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The management of information technology investments in the Australian ambulance services

Anthony J. Ahern
Edith Cowan University

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**THE MANAGEMENT OF INFORMATION TECHNOLOGY
INVESTMENTS IN THE AUSTRALIAN
AMBULANCE SERVICES**

BY

TONY AHERN B.Bus

**A Thesis Submitted in Partial Fulfilment of the
Requirements for The Award of**

**Master Of Business (Information Systems)
at the Faculty of Business, Edith Cowan University**

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

Abstract

Information Technology plays a significant role in the administration and operation of most organisations today. This is certainly the case with each of the Australian Ambulance Services. With the rapid increase in the use of Information Technology and the expectation about its use by both staff and the general public, the Ambulance Service managements' are faced with the dilemma of trying to ensure that their organisations are able to get the full advantage of advances in Information Technology and at the same time ensure that investments in IT are maintained at appropriate levels that will ensure the maximum return on the investment in terms of the Ambulance Service achieving its mission and objectives. The research considers three questions:

- How are IT investment decisions determined?
- How are levels of IT investments determined?
- Do IT investments contribute to the organisation's overall effectiveness?

The general feeling by the ambulance service CEOs is that the investment in IT has been worthwhile in terms of contributing to the organisation being more effective. These findings are contrary to a study by United Research/Business Week and described by LaPlante (1988) where less than half of CEOs surveyed felt that their organisation did an excellent job of linking computer strategy to corporate goals.

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"I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text."

Signature.

Date..... 25/10/95

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1. INTRODUCTION

The past decade has seen the issue of determining or measuring the effectiveness of information systems continually stated as a major concern to organisations' management. Ball & Harris (1982) identified the gauging of Management Information Systems (MIS) effectiveness as the second most important issue of concern by Information Systems (IS) and Information Technology (IT) management. Research by Dickson & Nechis (1984) showed "Measuring and improving IS effectiveness/productivity" as the number 5 issue. The issue of effectiveness continued to rate in the top 20 issues of concern to IS management through research by Brancheau and Wetherbe (1987), Watson (1988), Amoroso, Thompson and Cheney (1989), Niederman, Brancheau and Wetherbe (1991) and Watson and Brancheau (1991).

The research also identified other issues which rate highly and are linked to the question of effectiveness. These included issues such as IS/IT strategic planning, organisational alignment, competitive advantage and role and contribution. These issues all have elements which overlap the question of the effectiveness of an organisation's IS/IT.

What might be surmised from this is that the overall question of effectiveness involved a broader range of issues than had initially been identified.

Amoroso, Thompson and Cheney (1989) state:

The issue [of measuring IS Effectiveness and Productivity] has been important to IS executives for many years and there is no indication it will decrease in importance in the near future. Measuring performance is critical for sound management, but measuring the benefit side of the cost/benefit equation continues to be a major problem. (p. 5)

This statement by Amoroso, Thompson and Cheney highlights what has been a continuing problem for management and the fact is while few would question the need for measuring and thus determining how effective IT is to an organisation, actually arriving at an acceptable method for achieving this continues to be extremely elusive. A factor that appears to be a key in determining whether an organisation is able to maximise the effectiveness of their IT is the actual determination of IT requirements. Howard Rubin (1991) observed that the whole area of measurement of IT effectiveness was shifting. Rather than a technical focus there was more of a business focus. He identified that the people who had been measuring inside the IS organisation were becoming aware that they needed to "connect" to the business. According to

Rubin (1991):

People are no longer asking how much output they get from their IT investment but instead are evaluating that outcome. (p. 1)

In other words, he is talking about the contribution of IT to the effectiveness of an organisation. It is of little use trying to measure the effectiveness or efficiency of the IT departments themselves. Whether or not IT is effective within an organisation can only be determined by looking at an organisation as a whole and making an evaluation of IT's contribution to the whole of the organisation in terms of that organisation achieving its objectives and mission. The importance of the determination of IT requirements is a key factor then because it determines whether or not an organisation is doing the right thing in terms of its IT. Belitso (1988) believed that there was a need for a sweeping reconceptualisation of the business value of information resources. He highlighted the fact that in determining the effectiveness of IT, organisations should focus on the effectiveness of the organisation as a whole in achieving strategic goals.

The determination of the IT requirements is critical to maximisation of the effectiveness of the investment in IT because it is this area that determines whether investments are made on the basis of a conscious evaluation of the

possible benefits (improvement in the organisation's overall effectiveness) or whether there is some other driving factor such as technology for technology's sake.

Ralph Carlyle (1987) observed that in the US there had been a fundamental problem with corporations being unable to relate their MIS spending to the corporate bottom line. He made the point that until Information Technology costs can be tied into some return, corporate management is not really managing at all. Crowston and Treacy (1986) expressed similar sentiments:

Implicit in what we do in MIS is the belief that Information Technology has an impact on the bottom line of the business. Surprisingly, we rarely know if this is true. It is very difficult to trace and measure the effects of Information Technology through a web of intermediate impacts upon enterprise level performance. (p. 299)

Pava (1983) helps to put into context the difference between IT efficiency and effectiveness and subsequently supports the notion above. He believes that efficiency entails perfecting internal operations under conditions of stability whereas effectiveness entails improving the match with one's surrounding environment under conditions of change.

2. RESEARCH INTEREST

2.1 Measurement Approach

Although there has been a large amount of research carried out in terms of evaluating and measuring IT effectiveness it is an area that has not produced results readily used or understood by managers. One reason for this may be the attempt to use quantitative methods on what is largely a subjective area. For example, Hirschheim and Smithson (1986) state:-

It is our contention -- at least within the information systems area -- that in the drive for better tool creation (to improve the process of evaluation), there has been a concentration on the "means" to the detriment of the "ends". That is, the function and substance of evaluation has been given too little attention, while the mechanisms for carrying out evaluation have been given too much attention. (p. 18)

Thus on the one hand we have formal evaluation studies which although technical on the surface may contain much intergroup political activity underneath, and on the other hand we have informal evaluations subject to intragroup pressures. Clearly the common factor is the social nature of evaluation, however it is carried out. Since it is argued that information systems should be regarded more as social systems and less as technical systems (Hirschheim {1984}), similar reasoning can be applied to the notion of evaluation itself. (p. 19)

The authors talk about the highly rational/objective end of the continuum, in relation to evaluation, and say that it is possible to detail an area of evaluation literature which might broadly be defined as an efficiency zone. Here, they say, one can find the approaches based on the notion of quality assurance as it is known in production management. These approaches assume that the function and goals of evaluation are non-controversial and that the overall aim is to achieve more precise measures of performance, efficiency and reliability.

This however, does not help in terms of addressing the effectiveness question. In other words, while questions of IT efficiency might be more easily addressed because of their more objective nature, the social nature of the whole question of IT effectiveness has made attempts at measuring and quantifying effectiveness extremely difficult and arguably has led to a situation where there is still little guidance for management in terms of how they should deal with the issue. Although their research was carried out some time ago, Keen and Scott Morton (1978) offered four reasons why evaluation of IT effectiveness was so difficult. These reasons were:-

- 1) Systems do not have an initial adequate definition of objectives and criteria for "success" and "failure".

- 2) Evaluation must take into account social (qualitative) aspects, yet most attempts at assessment only include efficiency oriented and easily quantifiable aspects, i.e. technical objectives.
- 3) Because of what evaluation must embrace, it is intrinsically subjective, based on individual value judgements which will differ from one person to the next.
- 4) Even if initial system objectives could be set, they would be considerably different from the final objectives due to the fact that user requirements evolve and change over time.

From these points made by Keen and Scott Morton it becomes apparent that the difficulties associated with the evaluation of IT effectiveness go back some considerable time. Interestingly, they made similar observations with recent research in relation to the need to take into account the social nature of Information Systems. The first of the four points raised by these authors, the fact that systems do not have an initial adequate definition of objectives and criteria for success could arguably be tied into the question of the determination of IT priorities. There could be a link between the lack of adequate definition of objectives and a weakness in the way an organisation goes about

determining "what" it is going to do in relation to IT.

Cost Benefit Analysis (CBA) is a typical example where an attempt is made at quantifying the benefits of IT and comparing these to costs. Many writers are critical of the notion of Cost Benefit Analysis in relation to IT. Tapscott (1982), for example, criticises CBA on the grounds that:-

- 1) the frequently quoted benefit of increased productivity is problematic when there is no widely accepted theory or measure of office/management productivity (see also Bitran and Chang, 1984; Strassmann, 1985);
- 2) it is often far from easy to predict reliably the exact impact of a new information system;
- 3) savings in, for example, time are not necessarily additive;
- 4) it is difficult to show causality, i.e. to prove that a particular benefit is directly/solely due to the new information system.

Hirschheim and Smithson (1984 et al) believe that from their examination of the

literature, research on evaluation has been misdirected toward tools and techniques for measurement and away from understanding the process of evaluation itself. They make the point that what has happened is similar to what occurred in the Operations Research field in that the techniques have attained primacy while the problems that led to their formulation appear now to be neglected. They say that:-

Evaluation ... must contain a large measure of subjectivity; it must consider the political and social domain. (p. 28)

If an attempt is made to rationalise these processes through the application of objective tools it may lead to a situation where the results are suspect. A concept that is supported by Hirschheim and Smithson (1984 et al) is that a structured approach is both feasible and desirable, however, the emphasis of evaluation must be brought back to understanding the subject of inquiry.

An alternative approach to effectiveness which steers clear of the difficulties inherent in trying to precisely measure costs and benefits is to examine the information system with respect to the organisation's objectives. The notion of Critical Success Factors (CSF) (Rockart 1979) is an example of management thinking transferred to IS evaluation.

Rockart suggests that the concept of "Critical Success Factors" is:-

the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organisation. They are the few key areas where "things must go right" for the business to flourish. If the results in these areas are not adequate, the organisation's efforts for the period will be less than desired.

(p. 85)

Rockart makes the point that CSF has another significant utility in that it can be useful as a performance measurement and enhancement device for the IS function. In other words, although CSF has been thought of as a "general" management technique for determining/evaluating organisational performance the same concept can be specifically applied to IT. Strassmann (1990) describes Critical Success Factors as the most imaginative of all taxonomies for identifying the value of information. The method involves interviews with an organisation's management where the views of the managers on the organisation's mission and objectives are obtained. The views of the various managers are analysed and following discussion about the divergence of opinions an agreement about systems investment priorities is expected to emerge.

2.2 Theoretical Frameworks

A number of theoretical frameworks were considered for this research. These included:-

"The Balanced Scorecard" (Kaplan and Norton 1992) - a set of measures that gives senior managers a fast but comprehensive view of the business. According to the authors the balanced scorecard links performance measures by providing answers to four basic questions:-

- (i) How do customers see us? (customer perspective);
- (ii) What must we excel at? (internal perspective);
- (iii) Can we continue to improve and create value? (innovation and learning perspective);
- (iv) How do we look to shareholders? (financial perspective).

The approach has a strong emphasis on operational aspects and appears to be weak in terms of not linking to the overall mission/objectives of the entire

organisation.

Another approach considered was the business value framework (Rubin 1991). This framework provides for the identification and measurement of five key indicators: yield, alignment, IS capability, IS capacity and IS technical performance. However, this approach is oriented toward large organisations. There would appear to be a difference between large organisations and the organisations that are the subject of this research in that the mission and objectives of the overall organisation should be less obscure to all levels of management than they might be in large organisations. As such, Rubin's approach provides significant emphasis on linking the IS department to business objectives. While this must also be an objective of medium sized organisations the linkage, as previously mentioned, should be less obscure.

The approach most suitable and thus used for this research is similar to that used by Paul Berger (1990) in his "Enterprise Level Measure". Paul Berger's enterprise-level approach to measurement suggests that every information technology activity be viewed in one of three categories:-

- (i) Internal/operational in which information technology is used to coordinate and streamline the enterprise's internal

operations;

- (ii) Strategic/Competitive in which the use of information systems repositions the enterprise competitively;
- (iii) Product/service in which Information Technology is employed to produce or deliver a product or service to the enterprise's customers.

To produce real business value, information technology must have a direct impact on company contact with customers, clients and suppliers. The only appropriate measure is one based on the degree of satisfaction of the company's strategic business goals. Berger (1990) uses the example of a company that decides to use Information Technology to increase sales to existing customers and gives those customers desktop terminals to enter orders directly into the company's order-entry system and to independently check inventory status and pricing. He illustrates that the measure of impact is not some specialised metric that separates out Return on Investment (ROI) of the terminal and software that provides the mainframe link but rather the conventional measurement of the impact on sales to existing customers as compared with corporate goals.

If the goals are achieved with Information Technology as a major part of the business implementation Berger (et al) believes the technology's value would be positive as measured by the positive business accomplishment. The degree of success or failure of the business strategy then correlates directly with the business value of the investment in technology. This then, is truly an example of where the IT investment is related to the corporate bottom line.

2.3 Australian Ambulance Services

Ambulance services throughout Australia do not have "large" IS or IT departments and have possibly been driven in terms of the introduction of IT by vendors and public perception. The implication in not having large IS or IT departments is that there may not be the expertise in the IT area that might exist in organisations that did have larger IT departments. Due to the sometimes critical nature of the emergency work carried out by the ambulance services, there may be a tendency to exaggerate certain aspects of the service's performance in relation to the achievement of its objectives and mission. Specifically, this means that the sheer nature of "emergency" work may at times cause inadequate business considerations. For example, if a proposition were put to an ambulance service claiming that a particular piece of Information Technology may lead to a certain reduction in response times, i.e. the time it takes to get an ambulance to the scene of an incident, the emotive life and death nature of response times may lead to a decision being made to proceed without adequate evaluation of the contribution of that IT to the organisation's overall objectives. It could well be, for example, that had the same amount been invested elsewhere in the organisation a similar or greater contribution could have been made to providing the "best" possible ambulance service.

There is a need for organisations to ensure that investments in IT do contribute to the overall effectiveness of the organisation. Research shows that this is often not the case. Although the following quoted research applies to large organisations it would be reasonable to expect that the "attitudes" in smaller organisations would be similar. Symons (1991) states that:-

A survey of 750 UK computer-using firms (Price Waterhouse Technology Review 1988/89) showed the amount spent on information technology averaging just under 2% of turnover (around 3 million pounds per company in 1989), but Peat Marwick McLintock found that 44% of top UK companies and public sector organisations made no attempt to quantify the benefits of IT investment (Financial Times 8 June 1989). (p. 205)

Asked how IT investment was justified, one Building Society manager was quoted (Financial Times 13 June 1989) as saying: "In larger projects, we mostly go by gut feel". Another summed up the overall attitude (Financial Times, 13 June 1989) with: "If it is strategic, we just do it. If it is efficiency related, we have to do a cost justification. (p. 205)

This research will examine the area of effectiveness of IT in the Australian Ambulance Services. Research that has been carried out in the area of IT effectiveness, as well as similar areas, such as aligning IT with business objectives, calculating return on investment in IT, different methods and theories for determining and measuring effectiveness, still leaves organisations

such as those, the subject of this research, with little help in terms of being able to apply any of the conclusions to date. In other words, from a management perspective, how does a state ambulance service organisation determine whether or not their particular organisation is more effective in achieving its mission and objectives as a result of its investment in IT?

Each service, although structured differently, is a non-profit, service based organisation. Each service has the ability to generate revenue through charges for ambulance services as well as membership of ambulance contribution (insurance) schemes, but none of the services has the ability to raise sufficient revenue to cover expenditure. All state services, therefore, are reliant on Government funding, in most cases, via the various State Health Departments, for the continuation of the current level of ambulance services. The significance of the question of effectiveness in terms of investment levels, therefore, can be simply stated as follows:-

Every dollar spent on IT is a dollar that is not spent on alternate areas of the ambulance service operation that may or may not directly contribute to the service providing a better ambulance service to the public with the available resources.

For the corporate bottom line, as talked about by Ralph Carlyle (1987 et al), this statement reflects the link between spending on IT and the corporate bottom line in the Australian Ambulance Services.

The research provides an opportunity to study a number of separate organisations that collectively make up the complete ambulance service industry within Australia. Although there is considerable variation in the size and structure of each state service, it is true to say that each service is a medium sized organisation with a small IT/IS department.

The sample will be all of the State/Territory Ambulance Services. Each service varies considerably in size and structure. The total number of staff are as follows:-

	<u>Paid</u>	<u>Voluntary</u>
New South Wales	2,600	50
Victoria	1,700	0
Queensland	1,500	450
Western Australia	450	2,000
South Australia	500	1,000
Tasmania	160	200
Northern Territory	90	20

There are three distinct groupings in terms of size as determined by paid staff numbers. New South Wales, Victoria and Queensland could be placed into one category and classed as large ambulance services. Western Australia and South Australia as medium Ambulance Services while Tasmania and the Northern Territory as small Ambulance Services.

3. RESEARCH QUESTIONS

This research aims to identify the present position within the ambulance services by answering the following questions:-

- How are IT investment decisions determined?
- How are levels of IT investments determined?
- Do IT investments contribute to the organisation's overall effectiveness?

3.1 How Are IT Investment Decisions Determined?

For the purposes of this research "IT investment decisions" refer to the decision to develop/implement an Information System. This process may involve the purchase of hardware and software and/or the development of new systems with existing hardware and software or simply the decision to buy packaged software to run on existing hardware, or even the modification of an existing Information System.

The first step will be to identify whether a formal methodology is used to determine IT investment decisions. If a formal methodology is used, what is that methodology? It will then be necessary to determine if the driving influence for a new system is internal or external.

Both the internal influences and external influences can be categorised according to the following list of variables:

External

Members/customers

Government

Vendors

Internal

Efficiency

Effectiveness

Political

Variables

Members/Customer	Members of ambulance subscription funds, users of the ambulance services and customers who purchase other services from the ambulance service.
------------------	--

- Government:** Providers of the funding required as a result of the shortfall in funds raised through ambulance service operations. In most cases the various State Health Departments.
- Vendors:** Providers of IT Hardware and Software.
- Efficiency:** Measures aimed at reducing the costs of performing a particular task.
- Effectiveness:** Measures that result in achieving or better achieving the organisations mission and objectives.
- Political:** Internal pressures resulting from the power structure within the organisation.

In order to develop/implement an "effective" information system, the starting point must obviously be the decision as to "what" IS/IT is to be developed and/or implemented. As research previously quoted has shown, there has been a general difficulty in linking what is being done in IT to the corporate bottom line. Weill and Olson (1989) in six case studies, found that political

considerations significantly impacted on investment decisions. They made the point that the political considerations sometimes eclipse the technical and economic considerations and in fact were generally perceived as becoming more and more important. They also found in the case studies that the link between IT and corporate strategy varied considerably. In two of the six cases there was no link while one stated the link was purely cost-containment.

