and automation in Canadian museums was almost nil and that this sector is having to rapidly catch up in technological terms with other sectors of the tourism industry.

Adoption of innovation is not a linear process. The fact that' certain innovations are being adopted by larger, more aggressive, museums does not necessarily mean that these same innovations will find their way into more traditional museums. New museums, such as the CMC, can afford to adopt these new technologies because they are part of their initial funding. Other museums, which are more constrained by funding, may find the decision harder to make and may wish to wait until the market and f inancial risks inherent in the adoption process are substantially reduced. **This will only occur when a body of experience has accumulated.** In other words, it cannot be expected that the problem of diffusion of new technologies will be resolved for all museums by simply creating awareness and offering training.

Therefore, there is a responsibility which must be assumed either by those museums who are gaining access to the new technologies, or by those governments or institutions which are directly interested in the diffusion of these technologies. That responsibility is to ensure that information on accumulated experience is collected.

If Canadian museums could be brought to the level of technology utilization projected by the Canadian Museum of Civilization, Canada would be among the world leaders in the sector.

Evaluation

In the evaluation phase, the prospective user compares the characteristics of specific, competing systems. To evaluate a given type of system, the prospective

user is affected by two types of inputs: 1) the cognitive dimension (composed of facts and figures), and 2) the affective dimension (images, attitudes and prejudices). As can be seen from the suggested guidelines below, Tourism Canada's most appropriate role is in relation to the cognitive dimension associated with technologies. The affective role is probably more appropriately left to the responsibility of the private sector.

Tourism Canada's involvement in the evaluation process would probably have a significant impact in fostering diffusion since it is likely to be regarded by prospective users as a much more credible source than individual system suppliers. Source credibility is a key factor in the evaluation process, especially among small and medium-sized prospective adopters who do not have the time, nor the expertise to undertake the necessary comparison process themselves and do not have confidence in information received from suppliers or dealers.

- The basic role of government is to ensure that information supplied is presented in a standardized format to allow cross-comparisons among systems.

  The government could sponsor a series of demonstration projects, in which several similar systems were tested in comparable circumstances. Sponsorship by Tourism Canada would enhance the source credibility of this information.

Decision and Action

The case studies indicated a number of instances where operators/prospective users would benefit from government intervention aimed at reducing actual or perceived risk levels.

The areas of concern are:

- **financial discrimination endured by many sub-sectors of the tourism industry, especially food and beverage.**

Many leasing companies apparently treat even large establishments as if they were fly-by-night operations and impose onerous credit information requirements on small operations.

While this study did not reveal a specific solution, it should be recognized that this could be a major problem to the adoption of new technologies. We propose that Tourism Canada investigate the policies and programs in other countries of programs aimed at mitigating financial discrimination experienced by small and medium-sized operators in the tourism industry.

- **the stability and reliability of suppliers.**

Operators are generally reluctant to adopt new systems from small, relatively unknown suppliers, even if these systems are clearly superior to others available on the market. Some software suppliers are attempting to bolster their credibility by depositing copies of their software and supporting material in trust, to make it available to a successor company in the event of their withdrawal. Tourism Canada, the provinces, the trade associations and the private industry should create a committee to examine these issues and devise some form of guarantee or insurance to protect small users from the consequences of the demise of system suppliers.

- **the sizeable cost barriers facing small and medium-sized operators wishing to adopt a tourism system.**

New POS and PMS systems have a distributed processing capability and are capable of serving more than one property. Small and medium–sized operators may wish as a first step to hire a "service bureau" which would allow him/her to share a system with other users and partake in the following advantages:

1. A lower entry cost.

2. On-going support from the service bureau which may generate the reports and even do part of the analysis.

3. The ability to try a system, without making a long-term commitment to it.

The service bureau would have to be an independent entity, with the capability to service individual accounts independently. The role of Tourism Canada could be to promote the service bureau as a concept to likely investors or providers.

o **the cost, expertise and human resources required to participate in broadly-based information systems such as videotex and large, centralized reservations systems.**

Encouraging small properties (hotels as well as events, attractions and restaurants) to regroup at a local level, integrate their reservation systems or information bases and create a capability to interface on a group basis with larger CRS or information systems would increase their level of competitiveness. It should be noted that such an action would help to eliminate one of the areas in which the Canadian tourism industry is weakest vis-as-vis its major competitors.

This action would lower the cost of being a participant and increase the advantages, without augmenting the complexity involved for the small and medium-sized operator.