Dodgson (1989) found that a commonly voiced complaint was that the technology is oversold; the hype is such that the technology cannot achieve what it purports to achieve.

Antil (1984) noted that back in the early days of computing, i.e. 1960s, computers were very limited and could only perform one function. The cost of hardware was great and management were largely unaware of computers and needed to be convinced of the merit of their introduction. He believes, however, that as computers became more readily available and hardware costs dropped, computers became a status symbol and things reached a stage where organisations may have felt they needed to justify not having them.

Dodgson (1989) supports this. He believes that many applications are stimulated by concern for the way other companies are applying the

technology. They fear that advertisements for information technology products may be right and that they may be left behind. He also makes the point that an organisation may wish to create an impression that it is an up-to-date, efficient high technology organisation.

If it is reasonable to assume from these sorts of comments and the vagueness of the connection between IT and the corporate bottom line, that the area of IT has largely been "Technology Driven" (Technology Driven means that there is a desire or pressure to use the technology because it exists or is available as opposed to using it because it is identified as a means to achieving a desired outcome) then it is probably even more likely to be the case in organisations such as those that are the subject of this research, i.e. do not have large IT/IS departments and therefore may lack the resources necessary for sound evaluation. The first proposition for the research is:-

- (1) The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

Further, because in many instances the ambulance services will not have had

the internal structure and procedures to apply the appropriate research into possible IT solutions, it is unlikely that they would use a formal methodology in the determination of IT investments. This leads to the second proposition:-

- (2) The decision to commence a new Information System is not the result of a formal IT investment methodology.

3.2 How are Levels of IT Investments Determined?

The first step in this section is to identify whether a formal methodology is used to determine the appropriate level of IT investment. If a formal methodology is used, what is that methodology? It will then be necessary to determine if there is evidence of any conscious evaluation of an appropriate level of investment for a particular system? Is the appropriate level of investment determined by:-

External Factors

Government

Internal Factors

Political

Conscious awareness of contribution
to overall efficiency

Conscious awareness of contribution
to overall effectiveness

Availability of funds

Weill and Olson (1989) suggest that frequently the only spending guidelines managers have for IT investments are the spending levels of competing firms in their industry or a flat increment on last year's IT budget. Unfortunately, therefore, much of this investment is based on blind faith that real returns will occur.

Due to the difficulty in quantifying benefits associated with the introduction of IT, and the fact that as a result of both vendor pressure and internal political influence, organisations are often pressured into a position where they feel that

an IT solution in a particular area is the only appropriate way to go. This coupled with the nature of the ambulance services, i.e. highly emotive in that they deal with life and death situations on a daily basis, the driving factor in terms of the level of investment in a particular Information System is often the availability of finance rather than a conscious evaluation of the possible "benefits" that the amount of money will buy through its investment in IT as opposed to investing it in other areas of the service.

This leads to the third proposition:-

- (3) The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

Although Ralph Carlyle (1987 et al) was referring to large organisations in the US when he stated that corporations were unable to relate their MIS spending to the corporate bottom line, there is no reason to believe that the situation is different for Australian organisations of the size and nature of those that are the subject of this research. This then leads to the next proposition:-

- (4) Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

3.3 Do IT Investments Contribute To The Organisation's Overall Effectiveness?

As each state ambulance service will have slightly different missions and objectives, it is necessary to identify each service's mission/objectives. Following this will be an identification of the indicators (critical success factors) used by each service to measure its own performance.

An analysis will then be made of the link between each Information System and which, if any, of the key indicators that particular system is "perceived" by management to have an influence on. This category will in fact be analysed at two points in time, i.e. the perceived contribution, if any, that the system was to make PRIOR to it's actual development/implementation, and the perceived contribution of the system at the time of this research, i.e. post-implementation.

Figure 1 represents a classification of IT benefits.

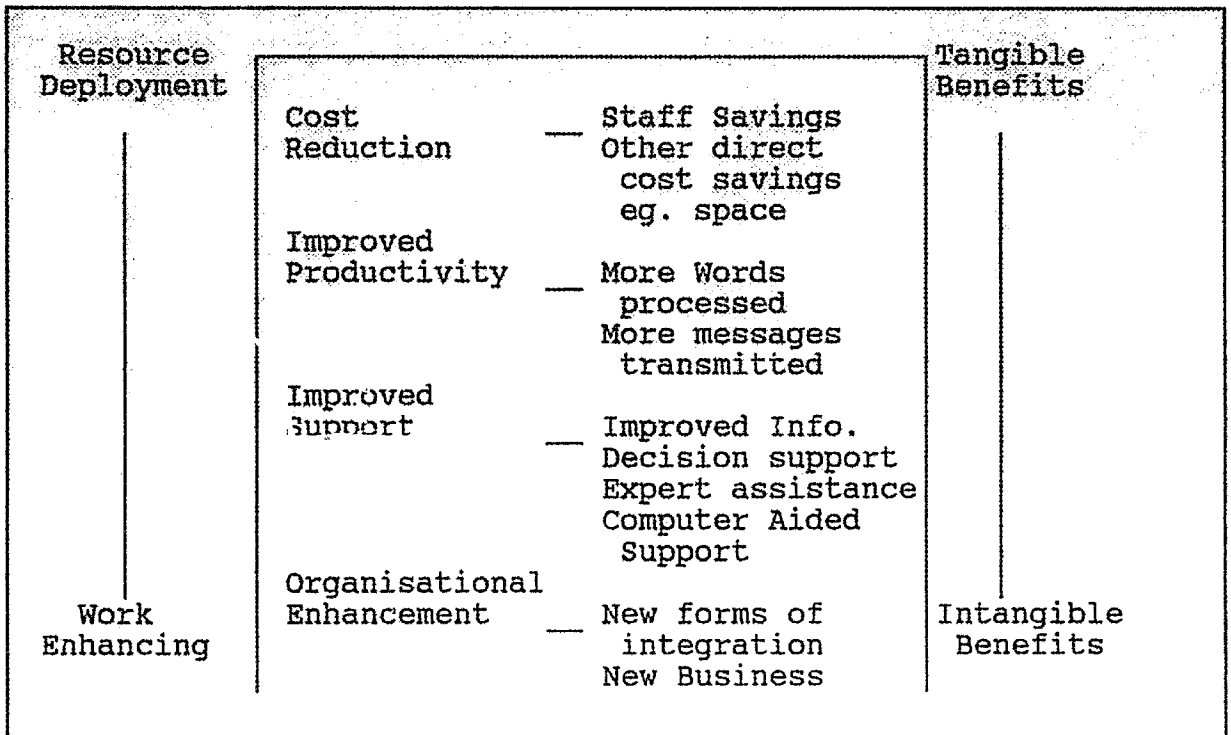


Figure 1 IT Benefits in The Office Dodgson (1989, p 12)

Figure 1 represents a guide that is used in the research to categorise the types of benefits that an organisation might receive from IT

Each ambulance service will use similar but slightly different critical success factors or performance indicators. To achieve some commonality throughout the research the performance indicators will be grouped into the following categories:-

Response Times

Does the IT/IS contribute more to the reduction of

response times than would be the case if the amount of money spent on the particular system were to be spent elsewhere within the service?

Operational Cost

per Patient

Does the IT/IS contribute more to the reduction in the operational costs per patient more than would be the case if the amount of money spent on a particular system were to be spent elsewhere within the service?

Overhead Cost

per Patient

Does the IT/IS contribute more to the reduction in the overhead costs per patient more than would be the case if the amount of money spent on a particular system were to be spent elsewhere within the service?

Quality of

Ambulance Care

Does the IT/IS contribute more to the improvement in the quality of ambulance care delivered to a patient than would be the case if the amount of money spent on a particular system were to be spent elsewhere within the service?

New Business

Opportunities:

New business opportunities include any areas for raising additional revenue, i.e. by being able to market services to additional clients, by being able to market new services etc.

Most of the performance indicators used by the different services are able to be grouped into one of these five categories. This leads to the following five propositions:-

- (5) Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service.

- (6) Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs per patient than had the investments been spent elsewhere within the service.

- (7) Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.

- (8) Investment in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.

- (9) Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service.

Variable Definitions:

Response Times: Response times are defined as the elapsed time between the ambulance service receiving a call for assistance and the time of arrival of assistance at the scene.

Operational Costs

per Patient: The operational costs per patient include costs of medical supplies used on ambulance calls, running costs of vehicles, cost of communications facilities, salaries and wages of operational staff.

Overhead Costs

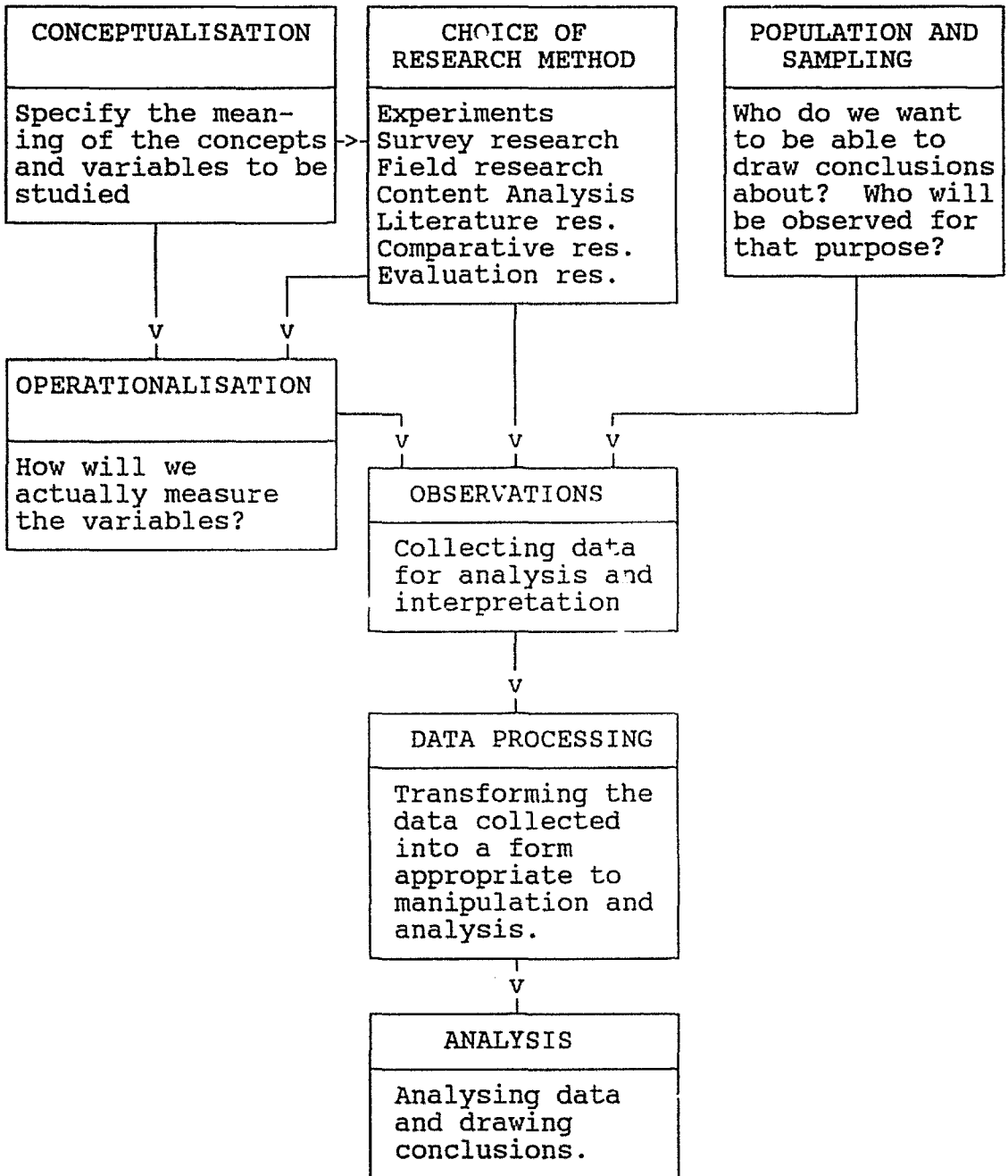
per Patient: The overhead costs per patient are all of the costs associated with running the ambulance service that are not defined as operational costs.

Quality of

Ambulance Care: The quality of ambulance care is the standard of patient assessment and management provided by the ambulance officers.

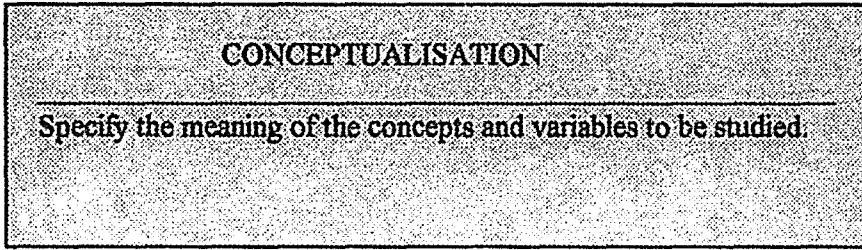
4. RESEARCH METHODOLOGY

The following is a model of the research methodology and has been adapted from Babbie 1983.

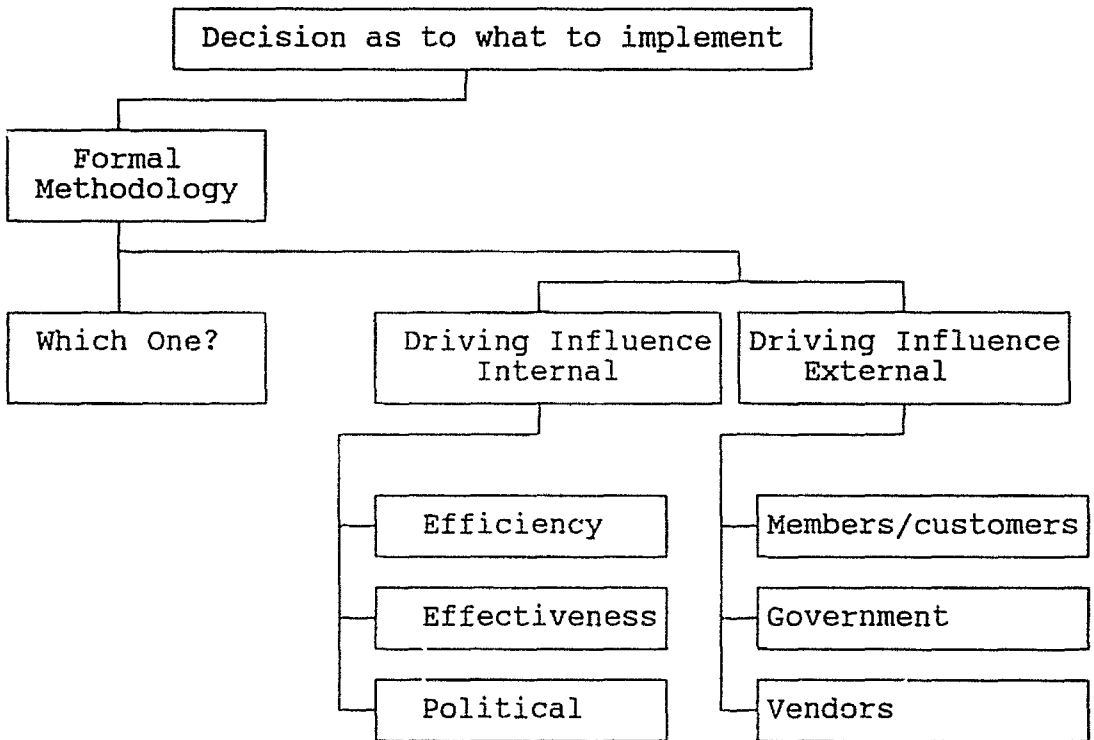


4.1 Conceptualisation

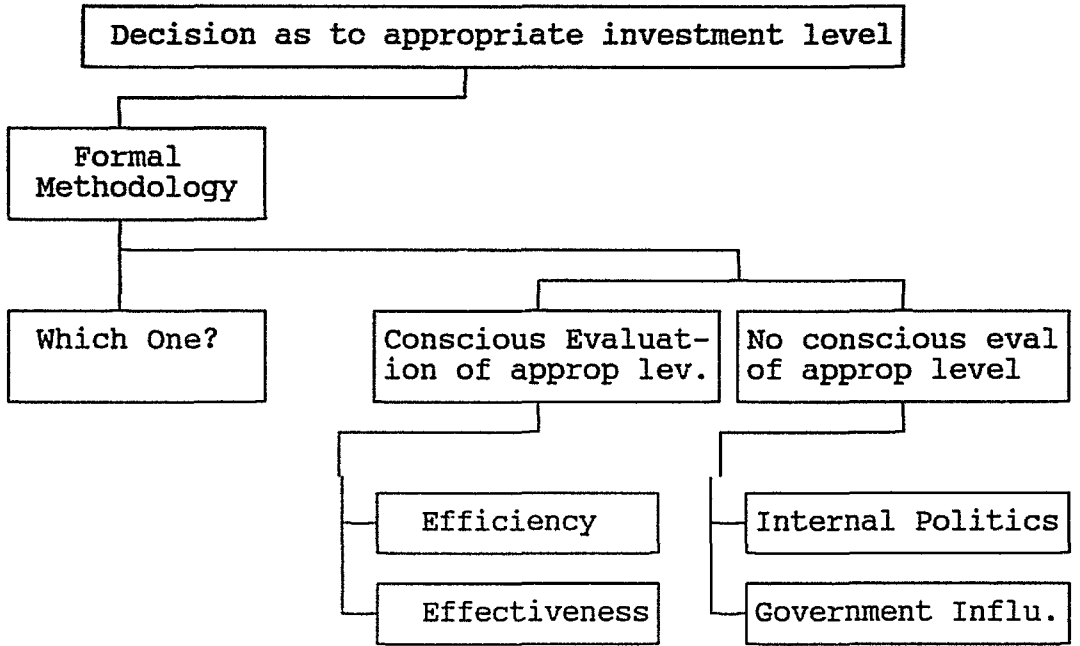
The first step in the research methodology is the conceptualisation.



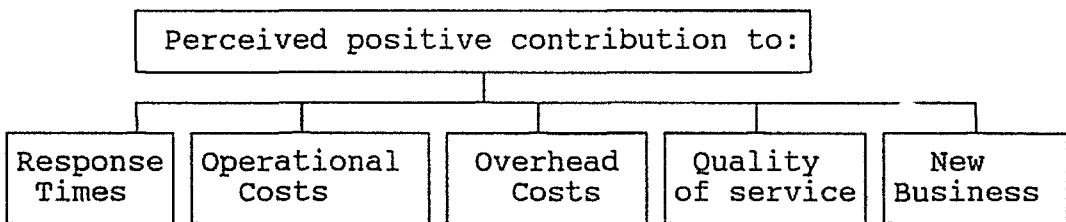
For this research, the conceptualisation is as follows:-



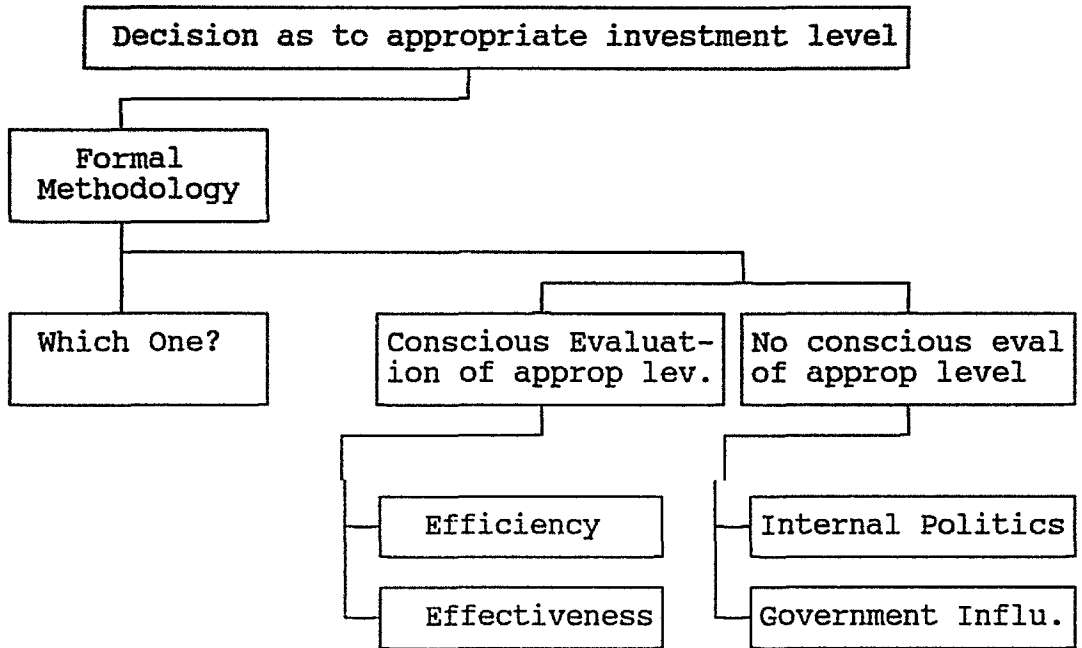
The first point in linking IT to the overall effectiveness of the organisation is to go back to the point at which the organisation decides to implement/develop a system and look at how that decision was made.



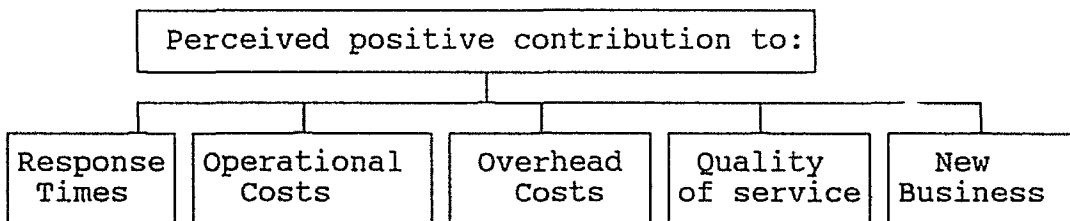
Once an undertaking has been made to proceed with a particular system, the next stage is to make a decision regarding the level of finance that will be committed to that project. A vital factor in determining the question of the contribution of IT to overall effectiveness is to ascertain how the organisation determined the level of investment that was appropriate.



In the final stage, after having looked at how the decision was made to implement a particular system and how much should be invested in that system, it is necessary to determine senior managements perception as to the



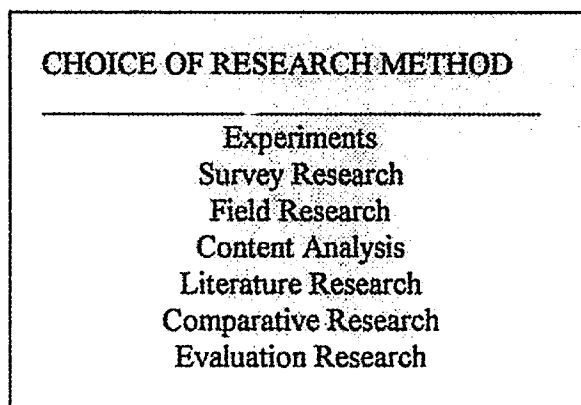
Once an undertaking has been made to proceed with a particular system, the next stage is to make a decision regarding the level of finance that will be committed to that project. A vital factor in determining the question of the contribution of IT to overall effectiveness is to ascertain how the organisation determined the level of investment that was appropriate.



In the final stage, after having looked at how the decision was made to implement a particular system and how much should be invested in that system, it is necessary to determine senior managements perception as to the

contribution of that IT to the overall performance of the organisation.

4.2 Research Method



The research design will include both survey and interview techniques. The major emphasis will be on the interviews with the survey being used to detail IS/IT being used by each service. The first contact was made via a letter of introduction from the Executive Director of the W.A. Ambulance Service to each of the other services requesting their support and co-operation in this research.

The interview is considered the most appropriate method for this research because of the subjective nature of the approach to IT effectiveness. Other techniques might not cater for this subjectivity.

4.3 Data Collection

POPULATION AND SAMPLING

Who do we want to be able to draw conclusions about? Who will be observed for that purpose?

The research was conducted on the State and Territory Ambulance Services of Australia. The subjects of the research were the Chief Executive Officers (CEO) or equivalent and the IS/IT Managers or equivalent for each service. Due to the size of the smaller services there was not always a specific position of IS/IT manager, however, the person who has responsibility for determination of IT priorities and IT investment levels was used in conjunction with the CEOs from those services.

Interviews were arranged in each state/territory with the CEO and IS/IT Manager. The interview participants were forewarned of the issues to be raised in the interview. The interview established contact and then attempted to answer the questions that related to identifying the organisation's mission and general policies towards determination of IT priorities and the determination of appropriate levels of investment in IT as well as the establishment of perceived benefits from the various systems.

Prior to the interview, the participants were given a questionnaire that aimed to gather the data on the IS/IT currently being used by the organisation. This questionnaire was completed by the IS/IT manager. Due to the support of the Executive Director from the WA Ambulance Service and the small population being studied all of the Australian Ambulance Services participated and all CEO's took part in the interviews with the exception of NSW where the IT manager was interviewed on behalf of the CEO.

4.3 Data Analysis

The data analysis follows an "Explanation-Building" analytic strategy. Yin (1988) describes this approach as a special type of pattern-matching where the goal is to analyse the case study data by building an explanation about the case. Yin describes the iterative nature of explanation-building by stating that the final explanation is a result of a series of iterations:

- making an initial theoretical statement or an initial proposition about policy or social behaviour

- comparing the findings of an initial case against such a proposition

- **revising the statement or proposition**

- **comparing other details of the case against the revision**

- **again revising the statement or proposition**

- **comparing the revision to the facts of a second, third, or more cases; and**

- **repeating this process as many times as needed.**

5. POTENTIAL BENEFITS AND LIMITATIONS

In order to be able to identify the level of effectiveness of the IT used by the Ambulance Services of Australia it is necessary to bring together the three concepts previously outlined, i.e. how each service goes about determining "what" to do and "how much" to invest in IT projects and what the perceived benefits are from that IT in terms of the service achieving its objectives and mission.

Essentially, this research is aiming to establish whether the IT that has been introduced, or has been attempted to be introduced, into the Ambulance Services over the past decade has in fact contributed to each of the organisations being more effective in terms of achieving their objectives and mission.

The study is a qualitative rather than a quantitative one in that results that will be of use in a management context, will involve the examination of a number of subjective management judgements. The results of this research will put the question of IT effectiveness into a context that will have the most meaning to managers of each of the state ambulance services, i.e. by relating IT to the overall effectiveness of each ambulance service in terms of each service

achieving or at least better achieving their respective missions.

As well as giving an insight into the question of IT effectiveness of each individual ambulance service the study will provide the means for comparison between each of the services. The organisations could be classed as typical medium sized service oriented organisations in Australia. The findings therefore may have relevance for other similar sized Australian organisations.

One of the limitations of this study is the fact that it covers a broad range of issues. There has been a need to accept many subjective answers and points of view. However, to avoid the fact that the research is both subjective and qualitative would be to avoid the whole question of the contribution of IT to the overall effectiveness of each of the Australian Ambulance Services.

Another potential limitation is the parochial nature of each state service. As this is a study and comparison of each state service there may be a desire by individual services to emphasise the "good" points and pass over the "bad" points relating to their organisation's IT.

6. ETHICAL CONSIDERATIONS

The most significant of the ethical considerations has been the need to conduct the research in a fair and open way that does not show favour or preference to any particular state service. This research is not about point scoring of any state ambulance service over another.

Although the research involved the CEO and IT manager from each service, in the case of Western Australia it involved the CEO and Finance Director as my position of IT manager with the WA Ambulance Service would leave the research open to criticism should I answer any of the research questions on behalf of the WA service.

The research will not refer to any individual by name within a particular service either in regard to decisions taken on systems that were perceived to be successful by the particular organisation or those that were considered to be unsuccessful.

7. Approach Outline

Each of the services is described in a separate case study. This means there are eight separate case studies. Each case study follows the same format and draws conclusions about the particular service and how the issues relate to the literature on the subjects being covered by the research. In the case of the study on Victoria the state has been treated as one case study even though there are six separate ambulance services in that state. The Victorian study treats the Metropolitan Ambulance Service as one service and the other five rural services as one.

Each case study gives a background to the ambulance service, its structure and relationship with government as well as an outline of its mission and objectives. The mission and objectives of each service are critical to the research in terms of the CEO making judgements about whether an IT investment has contributed to the organisation's overall effectiveness. In making that judgement, the CEO was asked to consider each system and comment on whether that system has contributed positively or negatively to the organisation achieving or better achieving its mission and objectives.

Each case study gives a general overview of the current IT in place and the

background or history of the development of IT within each service (Figure 2). The degree of detail varied considerably between services as some services, due to personnel changes, had less knowledge of the history of IT development in their organisation than others.

Following these sections which provide the overview of each organisation and their IT, each case study will put each proposition and outline the responses of the service to each of the questions that relate to each proposition. From there conclusions will be drawn for each proposition for the particular service. After each proposition has been examined there will be a summary section for each case that will work through the propositions for that service and draw a picture of the service and its approach to IT as a result of the outcomes of the nine propositions. The outcomes will then be related back to the three research questions for each service. In addition, the summary will draw comparisons with the literature and how that compares or contrasts with the service.

Following the eight case studies the conclusions section will draw together the outcomes for each of the eight services and look at the three research questions from the overall perspective. Again, this will be compared and contrasted with the literature.

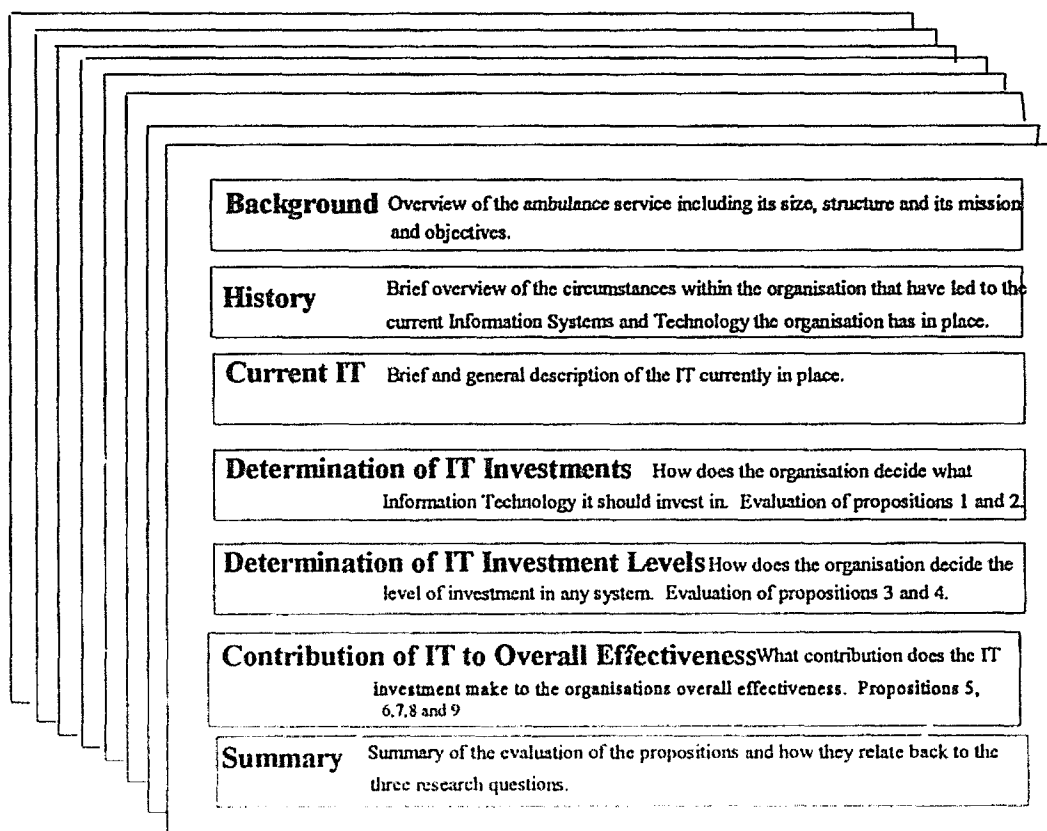


Figure 2 Overview of the structure of each of the eight case studies.

Criteria for Successful Pattern Matching of the Propositions:

Proposition 1 The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

In evaluating whether each of the ambulance services matches this proposition

the research will determine a weighting, based on the perception of the senior management representatives present at the interview. If a combination of the factors stated in the proposition, i.e. internal political factors, government influence or vendors, contributed more to the determination of an IT investment, proposition 1 will be said to be supported. In other words, if the weighting placed on internal political factors, government influence and vendors add up to more than the weighting placed on contribution to effectiveness, this proposition will be supported.

Proposition 2 The decision to commence a new Information System is not the result of a formal IT investment methodology.

In evaluating whether each of the ambulance services matches this proposition the research will determine whether a formal methodology or formal procedures were used in determining whether or not to proceed with the current investments it has in IT. It will be accepted as formal methodology or procedures if there is a structured procedure that is adhered to in deciding what Information Technology should be invested in by the organisation. The structured procedure must link back in some way to the organisation's strategic direction and/or budgetary and policy decision making processes. A formal procedure which simply evaluates one piece of information technology against

another will not be classed as a formal procedure or methodology for the determination of whether to commence a new system or technology.

Proposition 3 The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

In evaluating whether each of the ambulance services matches this proposition the research will determine whether the organisation goes through any sort of a cost-benefit analysis or any other procedure to determine what is an appropriate level of investment for any Information System or Technology. If the level of investment is decided simply on the basis of an amount of funds being available through the budgetary process this proposition will be supported.

Proposition 4 Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

In evaluating whether each of the ambulance services matches this proposition the research will determine whether the organisation consciously considers

how this system or technology will contribute to the organisation's overall effectiveness. To consider whether the IT will contribute to the organisation's overall effectiveness there will need to be some evidence or indication that the organisation has a procedure that allows it to evaluate the potential contribution a proposed investment in IT would make toward the organisation better achieving its mission and objectives, as against potential investments in other areas of the organisation that may have an equal or greater effect in terms of the achievement of the mission and objectives.

Proposition 5 Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service.

In evaluating whether each of the ambulance services matches this proposition the research will determine what systems the organisation has that would have been expected to have an effect on this area of the organisation. Once the system or systems have been identified the senior management representatives will make a judgement on whether the investment has contributed positively toward achieving that expectation. At the time of making the judgement, i.e. during the interview, the management representatives will be reminded of the

level of investment that was made in the system or systems. If the management representatives believe that the same level of investment could not have provided the same or a greater improvement in response times by being made elsewhere within the service, proposition five will be supported.

Proposition 6 Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs per patient than had the investments been spent elsewhere within the service.

In evaluating whether each of the ambulance services match this proposition the research will determine what systems the organisation has that would have been expected to have an effect on this area of the organisation. Once the system or systems have been identified the senior management representatives will make a judgement on whether the investment has contributed positively toward achieving that expectation. At the time of making the judgement, i.e. during the interview, the management representatives will be reminded of the level of investment that was made in the system or systems. If the management representatives believe that the same level of investment could not have provided the same or a greater improvement in terms of reducing operational costs per patient by being made elsewhere within the service,

proposition 6 will be supported.

Proposition 7 Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.

In evaluating whether each of the ambulance services match this proposition the research will determine what systems the organisation has that would have been expected to have an effect on this area of the organisation. Once the system or systems have been identified the senior management representatives will make a judgement on whether the investment has contributed positively toward achieving that expectation. At the time of making the judgement, i.e. during the interview, the management representatives will be reminded of the level of investment that was made in the system or systems. If the management representatives believe that the same level of investment could not have provided the same or a greater improvement in terms of reducing overhead costs per patient by being made elsewhere within the service, proposition 7 will be supported.

Proposition 8 Investment in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.

In evaluating whether each of the ambulance services match this proposition the research will determine what systems the organisation has that would have been expected to have an effect on this area of the organisation. Once the system or systems have been identified the senior management representatives will make a judgement on whether the investment has contributed positively toward achieving that expectation. At the time of making the judgement, i.e. during the interview, the management representatives will be reminded of the level of investment that was made in the system or systems. If the management representatives believe that the same level of investment could not have provided the same or a greater improvement in terms of the quality of the care given to patients by being made elsewhere within the service, proposition 8 will be supported.

Proposition 9 **Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service.**

In evaluating whether each of the ambulance services match this proposition the research will determine what systems the organisation has that would have been expected to have an effect on this area of the organisation. Once the system or systems have been identified the senior management representatives will make a judgement on whether the investment has contributed positively toward achieving that expectation. At the time of making the judgement, i.e. during the interview, the management representatives will be reminded of the level of investment that was made in the system or systems. If the management representatives believe that the same level of investment could not have provided the same or a greater improvement in terms of opening up additional sources of revenue by being made elsewhere within the service, proposition 9 will be supported.

WA Ambulance Service

Background

The WA Ambulance Service is run by St. John Ambulance Australia Inc. in Western Australia. Its correct name is St. John Ambulance Australia WA Ambulance Service Inc. The ambulance service employs approximately 450 staff that includes 260 ambulance officers state wide. Besides being the provider of the state's ambulance service, the organisation has as part of its mission the task of teaching first aid to the West Australian public. Beyond the 450 paid staff, the organisation has approximately 2,000 volunteers state wide.

The ambulance service provides ambulance cover for a state population of in excess of 1.6 million people. The metropolitan area has a population of approximately 1.2 million people. The ambulance service has a fleet of some 260 ambulances of which 60 are in the metropolitan area. There are 27 ambulance depots in Western Australia where paid ambulance officers operate and another 137 volunteer depots. During 1992/93 the WA Ambulance Service attended a total of 88,264 cases travelling a total distance of 2.7 million kilometers.

The ambulance service in the metropolitan area consists of mainly paid ambulance officers using volunteers in some outlying metropolitan areas. The country is a different story, with paid staff in seven of the larger country centres. These seven centres have backup support provided by volunteers. In the remaining sub centres the ambulance service is provided by volunteers.

The total expenditure for the WA Ambulance Service for 1992/93 was \$33 million. The cost of the service per case was \$373.87

The WA Ambulance Service has two missions. One is a general mission and the other the normal, more specific one. The general mission is:

For the service of humanity

The specific mission is:

To provide ambulance and first aid services for the welfare of the community of Western Australia, with the best use of resources.

General History of Information Technology

Prior to 1991, due to its size, the WA Ambulance Service did not have its main computer systems in-house. It had, until this point used external, bureau based services to provide the systems it required. During the latter part of the 1980's the organisation had been investigating the feasibility of bringing all its computer resources in-house and ending the relationship with the company providing the bureau based service. The reason for this was that during the 1980's there had been three different bureaus providing the service. These organisations provided various levels of service ranging from reasonably satisfactory to totally unsatisfactory. There had been a number of occasions where due to the inability of the company providing the bureau service to continue trading, the Information Systems of the ambulance service had been under threat.

Being a private organisation, senior management had acknowledged that the computer resources could only come in-house if such a move could occur within the limitations of the existing level of resources that were being used on the bureau service. Therefore, a critical factor in the timing of the in-house move was the price of the technology and when that price was going to come

down such that it would fall within those limitations. The in-house system became operational in January 1991.

Current Information Systems and Technology

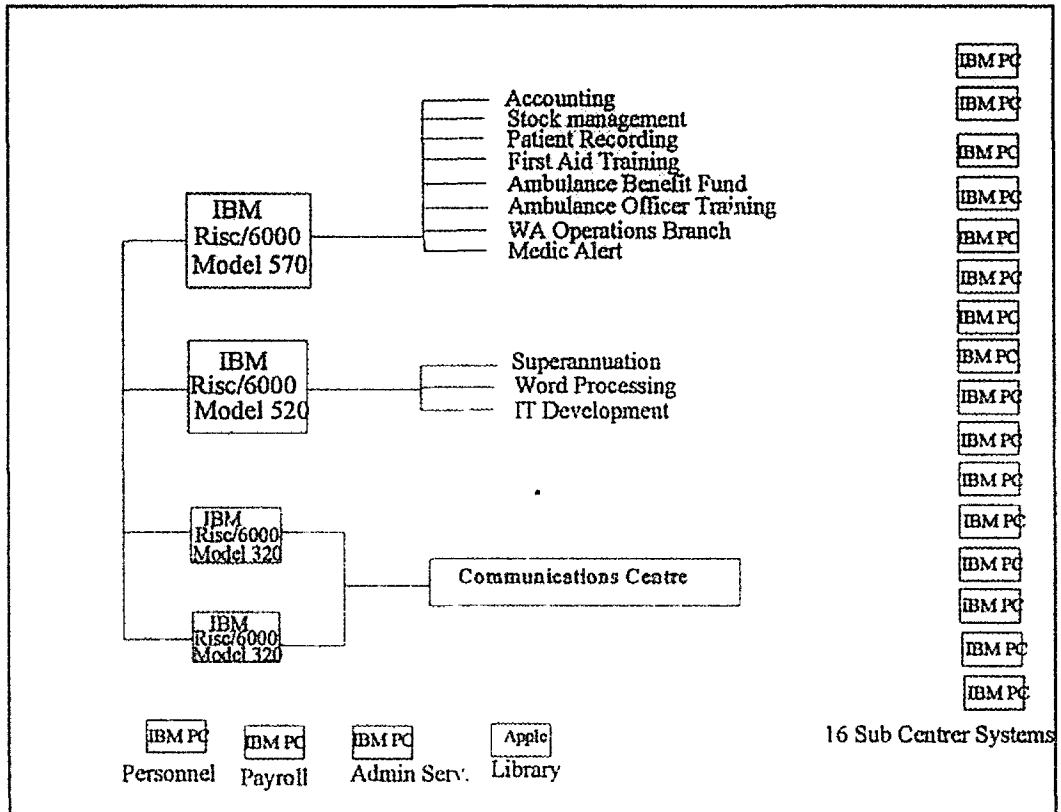


Figure 3 WA Ambulance Service Current Information Systems & Technology

The WA Ambulance Service has four IBM Risc/6000 computers running AIX. The RDMS is Informix and all systems are developed in Informix with some of the routines for the communications centre system being written in C. The four Risc boxes are connected via token ring network. The communication

centre staff use IBM X-Stations as do the programmer and system administrator. The remaining staff use ASCII terminals with the exception of a number of staff who use PCs with a terminal emulation package (Figure 3).

The WA Ambulance Service was asked to identify each system it had and estimate the cost of that system. The cost of each system was defined as the investment in both hardware and software in the system in its

<i>Accounting</i>	78,000
<i>Admin Services (PABX Analysis)</i>	4,000
<i>Ambulance Benefit Fund</i>	39,300
<i>Ambulance Officer Training</i>	18,300
<i>Communications Centre</i>	265,000
<i>First Aid Training</i>	49,500
<i>Library</i>	5,000
<i>Medic Alert</i>	26,900
<i>Patient Recording</i>	37,600
<i>Persomel</i>	3,600
<i>Payroll</i>	9,000
<i>Stock Management</i>	27,300
<i>Sub Centre Systems</i>	96,000 *
<i>Superannuation</i>	51,500
<i>WA Operations Branch</i>	27,300
<i>Word Processing (Secretarial)</i>	56,000
<i>IT Maintenance/Development</i>	83,500
* 16 systems @ \$6,000	

Table 1 Systems used by The WA Ambulance Service

existing form. The systems represent a total investment of \$877,800 (Table 1). This investment excludes the cost of annual maintenance contracts or support and also excludes the cost of any internal support. It does include the cost of all peripherals associated with each system.

The Determination of IT Investments

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

The WA Ambulance Service has gone through some significant and dramatic changes in terms of the way in which IT has been handled by the organisation. In the first half of the last decade there was no formal planning process or methodology used to determine what IT should be invested in. There were two major reasons why the organisation did not follow a formal procedure to determine IT investment priorities. The first was that as the organisation's only computer systems were on a bureau it was considered that there were not a lot of options in terms of what could be achieved with IT. The second reason was that it was considered that IT only represented a small proportion of total expenditure. As the organisation was going through significant growth and change at this time in other areas such as staff levels, training of ambulance

officers and the general quality of care as well as changes to the management structure, it was not considered that IT was a significant enough issue to force formal planning procedures. IT evolved in this organisation from a needs base. In other words, the bureau was used to address issues associated with efficiency. The accounting system was computerised because to run a manual accounting system would involve more staff. Similarly with the benefit fund and medic alert.

During the past 5 years, particularly with the advent of the in-house Information Systems, the organisation moved toward a more formal evaluation process. This formal evaluation process involved an analysis of the possible benefits of any proposed system as well as an analysis of the capability of the organisation to achieve the successful development and implementation of the proposed system within the budgetary constraints. Basically, the WA Ambulance Service realised it had the ability to achieve significant growth in terms of introducing IT. However, it also realised that it could not achieve everything that might be desired by various groups within the organisation. For this reason proposals were linked to the process of the three year plan. Proposals were examined to see what the long term implications were and where they fitted in with the organisation's three year plan.

To quote the finance director:-

[Planning actually consisted of] linking to what were considered the real issues (G. Wilson, personal communication, February 1994)

From the previous list of 17 systems, 9 were identified as having resulted from a formal planning process. These were:-

Ambulance Benefit Fund

Communications Centre System

First Aid Training

IT Maintenance/Development

Medic Alert

Patient Recording

Payroll

Sub Centre Systems

Superannuation

All of these system resulted from a planning process either in terms of their initial development or redevelopment. The other systems either happened because of some perceived need somewhere within the organisation or simply because they rode on the back of other systems. The library system, for

example, just happened. There was no real evaluation or planning. Stores (stock management) tended to ride on the back of the accounting system. The accounting system itself was an historic system and its initial computerisation was prior to the last decade.

The Driving Influence in Determining IT Investment Priorities

In determining IT investment priorities, there are a number of factors that could be said to be driving influences. The factors can be divided into two categories, namely, internal and external. The internal factors are efficiency, effectiveness and political. The external factors are members/customers, Government and vendors.

The WA Ambulance Service has mainly been driven by internal influences. Specifically, it is their belief that efficiency and effectiveness issues were their major driving factors. There was some element of internal political influence. As far as external influences, members/customers were the major driving influence with vendors having little influence and Government even less. Internal influences were rated as being 65% of the driving influence for new systems with external influences contributing 35% of the driving influence.

Table 2 gives a breakup of driving influences as perceived by senior management. At the time of giving this perception, the

<u>External</u>	<u>35%</u>	<u>Internal</u>	<u>65%</u>
Members/customers	24%	Efficiency	26%
Government	4%	Effectiveness	26%
Vendors	7%	Political	13%

Table 2 Driving Influences for Information System & Information Technology resources in the WA Ambulance Service

representatives of senior management were asked not to focus too closely on the individual systems, but rather give a perception of the overall situation. The political influence in the WA Ambulance Service is interesting as it appears to be a reasonably low figure. The explanation given for this by the Chief Executive Officer was the fact that over the past 15 years the WA Ambulance Service has had two very forceful Finance Directors who had ultimate responsibility for the IT investment decisions.

Although senior management has an overall perception as to what drives the decision to invest in various information systems within its organisation it is interesting to then specify each of those systems and get them (senior management) to recall what were actually the driving influences behind the investment in each of their systems. As far as the individual systems are concerned, senior management described the driving influence in the decision to implement each system as represented by chart 1 below.

	Customers	Gov't	Vendors	Efficiency	Effectiveness	Political
Accounting	0.3			0.3	0.3	0.1
Admin Services				1		
Amb Benefit Fund	0.3			0.3	0.3	0.1
Amb Off. Training					0.25	0.75
Comms Centre	0.2		0.05	0.3	0.3	0.15
First Aid Training	0.5			0.25	0.25	
Library						1
Medic Alert	0.3			0.3	0.3	0.1
Patient Recording				0.25	0.65	0.1
Personnel				0.8		0.2
Payroll				1		
Stock Manage.	0.15			0.25	0.25	0.35
Sub Centre Sys.				0.4	0.4	0.2
Superannuation		0.3		0.5		0.25
WA Operations				0.4	0.1	0.5
Word Processing				0.25		0.75
IT Maint/Develop.	0.15		0.05	0.35	0.35	0.1
Average	11.00%	0.01%	0.10%	40.00%	21.00%	27.89%

Chart 1 Driving Influences on Each System within the WA Ambulance Service

The comparison between the estimates of the individual systems and the estimate for the organisation generally shows that the influence that customers or members have on determining what systems are implemented is less on a system by system basis that it was perceived to be generally. The same is true of government and vendors. While senior management had identified that

neither had a large influence on determining system investments, on a system by system basis they had even less impact. Political influences were about double what they had been perceived generally. Effectiveness was less and efficiency more. Efficiency measures were the most predominant influence in determining system investment priorities on a system by system basis.

The figures in the chart below show the comparison of the ratings given by the management representatives when considering proposition one in a general sense compared with the ratings given when the systems were looked at on an individual basis.

<u>External</u>	<u>General</u>	<u>Specific</u>	<u>Internal</u>	<u>General</u>	<u>Specific</u>
Members/customers	24%	11%	Efficiency	26%	40%
Government	4%	0.01%	Effectiveness	26%	21%
Vendors	7%	0.1%	Political	13%	28%

Table 3 Comparison of Management's perception of Driving Influences on Systems showing results when considered in a general sense versus those when considered on a system by system basis.

Based on the factors outlined, the first proposition is supported for the WA Ambulance Service, i.e. the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors

than by a consideration of IT's contribution to the overall effectiveness of the organisation. Although the WA Ambulance Service was driven down the path it ultimately took in terms of IT investments, by a desire for improved efficiency, when the IT investments are looked at on a system by system basis the results show that the three variables, internal political factors, government influence and vendors, played a greater part in determining the IT investment path than did the consideration for improved effectiveness.

The second proposition is:-

The decision to commence a new Information System is not the result of a formal IT investment methodology.

Of the 17 systems identified, 9 (53%) resulted from a formal planning process.

This proposition is not supported for the WA Ambulance Service.

The Determination of the Levels of IT Investments

In the view of the Executive Director, the best way to determine the most appropriate level of investment in any new information system or technology is to ensure that you have the right people making those decisions. More specifically, when looking at the way investment levels have been determined within the WA Ambulance Service it is necessary to go back to the beginning of the last decade. The investment was on a needs basis. It involved determining how much you could get for what you could afford. Back in the early 80s hardware was expensive, but it was getting cheaper. There came a point where it was decided that the amount of money being spent on a bureau based service could be more effectively spent on an in-house system.

The rationale for the in-house system was that it would be possible to achieve far more with the available resources. The finance manager stated that:-

“The reason we adopted this approach was that money was reasonably tight throughout the 1980s. If we had gone out and spent \$1,000,000 on systems rather than \$200,000 in a year we would have had to reduce some aspect of our expenditure by \$800,000. In general terms that approach proved fairly effective in that we obtained good systems and have been able to maintain and upgrade

these systems within those boundaries.” (G. Wilson, personal communication, February 1994)

The third proposition for the case study is as follows:-

The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

From the general comment by the finance director of the WA Ambulance Service above this proposition would not seem to be supported for this organisation. At this point in the interview process, i.e. when considering the determination of the level of investment for a particular system the attention of the senior management representatives was focused on the level of investment as opposed to the decision as to whether or not to invest in a particular system. The example that was given was that if the organisation identified that it wished to achieve certain objectives with a new communications centre system and it had a range of possibilities in terms of the hardware and software that could achieve the objectives and it also had a large range of possibilities in terms of the actual functionality of the system and the various options meant that the possible cost of the system would be somewhere between \$200,000 and \$2,000,000, how would it go about deciding the appropriate level of

investment?

Senior management feel that this issue is tied quite neatly to the organisation's three year plan. As the organisation has a limited amount of funds it must first determine priorities. It would identify that there was a certain amount available for capital investments. The decision as to how much of the available capital would be allocated to any particular IT project would be determined by the priority that system had as perceived by management.

The conclusion here is that proposition three is supported, i.e. the greatest determining factor for the level of investment in any particular Information System is the availability of funds. While there is a perception that the organisation has matured to a point where IT investment decisions now and in the future, are made on the basis of an evaluation of the outcome that systems will deliver to the organisation and a comparison of that outcome to other outcomes that might be achieved if the investment is made elsewhere within the organisation, it is not the case that this has always happened in the past. Although, as stated by the finance director, there was an overriding view that expenditure on any project should be kept to the minimum necessary to implement the system, otherwise, some other investment option would need to

be reduced, there was not a process in place that evaluated an "appropriate" level of investment necessary to achieve stated objectives.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

To expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other words, if there were a proposed system that was going to cost, say, \$100,000 would the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service?

Senior management with the WA Ambulance Service feel that to some extent it is true that IT investment levels were determined by the availability of funds. There is a perception, however, that this is changing and that different questions are now being asked about the level of investment in IT. On this issue of the change in the way the service is now going about determining the level of investment in systems, the Chief Executive commented:-

"I think it is a process of osmosis. You look at a small organisation like ours over a decade where you are absorbing probably millions of dollars in Information Technology. Some of the investment levels were planned but in many cases they were forced on us. Much of the push for IT has been the perception that if you don't have a screen and keyboard on your desk you are considered old fashioned or out of touch." (I. Kaye-Eddie, personal communication, February 1994)

The WA Ambulance Service has tended to be efficiency based in the past. They believe this to be the case because they have limited themselves to certain levels of expenditure with the possible exception of two or three of the systems. Their perception is that with effectiveness questions you are talking big money. By this they mean big investments in IT but with potentially big gains. An example with this service was that if one of the more strategic systems such as communications centre or patient recording provided the

information that demonstrated that in one instance where additional capacity was required, a day ambulance would be adequate as opposed to a 24 hour ambulance, you could save about \$500,000 with that one decision. This is a similar attitude to that quoted in the Financial Times (1989):-

Asked how IT investment was justified, one Building Society manager was quoted (Financial Times 13 June 1989) as saying: "In larger projects, we mostly go by gut feel". Another summed up the overall attitude (Financial Times, 13 June 1989) with: "If it is strategic, we just do it. If it is efficiency related, we have to do a cost justification." (p. 205)

Still the question remained, how would the WA Ambulance Service go about deciding with any particular proposal for a system, whether it was appropriate in achieving the objectives of that proposal, to spend \$100,000 as opposed to \$500,000? The general feeling, was that it would be some judgement about the potential of the system. At the bottom end of the price expectation, the organisation would be looking for efficiency payback. Where the system came in at the top end or above expectations there would need to be a major effectiveness benefit potential in order to receive serious consideration. The organisation believes it has changed in this regard in the past couple of years.

Systems such as the communications centre, and patient recording systems have convinced senior management that you can actually invest in effectiveness producing technology.

Although the indications are that proposition four would not be supported for investment decisions now being made by the WA Ambulance Service, with the systems currently in place, proposition four is supported.

The Contribution of IT Investments to the Overall Effectiveness of the Organisation

The WA Ambulance Service uses performance indicators on a regular basis to monitor the performance of the service. On the issue of performance indicators, the Executive Director stated that:

“The measuring of our performance against those standards is critical in the delivery of our service to the community”. (I. Kaye-Eddie, personal communication, February 1994)

For the purposes of this research, the performance indicators used by each of the state and territory services will be grouped into five categories. These are:-

Response Times

Quality of Care

Operational Costs

New Business Opportunities

Overhead Costs

The third component of the research is where the contribution that IT has made to the overall effectiveness of the organisation is examined. This contribution is the contribution as perceived by the senior management of the organisation. The views of the CEO or his/her representative will be taken to represent the views of the organisation's senior management.

The fifth proposition for the research is that:-

Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service.

The management representatives were asked to indicate which performance indicators were expected to be influenced prior to the introduction of each system and which indicators were actually influenced. The general comment made by the finance director was that there were probably only four or five of the systems on the list that could be measured against the mission and critical success factors in the sense that they were the systems that were planned.

These are summarised in table 2:

	Response Times	Operational Cost	Overhead Cost	Quality of Care	New Business
Patient Recording	✓	✓	✓	✓	
Comms Ctr	✓	✓	✓		
Benefit Fund			✓		
First Aid Training			✓		
Medic Alert			✓		
Accounting			✓		
Stock Management			✓		

Chart 2 Systems, and the Performance Indicators those systems were expected to influence

In terms of response times, there was an expectation that the patient recording system and the communications centre system would have some impact on response times. The perception by both management representatives was that there had in fact been an actual impact on response times particularly from the communications centre system. Their perception was that the investment in these two systems definitely had contributed to a greater reduction in response

times than had that same level of investment been made elsewhere within the service. For the WA Ambulance Service then, the fifth proposition is supported.

The sixth proposition is:-

Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service.

The systems that were identified as having some impact on the operational costs per patient prior to their introduction were again the patient recording system and the communications centre system. The patient recording system had this expectation because of the geographical information it would provide that would allow appropriate planning with regard to location of ambulance depots, in addition giving a picture of the actual types of injuries and illnesses that were being encountered so that ambulance officer training could be developed so that it was directed specifically at what the service was really required to do.

Again, both of these systems are perceived by senior management to have delivered at least as much as what was expected of them and probably significantly more. The patient recording system has provided the expected geographical and clinical information that was required to plan for a more efficient ambulance service and the communications centre system has provided a means of reducing response times on non-urgent cases significantly. The result of the reduced response times is that the current level of ambulance resources are capable of handling more cases. This results in a reduced operational cost per patient than if it had not occurred. For the WA Ambulance Service, proposition number six is also supported because the perception of senior management is that investments in IT that were aimed at reducing the operational costs per patient (patient recording system and communications centre system) have resulted in a greater reduction in operational costs per patient than had the investments been spent elsewhere within the service.

The next area of performance indicator looked at was in relation to overhead costs per patient. Proposition 7 states that:-

Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.

The systems that were identified by the management representatives that had been expected to contribute to a reduction in the overheads of the organisation prior to the introduction of the system were Ambulance Benefit Fund and First Aid Training systems. These two systems had a definite efficiency expectation. Basically they were seen as ways of automating time consuming repetitive tasks that would result in staff savings as well as some other general efficiencies. The Medic Alert system could be classed similarly, although Medic Alert is actually a separate organisation as such but is administered by the ambulance service.

These systems did have the desired effect in that management's perception is that they have contributed to their respective areas running more efficiently.

The impact of the areas running more efficiently is that the overhead costs associated with running the ambulance service have been reduced. The feeling of management is that the area of efficiency is the area that Information Technology has made the greatest contribution to the WA Ambulance Service at this point in time. Even the systems identified as not having been planned as such, i.e. the accounting system and the stock management system are perceived as having contributed to an improved efficiency. Proposition 7 is therefore supported for this service.

Proposition 8 states that:-

Investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.

While the WA ambulance service has a number of systems that can be said to contribute to the quality of ambulance care, there has been only one investment made in IT with the specific objective of an improvement in the quality of care. This is the patient recording system. Although there are other systems which

have an effect on the quality of care, such as the communications centre system where reduced response times are indirectly increasing the quality of the service given to the public, the patient recording system, with its ability to monitor and analyse the management of patients by ambulance officers was expected to increase the quality of care.

The whole area of quality of care is an extremely complex one because there are so many variables contributing to the quality of care delivered by the ambulance officers. In terms of the eighth proposition, however, as there has only been one investment in IT that has had a specific expectation in terms of its contribution to the quality of care given and as that investment was quite small, senior management's perception is that the investment has contributed to a greater improvement in the quality of care than would have been the case if the investment had been made elsewhere. This then leads to the conclusion that proposition 8 is supported for the WA Ambulance Service.

The final proposition relates to the opening up of additional sources of revenue for the organisation. The WA Ambulance Service has a number of areas through which it receives its revenue. These are:-

- Charges for ambulance transport or ambulance attendance
- Contributions to the ambulance benefit fund
- Fees charged for first aid training
- Government contribution
- Miscellaneous (donations etc)

The major areas that would be classed as new business opportunities at this point in time are in the areas of benefit fund and first aid training. There may also be additional business opportunities for the ambulance service in providing patient transport for patient categories not previously carried by ambulances.

Up until now the WA Ambulance Service has not invested in Information Technology with the aim of that Technology generating new business opportunities. While this is identified as an issue that has and will become more relevant it has not been an issue in the past. For this reason the ninth proposition:-

Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments

been spent elsewhere within the service.

cannot be evaluated in relation to the WA Ambulance Service at this time.

Summary

The WA Ambulance Service spends approximately 1.5% of gross expenditure on Information Technology. The history of IT within the organisation, whilst going through some rocky patches in the days of the bureau based service, has been one of stability and steady growth with conservative approaches and expectations. There have been no "disasters" as such, in terms of projects that have simply not worked or have consumed significantly more money and resources than expected.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation, is supported because even though the service has in the past placed significant emphasis on using IT to improve efficiency, the investment in IT based on a system by system

approach, led to the conclusion that the combined influence of internal political factors, government influence and vendors was greater than the consideration of a contribution to effectiveness.

The second proposition that the decision to commence a new Information System is not the result of a formal investment methodology, is not supported, as 53% of the systems in this service resulted from a formal planning process.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is supported for the service in terms of its existing investment although the situation has changed and levels of investment are monitored more closely now from the point of view of examining alternative investment options with a view to maximising the organisation's effectiveness. This proposition could easily be confused for the WA Ambulance Service because, although it did consider the issue where investing in IT at any particular point in time meant that a certain amount of capital would not be available to invest in other areas, there was no process that evaluated the optimal level of investment required to achieve the desired outcomes in terms of IT.

The fourth proposition that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System is supported. Although it has been one of the significant factors in determining what to do, the decision as to the appropriate level of investment has not involved a procedure that evaluates the possible outcomes from that investment against alternate investments which may provide a greater enhancement in terms of the organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service, is supported because the two systems concerned, i.e. the patient recording system and the communications centre system have contributed to lower response times than would have been the case without the system or had a similar level of investment be made elsewhere in the service with the same objective.

The sixth proposition is that investments in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than

had the investments been spent elsewhere within the service. Again this proposition was shown to be supported for the WA Ambulance Service.

The seventh proposition that investments in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service is also supported for this service. This is particularly so because the WA Ambulance Service has always tended to have a strong focus on the issue of efficiency in relation to its Information Technology.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service is also supported for Western Australia.

Proposition 9 that investments in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service cannot be addressed in relation to the WA Ambulance Service because there are no systems that have been implemented with that goal or expectation.

The significance of the findings in relation to the research propositions is that despite the fact that the determination of IT investments has been influenced to a greater extent by internal political factors, government influence or vendors than by a consideration of IT's contribution

Proposition 1	Supported
Proposition 2	Not Supported
Proposition 3	Supported
Proposition 4	Supported
Proposition 5	Supported
Proposition 6	Supported
Proposition 7	Supported
Proposition 8	Supported
Proposition 9	N/A

Table 4 Summary of the results for each proposition for the WA Ambulance Servi

to the overall effectiveness of the organisation the intent of each of the systems, i.e. the aspects of the organisation that would be expected to be affected positively, have been affected that way. In the case of Western Australia perhaps the fact that proposition two was not supported and that the decision to commence a new Information System was the result of a formal IT investment methodology or plan has contributed to the perceived success of the systems.

Similarly, although propositions three and four were supported, i.e. that the greatest determining factor in the level of investment for each particular system was the availability of funds and the least determining factor was an

assessment of the investment options associated with that level of investment, upon reflection, the organisation's senior management consider that the investments have contributed more toward the organisations performance indicators and critical success factors that had the same level of investment been made elsewhere within the organisation. The experience in terms of investment levels for the WA Ambulance Service support the finding of Weill and Olson (1989) that frequently the only spending guidelines managers have for IT investments are the spending levels of competing firms in their industry or a flat increment on the previous years budget. They make the point that unfortunately much of the investment is based on blind faith that real returns will occur.

Although many organisations, no doubt including the WA Ambulance Service, would have difficulty with the concept that proposition four is supported for their organisation, i.e. that the least determining factor for the level of IT investment in any particular Information System is the concern for the overall effectiveness of the organisation, the proposition supports the point put by Ralph Carlyle (1987) that corporations were unable to relate their MIS spending to the corporate bottom line. That being the case, if MIS spending cannot be related to the corporate bottom line, how could it be argued that the

determination of IT investment levels takes into account the overall effectiveness of the organisation?

Howard Rubin (1991) sums up the situation when he states that the whole area of the measurement of IT effectiveness is shifting from a technical focus to a business focus. He talks about the need for IT people to "connect" to the business. He states that people are no longer asking how much output they get from their IT investment but rather are evaluating that outcome. This certainly appears true for the WA Ambulance Service as the need to evaluate the "outcome" of IT investments is now clearly seen as an objective.

Tasmanian Ambulance Service

Background

The Tasmanian Ambulance Service is run by the State Government via the Department of Health and Community Services. The service employs just over 150 staff and relies on the voluntary contribution of over 240 members. The Tasmanian Service covers a population of 469,200 statewide. The service has a fleet of 72 ambulances operating from 30 ambulance stations statewide. Of these 17 stations are manned by volunteers.

The Tasmanian Ambulance Service attended 36,230 ambulance cases throughout the state during the 1992/93 financial year. This means ambulance services were provided to 772 people per 10,000 of total population. The total expenditure for the Tasmanian service during this period was \$10.3 million. The cost per case was \$284.29.

The mission of the The Department of Health and Community Services is:-

Working together to deliver integrated services for the health and well being of the people of Tasmania.

There are certain values that support that mission and there are some three year goals for the department. Within these goals, integration and co-ordination of services based on a needs based service is one of the goals.

The Ambulance Service must then fit their business plan or strategic plan within these goals.

The mission of the Ambulance Service is to provide an integrated and high quality emergency care, rescue and transport service.

The ability of the Ambulance Service to do that is constrained by the Ambulance Service Act of 1982 which deals with the functions of the director of the Ambulance Service.

The Ambulance Service attends approximately 34,000 cases and transports approximately 28,000 patients each year. The past few years have seen a number of structural changes made to this service. This restructuring has seen them move from the Department of Health to the Department of Police and Emergency Services and The State Fire Commission and then back to the Department of Health and Community Services. Over the past 2 to 3 years the

operations of their communications centres have been consolidated into one communications centre to service the whole state. As mentioned, the provision of the Ambulance Service involves the use of both paid and volunteer ambulance officers. It is their view that this tiered arrangement ranging from fully paid crews in high workload environments to volunteer first response units in isolated rural communities provides a unique ability for the Ambulance Service to respond to the dispersed nature of the Tasmanian Population. The Tasmanian Ambulance Service believes that communities receive a much higher level of protection than could otherwise be provided because they are able to participate in the operation of the Ambulance Service in their area.

General History of Information Technology

In looking at the Information Technology resources of the Tasmanian Ambulance Service it needs to be remembered that the service is a part of the Health Department and in fact is one of the Health Department's "programs". Resultant of this, many of the Information Technology resources are not solely owned and operated by the Tasmanian Ambulance Service but rather the

Service uses Health Department facilities. The Tasmanian Ambulance Service does not have any specific IT staff positions. There is a systems administrator responsible for the communications centre system. This position also involves other duties. There is a programmer available at the Health Department, however, his time is not spent exclusively on Ambulance Service work. The estimate of the Health Department is that he spends 10% of his time on Ambulance Service work.

Most of the systems used by the Tasmanian Service originated from or through the Health department. An exception is the communications centre system which was actually designed and developed by an ambulance officer.

Current Information Systems and Technology

As the ambulance service uses a number of state wide government systems the structure of their Information Technology resources is reasonably complicated for a service of their size (figure 4).

Ambulance Service Access To Information Technology Resource

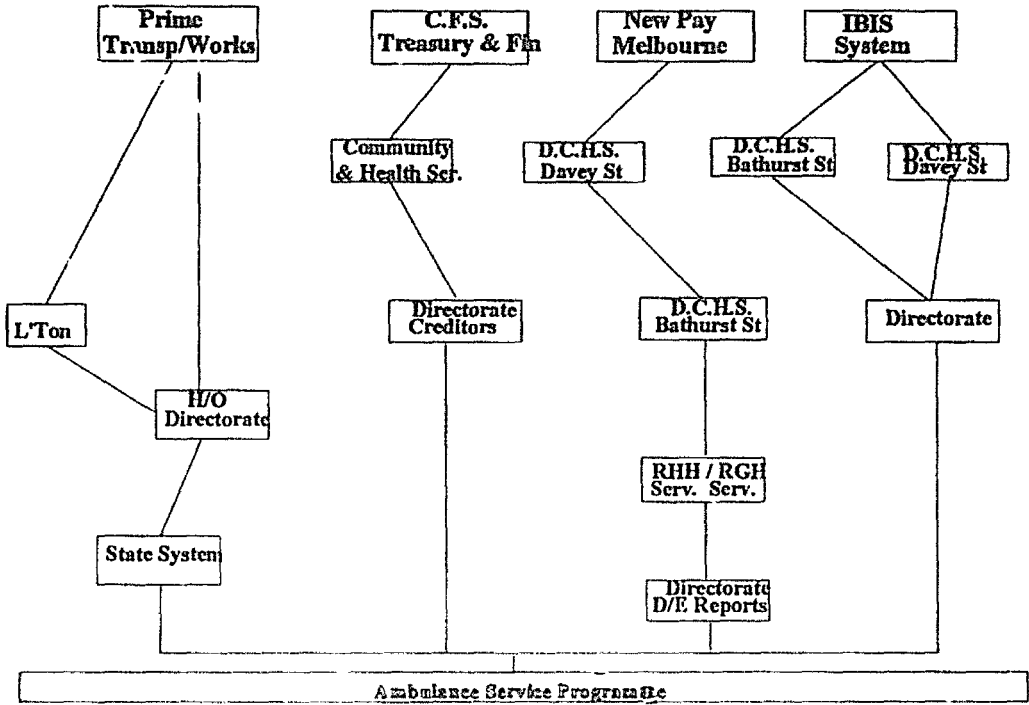


Figure 4 Tasmanian Ambulance Service access to Government Information Technology Resources

The ambulance service itself has the following Information Technology Resources:-

12 Printers

21 Personal Computers

6 ASCII Terminals

This hardware is used for the word processing and spreadsheet analysis, the CADIS system and to access the other Government systems as outlined above.

The Tasmanian Ambulance Service was asked to identify each system (Table 5) it had and estimate the

<i>Accounting</i>
<i>CADIS</i>
<i>Patient Recording (under development)</i>
<i>Payroll</i>
<i>Library</i>
<i>Word Processing PCs (Secretarial)</i>
<i>Spreadsheet Analysis (Management)</i>

Table 5 Identified Systems used by the Tasmanian Ambulance Service

cost of that system. The cost of each system was defined as the investment in both hardware and software in the system in its existing form. The systems in table 6 represent a

total investment of \$340,000. This investment excludes the cost of annual maintenance contracts or support and also excludes the cost of any internal support. It

<i>Communications Centre</i>		<i>250,000</i>
<i>Word Processing</i>		
<i>(9 PCs @ \$3,500 = 31,500)</i>		
<i>(9 copies Word = 3,500)</i>		
<i>(Printers = 13,500)</i>		<i>48,500</i>
<i>Accounting - Spreadsheet Analysis</i>		
<i>(6 PCs @ 3,500 = 21,000)</i>		
<i>(6 Copies Excel = 3,000)</i>		
<i>(Printers = 9,000)</i>		<i>33,000</i>
<i>Library</i>		<i>8,500</i>

Table 6 Systems that the Tasmanian Ambulance Service were able to put a value on the level of investment.

does include the cost of all peripherals associated with each system but as can be seen by comparing the contents of each box, it has not been possible to put a value on some of the systems that are Department of Health and Community Services systems which the ambulance service uses.

The difficulty with this exercise for the Tasmanian Ambulance Service was that because of the use of state wide systems from other departments, it was very difficult to ascertain the level of investment the ambulance service had made in some of those systems. In many cases, the investment would be non-existent or negligible while in others it is not.

The Determination of IT Investments

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

The Tasmanian Service has mainly been driven by internal influences. The perception of the CEO is that the major factor is improved effectiveness. Table 7 gives a breakup of the driving influences as perceived by senior management.

<u>External</u>		<u>Internal</u>	
Members/customers	20%	Efficiency	20%
Government	3.3%	Effectiveness	50%
Vendors	3.3%	Political	3.3%

The figures given here were given as a result of the CEO being asked to consider the

Table 7 Driving Influences for Information System & Information Technology resources in the Tasmanian Ambulance Service

systems overall without focusing specifically on any one system. The main issues for the Tasmanian Service, as identified by their senior management, are efficiency and effectiveness.

The initial perception, then, of senior management is that this proposition is not supported for the Tasmanian Service. The senior management representatives were asked to consider each of the variables in relation to each system rather than considering them in an overall sense. Chart 3 below shows the results on a system by system basis.

	Customers	Gov't	Vendors	Efficiency	Effectiveness	Political
Accounting		100%				
CADIS			20%	40%	40%	
Patient Record	50%				50%	
Payroll/personnel		100%				
Word Processing				99%		
Financial Analys. (Spreadsheet)				99%		
Library		100%				
Executive Mail			100%			
Exec Comms			100%			
HR Org Design						
Clinical Audit						
Average	5.5%	33.4%	24.4%	26.4%	10%	0%

Chart 3 Driving Influences on Each System within the Tas. Ambulance Service

The results from this chart give a completely different picture to the results when the variables are considered in a general overall manner.

The figures in table 8 show the comparison of the ratings given by the senior management representatives when considering proposition 1 in a general sense compared with the ratings given when the systems were looked at on an individual basis.

<u>External</u>	<u>General</u>	<u>Specific</u>	<u>Internal</u>	<u>General</u>	<u>Specific</u>
Memb./customers	20%	5.5%	Efficiency	20%	26.4%
Government	3.3%	33.4%	Effectiveness	50%	10%
Vendors	3.3%	24.4%	Political	3.3%	0%

Table 8 Comparison of Management's perception of Driving Influences on Systems showing results when considered in a general sense versus those when considered on a system by system basis.

The results from the detailed chart show quite clearly that proposition 1 is supported for the Tasmanian Service, i.e. the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation

The Driving Influence in Determining IT Investment Priorities

The second proposition -

The decision to commence a new Information System is not the result of a formal IT investment methodology.

In terms of whether or not a formal methodology is used to determine the IT investment priorities, i.e. the determination of what is going to be done and when, the Tasmanian Ambulance Service CEO indicated that the answer was sometimes yes and sometimes no. The department of Health and Community services has an overarching Information Systems management committee. What this means is that there are some departmental processes that must be gone through in terms of providing strategic plans and defining information systems needs is one of those strategic plans. Technically, each department is supposed to have an information management plan. The reality, however, is that it does not really exist in most departments. The ambulance service itself is supposed to have an information systems strategic plan but every time they start one they believe the goalposts are moved. The result is that they don't have one.

In terms of identifying opportunities for the use of information technology that is part of the sub program plans, the CEO stated:-

“The reality on the ground is that if someone says we are up the putt if we don't have an upgrade in terms of IT as recommended by consultants and they are not going to be able to operate [without that upgrade], I'm not going to say "Oh dear, you will have to do a major cost benefit analysis first". This is especially true where the proposal is only minor works stuff.” (M. Hargraves, personal communication 15 February 1994).

The CEO stated that where the project was not minor works it would be expected that a complete cost benefit analysis would be done. This was not the case, however, with the last major project undertaken by the Tasmanian Service, which was the complete replacement of the Computer Aided Dispatch system. What they believe probably happened was that there would have been a back of the envelope calculation done.

In the future the service plans to use the cost benefit analysis guidelines that were developed by the government computer advisory committee. These guidelines will allow proper post-implementation review as well as proper pre-implementation analysis of expectations about outcomes.

The situation, then, with the current IT investment is that there were not formal procedures or methodologies followed but rather, the systems have come about

in an ad hoc fashion. This would support the second proposition even though the intention within the Tasmanian Service is that there should be a formal process of evaluation and determination particularly for major projects. For Tasmania the second proposition is supported, i.e. the decision to commence a new Information System is not the result of a formal IT investment methodology.

The Determination of the Levels of IT Investments

The third proposition for the case study is:-

The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

The CEO was asked whether or not there was a formal methodology or formal process followed in determining the appropriate level of investment for a proposed system or technology within the organisation. In considering this question the CEO was asked to focus on the overall situation. In other words how the organisation generally approached this question. The situation with

the Tasmanian service is that although there is a formal process it is rarely used. There is, however, a clear intention to use a formal approach to the determination of the level of investment in IT in the future. The department of Health and Community services has come up with a prototype template for cost benefit analysis for all agencies. In the future this will be used in conjunction with the more detailed guidelines on Cost Benefit Analysis that have been established by the CEO. It was the situation, then, within the Tasmanian Service that the third proposition was supported, i.e. that the greatest determining factor for the level of investment in any information system or technology is the availability of funds.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

Again, to expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other

words, if there were a proposed system that was going to cost, say, \$100,000 would the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service?

The representatives from the Tasmanian Service were asked to consider each of their existing systems and consider which variable from a list of variables, influenced the level of investment made in each system. This question differed from the previous question in that it was asking the CEO to focus on each particular system that was currently in place. The responses further confirmed proposition number three, i.e. that the greatest determining factor for the level of investment in any particular Information System is the availability of funds. The Tasmanian Service had identified, with their Computer Aided Dispatch system that by spending X on the system the service would save Y and X was significantly greater than Y. This would indicate a conscious awareness of the contribution of the proposed system to the organisations overall efficiency. There was no evidence as to what consideration was given to the contribution of each system to the organisation's effectiveness, in other words, the

investments as they were being considered for various IT projects were not considered on the basis of "is spending this amount on this project the best way to ensure that we are maximising the achievement of our mission?"

This leads to the conclusion that proposition four is supported for Tasmania. Although, to use the example they quoted, spending X on a system would save Y and X was significantly greater than Y, was it true that spending X to save Y was the greatest way to enhance the service's ability to achieve or better achieve its mission. Although they may have saved Y, had they spent X elsewhere they may have achieved a better outcome in terms of the organisation's effectiveness.

Contribution To The Organisations Effectiveness

Although the actual contribution of each system to the organisation's overall effectiveness may not be a conscious consideration at the time of deciding to proceed with a particular Information System or Technology, it would be reasonable to assume that there is an underlying belief that this is the case. The next part of the research seeks to ascertain the view of the CEO in terms

of whether the levels of investment that have been made in each of the systems and in Information Technology generally have contributed toward the organisation being more effective. The definition of whether a system contributes to the organisation's overall effectiveness is whether it contributes toward the organisation achieving its mission to a greater degree than would have been the case without that system or technology.

The Tasmanian Service has its mission as previously stated which is "to provide an integrated and high quality emergency care, rescue and transport service". For an Information System or Technology to contribute to the organisation's overall effectiveness it would have to contribute toward the service better achieving this mission than would have been the case without the system or technology. Each service will measure various factors as a means of monitoring how well it is achieving its mission. While each of the services may have different terms or names for the critical success factors or performance indicators it uses, each will have some factors. In the case of the Tasmanian Service it refers to its performance indicators as outcomes.

The Tasmanian Service identified the accounting system as one that would be expected to contribute to the program management. (The ambulance service

is referred as a program within the Department of Health and Community Services). There is also a clear expectation that the accounting system contributes to good on-going relations with external providers. In terms of categorising which of the five generalised performance indicators used for this research, the accounting system would be expected to contribute to, the answer would be the operational cost per patient and the overhead cost per patient.

The CADIS (Computer Aided Dispatch System) contributes positively to emergency care services. The outcomes and outputs that result from emergency care services are "a reduction in preventable death and disability caused by injury or other acute medical conditions through delivering trained ambulance officers to the location of the patient, rescuing if necessary, treating the patient on site and en-route while transporting them as rapidly as possible to the nearest appropriate medical facility." There are also indicators that relate to efficiency and these include the convention of ambulance authorities decision to monitor response times and other indicators. The CADIS system will allow Tasmania to do this. In terms of the five generalised indicators used for this research the CADIS system would be expected to contribute to the first four, i.e. Response times, operational costs per patient, overhead costs per patient and quality of ambulance care.

The patient recording system is still very much experimental and as such comments could only be made in relation to expectations. Based on the expectations the patient recording system will be expected to make a positive contribution in terms of improvement with operational costs per patient, overhead costs per patient and quality of care.

With the payroll/personnel system the expectation of this system was that it would contribute to the organisation's efficiency. Therefore it would be expected to reduce the overhead cost per patient. There is little doubt in the mind of the CEO that this is the case.

The word processing and spreadsheet (financial analysis) tools were introduced with the aim of improved efficiency, i.e. contributing to a reduction in overhead costs per patient. The library system is a state wide system that is imposed upon the ambulance service by the Department of Health and Community services and therefore there were no expectations in relation to this system.

There was an expectation that the E-mail system would improve executive efficiency by 20% as this was the sort of improvement identified as being

needed to justify the investment. The Tasmanian Service has doubts about the measurement of this objective as the system currently has excessive periods of down time. There is another executive communications system called Exec Comms which has a similar story to E-mail.

Table 9 below summarised the systems and the performance indicator that system would effect:

	Response Times	Operational Cost	Overhead Cost	Quality of Care	New Business
Accounting		✓	✓		
CADIS	✓	✓	✓	✓	
Patient Recording		✓	✓	✓	
Payroll/HR			✓		
Library					
Word Processing			✓		
Spreadsheet			✓		
E-mail			✓		

Table 9 Systems and the Performance Indicators those systems were expected to influence

Having identified the area in which the Information System or Technology was expected to effect the organisation, i.e. what performance indicator was expected to be effected the CEO was asked to identify whether or not the system had made a positive contribution to the organisation. The way in which

the CEO was asked to determine whether or not the contribution was positive was to consider whether or not the same level of investment made elsewhere within the service would be expected to provide a greater contribution to the organisation in terms of the organisations better achieving its mission. Table 10 gives a summary of the perceived positive or negative contribution of each system:

Accounting	+
CADIS	+
Patient Recording	+
Payroll	+
Library	+
Word Processing	+
Spreadsheet	+
E-Mail	+

Table 10 Positive or Negative Contribution of each system as perceived by senior management.

The Tasmanian Service has only invested in one system which was expected to have a direct impact in terms of a reduction in response times. This was the CADIS system. In view of the fact that the CEO's perception is that the contribution of the CADIS system is positive, proposition number 5, which is that "Investment in IS/IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than

had the investments been spent elsewhere within the service, is supported for the Tasmanian Ambulance Service.

Proposition number 6 states that "Investment in IS/IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service". The Tasmanian Service has three systems which were expected to contribute to a reduction in operational costs per patient. These systems are the accounting system, the CADIS system and the Patient Recording system. Once again, in the view of the CEO each of these systems has contributed positively toward the achievement of the organisation's mission. Proposition 6 is therefore supported for the Tasmanian Service.

Proposition 7 is that "Investments in IS/IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service. Most of the systems in the Tasmanian Service are directed at efficiency measures which means they would be expected to contribute to this performance indicator. The systems specifically identified as being expected to contribute to this category of performance indicator were accounting, CADIS, patient recording, payroll,

library, word processing and spreadsheet. The library system was identified as not being specifically expected to contribute to any of the indicator categories, however, it was said to be making a positive contribution. All of the systems were said to be making a positive contribution therefore proposition number 7 is supported for the Tasmanian Service.

Two systems were identified as being expected to influence the category of performance indicator relating to the quality of ambulance care. These two systems were the CADIS system and the Patient Recording System. Once again these two systems were seen as making positive contributions and therefore for the Tasmanian Service proposition number 8 is supported.

The Tasmanian Service did not identify any systems that were expected to influence the category of performance indicators relating to new business opportunities. No conclusion can therefore be reached in relation to this proposition for the Tasmanian Service.

Summary

The Tasmanian Service is not able to specify exactly what it spends on IT due to the fact that IT resources are provided by the Health Department. The Tasmanian Service is in the process of trying to implement a more formal approach to IT planning both in determination of priorities and investment levels. The difficulty it faces is that it is a part of the Department of Health and Community Services in terms of its IT planning and has to try and deal with a situation where each time an IT strategic plan is commenced the requirements of the Department of Health and Community Services change.

Although there have been difficulties in trying to formalise the planning approach to IT, there was no evidence that Tasmania had experienced any disasters in terms of investing significant amounts in IT and then finding that a project was unworkable or did not deliver the outcomes required. The IT in this service has tended to follow a steady evolutionary development.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution

to the overall effectiveness of the organisation, is supported. Although when considered in a general sense, the senior management representatives did not think this was the case, looking at the variables on a system by system basis clearly indicated that it was the case.

The second proposition that the decision to commence a new Information System is not the result of a formal investment methodology is supported in this service as most of the systems have come about in an ad-hoc fashion. It is identified as a problem by the service and as such there are plans to formalise the decision making process in the near future.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is supported for the service in terms of its existing investment although the situation is to be changed and levels of investment will be monitored more closely now from the point of view of examining alternative investment options with a view to maximising the organisation's effectiveness.

The fourth proposition that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System is supported because although it has been one of the significant factors in determining what to do when the decision is made as to the appropriate level of investment, there has not been a procedure that evaluates the possible outcomes from that investment against alternate investments that may provide a greater enhancement in terms of the organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service, is supported.

The sixth proposition is that investments in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. Again this proposition has been supported for the Tasmanian Service.

The seventh proposition that investments in IT to reduce the overhead costs

per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service is also supported for this service.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service is also supported for Tasmania.

Proposition 9 that investments in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the

service cannot be addressed in relation to the Tasmanian Service because there are no systems that have been implemented with that goal or expectation.

Proposition 1	Supported
Proposition 2	Supported
Proposition 3	Supported
Proposition 4	Supported
Proposition 5	Supported
Proposition 6	Supported
Proposition 7	Supported
Proposition 8	Supported
Proposition 9	N/A

Table 11 Summary of the results for each proposition for the Tasmanian Ambulance Service

The significance of the findings in relation to the research propositions is that despite the fact that the determination of IT investments has been influenced to a greater extent by internal political factors, government influence or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation the intent of each of the systems, i.e. the aspects of the organisation that would be expected to be effected positively, have been effected that way.

Once again, the organisation's senior management consider that the investments have contributed more toward the organisation's performance indicators and critical success factors than had the same level of investment been made elsewhere within the organisation, as was the case in Western Australia. This was despite the fact that propositions 3 and 4 were supported, i.e. that the greatest determining factor in the level of investment for each particular system was the availability of funds and the least determining factor was an assessment of the investment options associated with that level of investment, The experience in terms of investment levels for the Tasmanian Ambulance Service also support the findings of Weill and Olson (1989).

The Tasmanian Ambulance Service, would have difficulty with the concept that proposition 4 is supported for their organisation, i.e. that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System, the proposition supports the point put by Ralph Carlyle (1987) that corporations were unable to relate their MIS spending to the corporate bottom line. Ralph Carlyle's comment is particularly true for Tasmania as a result of the way the IT resources are structured it is extremely difficult to gain an accurate picture of the investment levels in the IT that is being used by the service because of the complicated structure that exists with it using resources from a number of Government agencies.

Again, the point made by Howard Rubin (1991) where he sums up the situation by stating that the whole area of the measurement of IT effectiveness is shifting from a technical focus to a business focus seems appropriate here. Where he talks about the need for IT people to "connect" to the business and states that people are no longer asking how much output they get from their IT investment but rather are evaluating that outcome, he is making comments that appear true for the Tasmanian Ambulance Service as the need to evaluate the "outcome" of IT investments is now clearly seen as an objective. The difficulty for the

Tasmanian Service will be trying to evaluate that outcome against the resources that must be committed when it is so difficult to get a picture of those resources and in many cases the control the Tasmanian Service has over IT direction is somewhat limited.

Queensland Ambulance Service

Background

The Queensland Ambulance Service (QAS) is one of the departments of the Queensland Emergency Services (QES). The Ambulance Service has undergone significant and rapid changes over the past three to four years. Prior to the commencement of the changes a few years ago, the Queensland Ambulance Service had a body known as the Queensland Ambulance Transport Board which was responsible for overseeing the operations of in excess of 90 separate and autonomous ambulance services. Approximately three years ago a major restructure saw these separate organisations become one organisation known as the Queensland Ambulance Service. A further restructuring, the result of a government initiative, saw the ambulance service, fire service, counter disaster services, and state wide services come under the one umbrella known as the Queensland Emergency Services.

The Ambulance Service provides cover for a population of 3,023,296 of which 1,354,767 are in the metropolitan area. The service operates a fleet of 649 ambulances and 54 clinic vehicles. There are 184 ambulance stations from

which paid ambulance officers operate and 22 volunteer stations. Additionally there are 13 communication centres.

The Ambulance Service attended a total of 483,311 cases statewide during 1992/93. This involved a total distance of travel of 11.8 million kilometres.

The service employs a total of 1,483 ambulance officers and has another 454 volunteers. There is a support staff of approximately 190.

The organisational chart of the Queensland Emergency Services is as follows:-

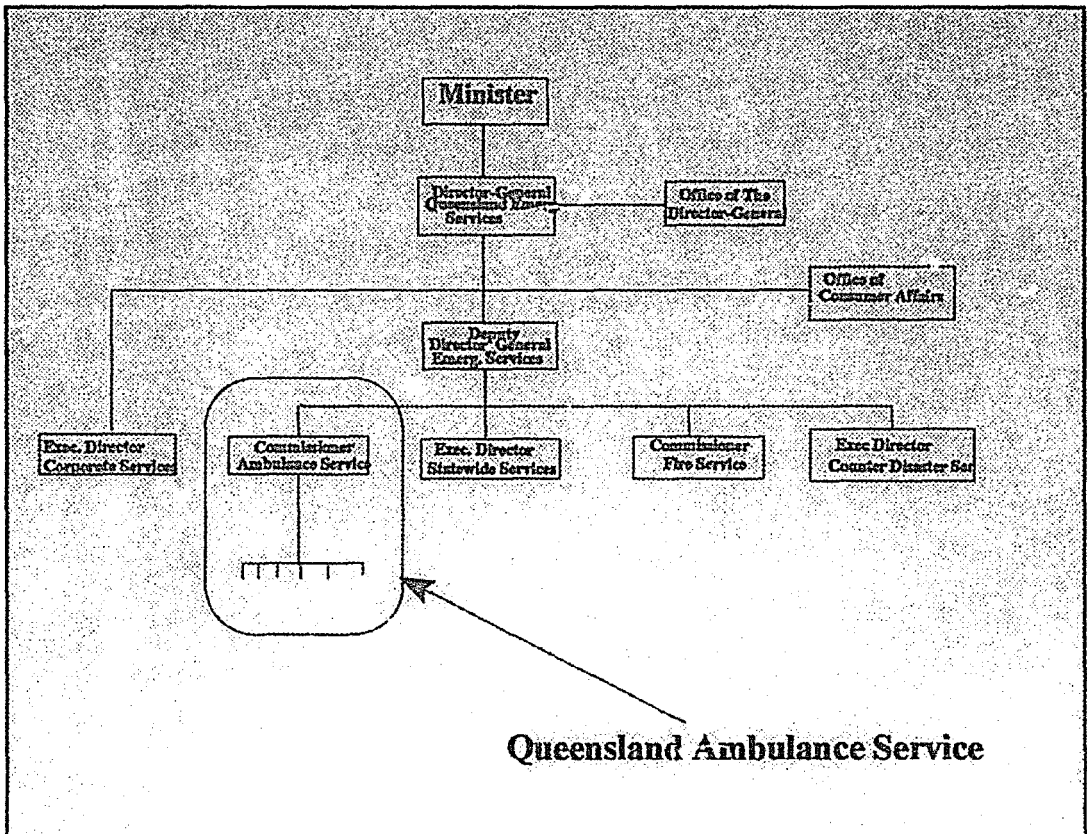


Figure 5 Queensland Emergency Services Bureau Senior Management Structure

The Queensland Ambulance Service attends more than 545,000 patients per annum. Within the structure of the Queensland Emergency Services, the ambulance service has a program goal, which is:

To improve the highest achievable level and quality of pre-hospital care and specialised patient transport in Queensland.

The mission of the Ambulance Service is:

Contribute to the preservation and restoration of health and prevention of injury and illness for the people in Queensland by providing:

1. **Efficient and effective pre-hospital patient care which is:**
 - (a) **timely**
 - (b) **appropriate to the needs of the patient**
 - (c) **of a high quality**
 - (d) **equitably available**
2. **Specialised patient transport**
3. **Public Education and other community services.**

The principles that guide the organisation are that QAS works collaboratively with the community, government and non-government agencies at local, regional and state levels to:

- **Provide Ambulance Services to all groups in the community with each individual having the right to be treated with compassion, consideration, respect and courtesy and in a manner that is culturally sensitive.**

- Provide equitable access to Ambulance Service appropriate to differing community needs.
- Ensure close integration and coordination with the health care system and health care professionals and have a close relationship with other emergency service agencies.
- Support and promote opportunities for client and community participation in needs assessment and the planning, delivery and evaluation of ambulance services.

The QAS principal roles are to provide pre-hospital patient care, specialised patient transport and public education.

General History of Information Technology

The direction, in terms of structure, from which the QAS comes has obviously played a significant part in the way in which its Information Systems and Information Technology emerged. The fact that only a few years ago the then

Queensland Ambulance Transport Board consisted of over 90 different Ambulance Services and the fact that those services have been brought under the one umbrella which itself has struggled to find the most appropriate structure has led to the situation where those trying to develop good coordinated Information Technology policies have had to address the ad-hoc, piece meal approach that had existed prior to 1991. Added to that is the fact that the Queensland Ambulance Service (QES) does not have total control over the direction of its IT.

Three years ago the Information Systems Branch (ISB) of the Queensland Emergency Service was established. The ISB has concentrated on drawing diverse data systems from around the state into a centralised, efficient network. The ISB manages all QES information systems and provides advice, guidance and consultation on all matters relating to these systems. The first project for ISB staff was to introduce a centralised accounting system into the department. Within twelve months this was installed to regional office level. In addition, the Human Resource Management System was also installed.

The ISB implemented the Queensland Ambulance Service's subscriber system state wide across a wide area network. This system is now installed in 22 QAS

district offices.

As the Information Technology resources of the Queensland Ambulance Service are part of the resources of the Queensland Emergency Services, a detailed outline is not provided in this research in terms of the actual nature and structure of the QES Information Technology resources. Instead, the following section focuses only on the actual systems used by the QAS.

Current Information Systems and Technology

The Queensland Ambulance Service was asked to identify each system it had and estimate the cost

of that system. The cost of each system was defined as the investment in both hardware and software in the system in its existing form. The systems in the table

System	Level of Investment
<i>Subscriptions</i>	<i>3,000,000</i>
<i>Debtors</i>	<i>29,000</i>
<i>Baby Capsules</i>	<i>11,000</i>
<i>ESMAP</i>	<i>75,000</i>
<i>Rosters</i>	<i>31,000</i>
<i>Payroll</i>	<i>10,000</i>
<i>Public Education</i>	<i>1,000</i>
<i>Word Processing</i>)
<i>Spreadsheet analysis</i>) 8000,000
<i>QGFMS - accounting system</i>	<i>50,000 p.a.</i>
<i>Performance planning/monitoring</i>	<i>2,000</i>
<i>Asset management</i>	<i>150,000</i>
<i>Interim CAD</i>	<i>150,000</i>
<i>CAD</i>	<i>500,000 p.a.</i>
<i>Office Automation</i>	

Table 12 Systems used by The QLD Ambulance Service

above represent a total

investment of \$4,300,000 with an on-going cost of \$1,700,000 per year. This investment excludes the cost of annual maintenance contracts or support and also excludes the cost of any internal support. It does include the cost of all peripherals associated with each system. The estimates were made by representatives from the IT Department of the Queensland Emergency Services Bureau. The hardware component of the investment levels is based on an estimate of the Ambulance Services proportion of the total investment. The

same is true for some of the software and peripheral components.

The Determination of IT Investments

In every program within the Queensland Emergency Services (QES) a strategic plan is developed. Information Technology is managed largely by the branch. Strategic plans are approved by the divisional heads. Every project must go through a project development strategy and evaluation process during which time it is given a priority in terms of its development/implementation. This is determined by its expected contribution to the organisation's operational goals. The management perspective is that when a project is proposed from any source a project proposal is developed. There is a QAS IT group who get together and evaluate that proposal. It depends on the size of the project as to whether this actually happens. The Commissioner of the Queensland Ambulance Service stated that

“If it is a small investment we just let it happen. If it is a larger proposal for some strategic proposal we will work up the proposal to a stage where it will be put to the Information Technology steering committee of the department. It will then go to the Information Technology policy board which is the government body responsible. This body will make the decision.” (G Fitzgerald, personal

communication, 17 February 1994)

Although this is the procedure now for the QAS it has only been in place for a number of months. Prior to that there was a lot of confusion caused largely by the restructuring that was occurring. It had tended to become a case of someone simply saying they wanted something and it was put on the list of required systems or technology. As a result of the restructuring and reorganising an IT strategic plan was developed to get this situation in order. As a result the list of "required systems" was reduced from approximately 20 to 2. This has occurred, in the opinion of the commissioner, as a result of bringing things to more of a strategic level.

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

Based on the system that has been put into place for the QAS it would be

reasonable to conclude that there is now a focus on the contribution of IT to the overall effectiveness of the organisation. This conclusion can be arrived at in light of the emphasis on looking at proposed systems at a strategic level and linking to a strategic plan. In terms of the systems in place the opposite is true. The fact that a system only had to be requested to be put on the "required" list would indicate that factors other than a consideration of Information Technology's contribution to the organisation's overall effectiveness would play a significant part. The fact that following the establishment of more formal procedures that linked proposals to the strategic issues resulted in the list of required systems reducing from 20 to 2 indicates that the old procedures accommodated the situation where systems that were not required could get onto the required list. Therefore while the processes and procedures that are in place now will lead to a consideration of proposed IT's contribution to the organisation's overall effectiveness it is not possible to conclude that this was the case while the current investment in IT was being put into place. Therefore for the Queensland Ambulance Service proposition 1 would appear to be supported based on the approach to the way in which proposed systems have been considered in the past.

The figures given here (table 13) were given as a result of the CEO being

asked to consider the systems overall without focusing specifically on any one system. The main issue for the Queensland Ambulance Service, as identified by their senior management, is effectiveness.

The perception, then, of senior management, when considering these

<u>External</u>		<u>Internal</u>	
Members/customers	15%	Efficiency	15%
Government	15%	Effectiveness	50%
Vendors	0%	Political	5%

Table 13 Driving Influences for Information System & Information Technology resources in the QLD Ambulance Service

variables in a general sense, is that this proposition is not supported for the Queensland Service. Whilst they rate external factors as contributing to the determination of IT investment, the single most important factor is the systems contribution to the organisation's effectiveness.

Chart 4 shows the influences for each system. A number of the systems are systems that have been put in place for all of the Queensland Emergency Services. For these systems, the influence has been put at 100% government on the basis that it is an external influence caused as a direct result of government policy.

	Customers	Gov't	Vendors	Efficiency	Effectiveness	Political
Subscriptions	25%	25%		50%		
Debtors	5%	15%		40%	40%	
Baby Capsules	20%	50%		30%		
ESMAP		100%				
Rosters				60%	40%	
Payroll		100%				
Public Education	30%			40%	30%	
Word Processing & Spreadsheet		20%		50%		30%
EQGFMS (accounting)		100%				
Performance planning/monitoring		100%				
Asset Management		100%				
Interim CAD				40%	60%	
CAD				50%	50%	
Office Automation		100%				
Average	5.7%	50.7%	0%	25.7%	15.7%	2.2%

Chart 4 Driving Influences on Each System within the QLD Ambulance Service

When looked at on a system by system basis, the weighting given to each of the influences gives a different picture to general perception of the ambulance service's senior management. While in a general sense they rate "contribution to effectiveness" as 50% of the driving influence when the ratings are applied on a system by system basis the contribution to effectiveness only accounts for 15.7%.

The figures in table 14 below show the comparison of the ratings given by the Commissioner when considering proposition 1 in a general sense compared with the ratings given when the systems were looked at on an individual basis.

<u>External</u>	<u>General</u>	<u>Specific</u>	<u>Internal</u>	<u>General</u>	<u>Specific</u>
Memb./customers	15%	5.7%	Efficiency	15%	25.7%
Government	15%	50.7%	Effectiveness	50%	15.7%
Vendors	0%	0%	Political	5%	2.2%

Table 14 Comparison of Management's perception of Driving Influences on Systems showing results when considered in a general sense versus those when considered on a system by system basis

As stated, proposition 1 is supported for the Queensland Ambulance Service and this is clearly illustrated by the results shown in the table above when the systems are considered on a system by system basis

The Driving Influence in Determining IT Investment Priorities

The second proposition:-

The decision to commence a new Information System is not the result of a formal IT investment methodology.

In terms of whether or not a formal methodology is used to determine the IT investment priorities, i.e. the determination of what is going to be done and when, the Queensland Ambulance Service intends to have more of a formal approach in relation to this issue in the future. Up until now, the issue of cost benefit analysis has not been very sophisticated in that a lot of the things that were done by the Queensland Service in relation to IT have been done based on gut feeling. The commissioner stated:

“The cost benefit often has been intangible. We would certainly expect new projects must now have a formal detailed cost benefit analysis which links in some terms operationally. We are not saying that they will need to be in some complicated form, but it will need to be an analysis of the projects pros and cons and an evaluation as to whether it meets the organisational goals and objectives.”

(G. Fitzgerald, personal communication, 17 February 1994)

The Queensland Service has a business planning process. That process now looks at the various elements of a project and that in effect is a cost benefit analysis. Therefore, while they do not have a specific formalised cost benefit analysis, they do have a formal methodology that is part of the formal business planning process. In terms of the second proposition, again the situation for the future differs from that applied to most of the existing investment. For Queensland the second proposition is supported, i.e. the decision to commence a new Information System is not the result of a formal IT investment methodology, however, based on the procedures and processes now in place this proposition should not be supported for current and future developments. It is not supported for the existing investment because as shown by the fact that the list of required systems was reduced from 20 to 2 , prior to the current procedures which are relatively new, systems were considered required for reasons other than having gone through some sort of formal methodology or planning process.

The Determination of the Levels of IT Investments

The third proposition for the case study is as follows:-

The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

The answers given for the previous proposition also apply to this one. In other words, the business planning process which has been developed is the process used to determine the appropriate level of investment in any proposed system as well as answering the question as to whether or not the system should actually proceed. Once again, there would appear to be some difference between the systems that are already in place and the procedures for current and future developments.

Subscriptions	No
Debtors	Yes
Baby Capsules	No
ESMAP	No
Rosters	Yes
Payroll	No
Public Education	No
Word Processing	No
Spreadsheet	No
QGFMS - Accounting	No
Performance planning/monitoring	No
Asset management	No
Interim CAD	Yes
CAD	Yes
Office Automation	No

Table 15 Systems that are currently in place and whether or not they were subject to formal approaches in terms of identifying appropriate investment levels.

Table 15 shows the systems that are currently in place that were subjected to a formal approach in terms of identifying the appropriate level of investment.

Although QAS, like most organisations, would certainly have intended to introduce IT as a result of a desire to do things more efficiently and effectively, they acknowledge that the bottom line would have been a question as to whether or not a system or technology could be afforded. QAS believe that in the past two years they have become more conscious of the need for IT to provide a contribution toward the organisations overall effectiveness, however, prior to that there were some reserves available to fund changes to the structure of the Ambulance Service. This meant that funds were usually available and they believe this in fact worked to their detriment. For the current investment in IT then, the third proposition is supported in that the greatest determining factor for the level of investment in any particular Information System is the availability of funds. Once again, because of the changes that have occurred the organisation's management would not expect this to be the case for current and future developments.

In reaching this conclusion it is necessary to point out that during the interview

process one of the management respondents said:

“I really believe, after having listened to this conversation, that we have been driven by efficiency and effectiveness issues over the past few years in terms of the level of investment in IT.” (IT Manager, personal contact, 14 February 1994)

Another of the respondents stated:

“If you take CAD, for example, we have 60 staff in our communications room and we are up to 12 to 14 in there at any one time. An efficient CAD system could reduce that minimum to 6. If you look at the million dollars that it will cost us, allowing for the fact that you must spend the money this year to make the savings in two years time, the money issue becomes somewhat irrelevant as long as sufficient finance is available, because savings are going to be made over the longer term.” (G Fitzgerald, personal contact, 17 February 1994)

Although the sentiments being expressed here clearly indicate that the third proposition is not supported, i.e. that availability of funds is not the greatest determining factor for levels of investment in IT, there is another example within the Queensland Service where it is. QAS values its investment in word processing and spreadsheet facilities as approximately \$800,000. The comment was made during the interview that from the IT perspective, a PC

based word processing system was not what was wanted. The thing that drove the organisation down the path it followed was the expectation that everybody has, in that they should walk in and have a PC on their desk and be able to do word processing and spreadsheet analysis. Again to quote one of the respondents:

“The trouble is it is largely being driven by those people out there rather than the people in here (management and IT staff).” (IT Manager, personal contact, 17 February 1994)

When asked to clarify whether they were saying that the introduction of IT in these areas is not the result of policy decisions the response was that this was correct.

Following the discussions that led to the conclusions outlined above, the management representatives were asked to indicate the factors that influenced the levels of investment in each of the organisation's systems. The following chart shows those responses.

Subscriptions	50% Efficiency	50% Effectiveness	
Debtors	50% Efficiency	50% Effectiveness	
Baby Capsules	50% Efficiency	50% Effectiveness	
ESMAP			
Rosters	50% Efficiency	50% Effectiveness	
Payroll			
Public Education	50% Efficiency	50% Effectiveness	
Word Processing	50% Efficiency	50% Effectiveness	
Spreadsheet	50% Efficiency	50% Effectiveness	
QGFMS - Accounting			
Performance planning/monitoring			
Asset management	50% Efficiency	50% Effectiveness	
Interim CAD	50% Efficiency	50% Effectiveness	
CAD	25% Efficiency	25% Effectiveness	50% Availability
Office Automation			

Table 16 Managements perception of the factors that influenced the investment levels on a system by system basis

This indicates that there is some confusion on this point. The discussion on the word processing and spreadsheet facilities certainly did not indicate that the driving influences in determining the appropriate level of investment in these facilities was an equal consideration of the contribution to the organisation's efficiency and effectiveness. The responses shown in the chart above possibly are more a statement about what should have been driving the determination of the appropriate level of investment.

The conclusion reached for proposition 3 was based on the example that

already existed. In other words, the example concerning the word processing and spread sheet resources is an example of what has happened and what is in place. The examples that relate to savings as a result of a communications centre system are desired outcomes for the future.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

To expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other words, if there were a proposed system that was going to cost, say, \$100,000 would the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service?

Although not specifically stated, based on the discussions that took place it could not be concluded that the Queensland Ambulance Service was making these sorts of judgements. Clearly, they have identified the need for a greater link with the organisation's overall effectiveness, however, that does not seem to apply to the investment that is already in place.

Clearly from the previous chart the Queensland Service management representatives believe that efficiency and effectiveness considerations should be the major factors that determine the levels of investment in Information Technology, there was no indication of practices or procedures being in place as the current investment was made that allowed the organisation to consider investment options against each other and make judgements or evaluations as to the optimal level of investment in any particular IT project that would maximise the organisations effectiveness in terms of it achieving its mission and objectives.

Based on the lack of evidence to the contrary in terms of the current IT investment, proposition 4 is supported for the Queensland Ambulance Service.

**QES Corporate Plan - 1994 to 1997
Queensland Ambulance Service**

Goal

To deliver ambulance services that minimise the loss of life and severity of illness and injury in the pre-hospital environment, and promote patient recovery.

Role

The Queensland Ambulance Service is a frontline health and emergency service, providing

- ▶Emergency response and transport
- ▶Pre-hospital patient care
- ▶Specialised, inter-facility patient transfer
- ▶Community Education in prevention and treatment of illness and injury
- ▶Community preparedness and industry advice.

Rationale

The Queensland Ambulance Service exists to minimise loss of life and reduce pain and suffering of individuals in emergency and non-emergency situations.

In terms of the organisation's performance indicators or critical success factors, the current situation is that QAS is only just getting into that area now and trying to refine their planning process. They currently use both Government wide indicators and industry wide indicators. As the performance indicators are not fully defined for QAS we used the five broad categories for this research during the interview process. The categories used are:

Response Times Does the IT/IS contribute more to the reduction of response times than would be the case if the amount of money spent on the particular system were spent elsewhere within the service.

Operational Cost

per Patient Does the IT/IS contribute more to the reduction in the operational costs per patient more than would be the case if the amount of money spent on a particular system were spent elsewhere within the service.

Overhead Cost

per Patient Does the IT/IS contribute more to the reduction in the overhead costs per patient more than would be the case if the amount of money spent on a particular system were spent elsewhere within the service.

Quality of

Ambulance Care Does the IT/IS contribute more to the improvement in the quality of ambulance care delivered to a patient than

would be the case if the amount of money spent on a particular system were spent elsewhere within the service.

New Business

Opportunities: New business opportunities include any areas for raising additional revenue, i.e. by being able to market services to additional clients, by being able to market new services etc.

As the service has not yet fully defined its performance indicators the management representatives went through each system and considered them against the above list to establish what the expectation would have been, i.e. which performance indicators would have been expected to be effected by each system.

Contribution To The Organisations Effectiveness

The Queensland Ambulance Service introduced the subscription scheme with the expectation that it would contribute to a reduction in the overhead costs per

patient and that it would contribute to the generation of new business opportunities. This was the expectation prior to the development and after the implementation.

There was a similar expectation of the debtors system, i.e. that it would contribute to a reduction in overhead costs per patient and contribute to new business opportunities. With the baby capsules system the expectation was that it would contribute to an improved quality of care as well as provide new business opportunities.

With rosters there was an expectation of a contribution to the reduction of operational costs per patient as well as a contribution to an improvement in the quality of care. The public education system was expected to contribute to an improvement in the quality of care provided. Word processing and spreadsheet facilities were expected to contribute to an improvement in the overhead costs per patient. Likewise the asset management system would be expected to contribute to a reduced overhead cost per patient as well as contributing to some improvement in the quality of care provided.

Interim CAD is expected to provide some reduction in response times, while

the full CAD system is also expected to reduce response times as well as contribute to an improvement in the quality of care, overhead costs per patient and operational costs per patient.

It needs to be remembered that the expectations that were being put on these systems were being identified at the time of the interview for this research. As earlier discussion has demonstrated, conscious awareness of the contribution to the organisation's effectiveness was not always there. The purpose of the identification of expected contributions to the effectiveness at this point in time is based on the assumption that even though there may not have been a conscious awareness at the time of development or implementation there is an expectation now that these systems should have contributed in some way to the organisation's overall effectiveness.

Table 17 below summarised the systems and the performance indicator that system would effect:

	Response Times	Operational Cost	Overhead Cost	Quality of Care	New Business
Subscriptions			✓		✓
Debtors			✓		✓
Baby Capsules				✓	✓
Rosters		✓		✓	
Public Education				✓	
Word Processing			✓		
Spreadsheet			✓		
Asset Management			✓	✓	
Interim CAD	✓				
CAD	✓	✓	✓	✓	

Table 17 Systems and the Performance Indicators those systems were expected to influence

Having identified the area in which the information system or technology was expected to affect the organisation, i.e. what performance indicator was expected to be effected the CEO was asked to identify whether or not the system had made a positive contribution to the organisation based on a consideration of the area it was expected to affect, i.e. the performance indicator or critical success factor. The way in which the CEO was asked to determine whether or not the contribution was positive was to consider whether or not the same level of investment made elsewhere within the service would be expected to provide a greater contribution to the organisation in terms of the organisation better achieving its mission. Table 18 below gives a summary of the perceived positive or negative contribution of each system:

Subscriptions	+
Debtors	+
Baby capsules	+
Rosters	+
Public Education	+
Word Processing	+
Spreadsheet	+
Asset Management	+

Table 18 Positive or Negative Contribution of each system as perceived by senior management.

The Queensland Service has only invested in two systems which were expected to have a direct impact in terms of a reduction in response times. These are Interim CAD and CAD. In view of the fact that the CEO's perception is that the contribution of the CAD systems cannot yet be stated, proposition number 5, which is that "Investment in IS/IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service", cannot be proved or disproved for the Queensland Service.

Proposition number 6 states that "Investment in IS/IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service". The Queensland Service has two systems which were expected to contribute to a

reduction in operational costs per patient. These system are the roster system, and the CAD system. In the view of the CEO, while it is too early to determine the outcome from the cad systems, the roster system has contributed positively toward the achievement of the organisation's mission. Proposition 6 is therefore supported for the Queensland Service.

Proposition 7 is that "Investments in IS/IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service. Most of the systems in the Queensland Service are directed at efficiency measures which means they would be expected to contribute to this performance indicator. The systems specifically identified as being expected to contribute to this category of performance indicator were subscriptions, debtors, spread sheet and word processing, asset management and CAD. With the exception of the CAD system which is neither positive or negative, all of the systems were said to be making a positive contribution therefore proposition number 7 is supported for the Queensland Service.

Five systems were identified as being expected to influence the category of performance indicator relating to the quality of ambulance care. These five

systems were the baby capsules, rosters, public education, asset management and CAD. Once again with the exception of CAD these systems were seen as making positive contributions and therefore for the Queensland Service proposition number 8 is supported.

The Queensland Service identified three systems that were expected to contribute to new business opportunities. These systems were subscriptions, debtors, and baby capsules. These systems were seen as making positive contributions and therefore for the Queensland Service proposition number 9 is supported.

Summary

The Queensland Service provides an interesting study in that the perception is that most of the outcomes from their systems are positive despite some negative aspects in terms of the way in which they came about.

The Queensland Ambulance Service spends approximately \$1.2 million per year on IT expenses and salaries. This does not include capital expenditure.

As the Queensland Ambulance Service is a part of the Queensland Emergency Services the IT facilities and resources are provided by QES.

The Queensland Ambulance Services has gone through major structural changes over the past five years culminating in the present arrangement where they are a part of the Queensland Emergency Services. The major structural changes have obviously had a significant effect on the development of their IT resources.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation, is supported. Although when considered in a general sense, the senior management representatives did not think this was the case, looking at the variables on a system by system basis clearly indicated that it was the case.

The second proposition, the decision to commence a new Information System is not the result of a formal investment methodology is supported in this service. Although this proposition is supported for the existing IT investment

there have clearly been procedures and practices put in place that will ensure that this proposition is not supported for future investments by QAS.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is supported for the service in terms of its existing investment although the situation has been changed and levels of investment will be monitored more closely now from the point of view of examining alternative investment options with a view to maximising the organisations effectiveness.

The fourth proposition that the least determining factor for the level of investment in any particular Information System is the concern for the overall effectiveness of the organisation is supported because although it has been one of the significant factors in determining what to do, when the decision is made as to the appropriate level of investment there has not been a procedure that evaluates the possible outcomes from that investment against alternate investments which may provide a greater enhancement in terms of the organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service, cannot be evaluated at this time due to the fact that CAD has not yet been developed and interim CAD not yet implemented. These are the only two systems where there is an expectation that response times should be affected.

The sixth proposition is that investments in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. Again this proposition has been supported for the Queensland Service.

The seventh proposition that investments in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service is also supported for this service.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service is also supported for

Queensland.

Proposition 9 that investments in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service is also supported for the Queensland Service.

The significance of the findings in relation to the research propositions is that once again, despite the fact that the determination of IT investments have been influenced to a greater extent by internal political factors, government influence or

Proposition 1	Supported
Proposition 2	Supported
Proposition 3	Supported
Proposition 4	Supported
Proposition 5	N/A
Proposition 6	Supported
Proposition 7	Supported
Proposition 8	Supported
Proposition 9	Supported

Table 19 Summary of the results for each proposition for the Qld Ambulance Service

vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation the intent of each of the systems, i.e. the aspects of the organisation that would be expected to be affected positively, have been affected that way.

Although propositions 3 and 4 were supported, i.e. that the greatest determining factor in the level of investment for each particular system was the availability of funds and the least determining factor was an assessment of the investment options associated with that level of investment, the organisation's senior management, as with the previous two cases, consider that the investments have contributed more toward the organisation's performance indicators and critical success factors that had the same level of investment been made elsewhere within the organisation. The experience in terms of investment levels for the Queensland Ambulance Service also support the finding of Weill and Olson (1989).

Like the previous Ambulance Services looked at, there is little doubt the Queensland Ambulance Service, would have difficulty with the concept that proposition 4 is supported for their organisation, i.e. that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System, the proposition supports the point put by Ralph Carlyle (1987).

This case, as with the two previous ambulance services looked at, supports the notion that the whole area of the measurement of IT effectiveness is shifting

from a technical focus to a business focus (Howard Rubin 1991). The Queensland Ambulance Service has identified the need to evaluate the outcome of IT investments in terms of contributing to the organisation's mission and objectives as opposed to simply measuring that output.

New South Wales Ambulance Service

Background

The NSW Ambulance Service is a Government run ambulance service and comes under the wing of the state Health Department. There are 17 area health services within NSW and the ambulance service is the 18th body within that group.

The ambulance service provides ambulance cover for in excess of 5.7 million people. Of these 3.5 million are in the metropolitan area. The ambulance service has a fleet of 840 ambulances and 30 clinic vehicles. There are 230 ambulance stations in New South Wales of which 10 are manned by volunteers with the remainder being manned by paid ambulance personnel. New South Wales has 13 communications centres.

During the 1992/93 financial year the service attended 526,729 cases travelling a total distance of 15.2 million kilometres. The ambulance service employs 1,931 ambulance officers, 27 air ambulance staff, 135 operational support staff and 368 general support staff giving a total paid staff of 2,461. In addition there are 51 volunteer staff in New South Wales.

The total expenditure for the 1992/93 financial year was \$132,735,000. The cost per case was \$252.00.

The vision of the NSW Ambulance Service is:

To achieve excellence in the provision of ambulance services for the people of New South Wales.

The Mission is:

To provide an efficient and effective pre-hospital emergency care and health related transport system.

The NSW Ambulance Service then has a number of stated values to achieve the mission and vision. These are:

Efficiency

Appropriate allocation of resources in order to achieve the primary goal of the service, namely quality patient care.

Quality and Effectiveness

Excellence in clinical care and service delivery.

Integration of Services

Close integration with all aspects of the State's health care system and other emergency service agencies.

Equity and Access

A service available to all groups in the community with each person treated with consideration, respect, courtesy and in a manner that is culturally sensitive.

Staff Excellence

A participative and consultative management structure with a positive commitment to staff having equity of access to ensure their full professional and personal potential is reached.

Tradition

Maintenance of the traditions of the service consistent with modern clinical and management practices.

There are also four primary goals:

Quality of Care

Quality of care in all aspects of service provision.

Health Status

Improve or maintain the health status of patients in pre-hospital care.

Health Care

Provide a service which is the most rapid, the most appropriate and of the highest possible quality.

Value for Money

Deliver services efficiently and effectively with the highest regard for equity in the provision of such services.

General History of Information Technology

The NSW Service appointed a new director of Information Technology approximately 18 months ago. As a result the whole area is in somewhat of a state of transition. The service has had a mainframe based system for many years. Like many of the other state ambulance services, because it comes under the Health Department, many of the systems in place are ones that were forced upon the service or used because that was what was being used elsewhere within the Health Department and was considered appropriate for the Ambulance Service.

At some time prior to the appointment of the present IT director it was recognised that although the NSW Service had a significant investment in IT and has significant databases that had been built up over the years, it had very little analysis and reporting capability and as such provided little assistance to management in terms of information for decision making.

The NSW Service was unable to provide much information in relation to what had happened in terms of IT prior to the appointment of the current IT director. Most of the information contained in this case study relates to the period since

that appointment and the current procedures and practices.

Current Information Systems and Technology

The NSW Ambulance Service was asked to identify each system it had and estimate the cost of that system

<i>Financial Management</i> <i>(Medical Statistics)</i> <i>(Operational Performance Statistics)</i> <i>(State Trauma Plan)</i> <i>Fleet Management</i> <i>Human Resources Management</i> <i>Payroll/Personnel</i> <i>Word Processing</i> <i>Spreadsheet</i>

(Table 19). The cost of

Table 19 Identified Systems used by the NSW Ambulance Service

each system was defined as the investment in both hardware and software in the system in its existing form. It was not possible to establish a level of investment for this service as that information is not known by the service itself. The service is trying to realign IT to the organisations mission and objectives based on the overall restructuring that occurred within the service some eighteen months to two years ago. According to the IT Director:

“We are now trying to inculcate, if you like, private enterprise business strategies.”

(R. Mansfield, personal contact, 23 February 1994)

When the current director arrived at the service he arrived to an empty desk

and filing cabinet where all previous records had been destroyed. In the 1992/93 corporate plan there is a statement that it is the first time the organisation has had a corporate plan.

The Ambulance Service had a mainframe system that had not been upgraded in eight years. They have a huge database and they employ a programmer/analyst who spends his whole time using a statistical analysis package (SAS) to try to provide ad-hoc reports to management and users. The IT director stated:

“As far as I am concerned we are 10 or 15 years behind in our systems. I mean, we have a huge database here, years of data, but we have no standardised systems that are producing anything of real value to the ambulance service.” (R. Mansfield, personal contact, 23 February 1994)

The Determination of IT Investments

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or

vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

It is very difficult to get much information on the procedures in place when the decisions were made for most of the current IT investment. In the past eighteen months, however, the organisation has had a formal procedure. That procedure is that the strategic plan was developed. Once that had been developed it was approved by the department and the board. Once it has had approval anything that is proposed for IT must conform to that plan or be submitted by the IT director and go back to the board for approval.

Prior to the restructuring that occurred within the NSW Ambulance Service the driving influence in terms of IT investment priorities was almost totally government. Systems such as HOSFIN and HOSPAY are hospital systems that come from the Health Department. Up until the existing IT structure was developed there was no source code at the Ambulance Service. All development and documentation was done by the Health Department. Every time something was wanted it had to be referred back to the Health Department.

Within the Health Departments area health services there is an Information Systems steering committee. One of the first tasks the current IT director had to do was to convince the committee that the ambulance service was a totally different business to the other 17 area health services. The reason for this is that within the Health Department they have a system known as 80/20 funding for core systems. 80/20 funding works on the basis that if you pick up one of their systems, i.e. one developed under the auspices of the Information Systems Steering committee, the Health Department will provide 80% of the funding and the service needs only provide 20%. This system applies to try and get standardised systems across areas of the Health Department. The problem from the Ambulance Service's point of view was that there were no systems for things such as fleet management, computer aided dispatch etc. These were things that were part of the Ambulance Service's core business but not part of the core business of the 17 area health services.

This seems to indicate that for the NSW Service proposition 1 was supported in that the determination of an IT investment was influenced to a greater extent by government influence than by a consideration of IT's contribution to the overall effectiveness of the ambulance service organisation. Certainly since the restructure that has changed and the strategic planning process and the

alignment with the organisations mission and objectives indicates that the intention is there to use "contribution to efficiency" and "contribution to effectiveness" as the driving influences for future IT developments and implementations. The figures in the box below are an estimate made by the IT director. The figures are representative of the fact that the director indicated that the driving influences will be members/customers and efficiency and effectiveness measures. These measures are considered by the director to have equal rating with the other measures only playing a very minor role.

		<u>External</u>		<u>Internal</u>	
With each of the other State Ambulance	Members/customers	30%	Efficiency	30%	
	Government	3.3%	Effectiveness	30%	
	Vendors	3.3%	Political	3.3%	

Table 20 Driving Influences for Information System & Information Technology resources in the NSW Ambulance Service

Services we went through the process of looking at each system individually and considering each of these variable and providing some weighting so as to indicate how much each variable influenced the decision to implement each of the systems. This process was not possible with the NSW service because the current management team was not in place as the process of implementing the current systems proceeded. As it was not possible to get access to anyone who would have had direct involvement it was not possible to proceed with this question.

The second proposition:-

The decision to commence a new Information System is not the result of a formal IT investment methodology.

Again, for the NSW Service, this proposition needs to be looked at in two stages. Clearly, in terms of the systems currently in place that is the case, i.e. the decision to commence a new IS was not the result of a formal IT investment methodology. When the current IT director was appointed there were simply no such procedures in place. At the present time, however, the organisation is putting into place its own Information Systems steering committee and developing specific project teams. This coupled with the strategic planning processes that have already been put in place and the alignment of that planning process with the organisation's overall mission and objectives indicates that proposition 2 would no longer be correct in terms of IT investment decisions that are now confronting the organisation.

The Determination of the Levels of IT Investments

The third proposition for the case study is as follows:-

The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

As a rule of thumb the NSW Ambulance Service is working on an IT budget of 1.5% of total expenditure. When that proposition was put to the board for approval, i.e. spending levels of 1.5% of total expenditure, it was based on a number of factors. These included identifying the core systems and getting them included under the 80/20 Health Department funding arrangement and the fact that the organisation had a large database but no systems as such. Due to the fact that the IT area was inherited by the current director with little guidance in terms of what had happened in the past, he had to rely on gut feel to a large extent. In fact he stated:

“We still don't know today what our fleet management system is going to cost. If you take everything into account it will probably be about \$150,000 so that is the figure we included in the plan. We included \$250,000 for financials taking into account General Ledger, Asset Register etc. We quickly threw all of these figures

level of investment in any particular Information System is the availability of funds, is supported.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

To expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other words, if there were a proposed system that was going to cost, say, \$100,000 would the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service?

The CAD system example and the 80/20 funding arrangement the NSW

Service is locked into would suggest that this is not the case. In other words, they may have a situation where the money is not available to them for any purpose other than applying to IT capital costs. If they don't use it it will be used elsewhere within government. Although the contribution to effectiveness is a major factor in determining what IT to invest in it is not a factor in terms of the level of investment. Therefore proposition 4 is supported for the New South Wales Ambulance Service.

Contribution To The Organisation's Effectiveness

Although the actual contribution of each system to the organisation's overall effectiveness may or may not be a conscious consideration at the time of determining to proceed with a particular Information System or Technology, it would be reasonable to assume that there is an underlying belief that that is the case. The next part of the research seeks to ascertain the view of senior management in terms of whether the levels of investment that have been made in each of the systems and in Information Technology generally have contributed toward the organisation being more effective. The definition of whether a system contributes to the organisation's overall effectiveness is whether it contributes towards the organisation achieving its mission to a

greater degree than would have been the case without that system or technology.

The New South Wales Service has its mission as previously stated which is "To provide an efficient and effective pre-hospital emergency care and health related transport system". For an Information System or Technology to contribute to the organisation's overall effectiveness it would have to contribute toward the service better achieving this mission than would have been the case without the system or technology. Each service will measure various factors as a means of monitoring how well it is achieving its mission. While each of the services may have different terms or names for the critical success factors or performance indicators it uses, each will have some factors.

The next part of the research involved examination of the five propositions associated with the contribution or non contribution of IT to the organisation's performance indicators or critical success factors.

The five propositions (proposition numbers 5 to 9) are:-

- (5) Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in

response times than had the investments been spent elsewhere within the service.

- (6) Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service.
- (7) Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.
- (8) Investment in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.
- (9) Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service.

The NSW Service had some difficulty in terms of the contribution of their systems to the organisation's overall effectiveness because their view is that they are so far behind in that they are providing virtually no Information Technology facilities to their staff at the moment. In making this point they were really referring to the output that was available from the information technology that the organisation does have. As previously identified, the organisation has the following systems:

Financial Management

Medical Statistics

Operational Performance Statistics

State Trauma Plan

Fleet Management

Human Resources Management

Payroll Personnel

Word Processing

Spreadsheet

Their view, however, is that although these systems have been put in place they have been put in place with little regard for the outcome or output and what contribution that output would make to the organisation.

On the final question during the interview process, when asked whether the investment the NSW Service has made in IT over the past decade had made a positive contribution to the organisation's effectiveness in terms of achieving or better achieving its mission the response was no. The service's belief is that they have had a system for the past eight years that the government gave them. It also gave them most of the software without any real consideration for how the systems fitted the ambulance service. The organisation has gone through a process in the last twelve months where it has put in a whole new network and all new equipment. It is only now looking at the software. The IT manager stated:

“The answer to the question must be no because we have just expended \$3,000,000 and we have effectively done nothing more than what we already had. If you come back in two to three years the answer must be yes because that is what we are aiming to do.” (R. Mansfield, personal contact, 23 February 1994)

From the general statements made here and by virtue of the fact that the NSW Ambulance Service did not feel they could answer the specific questions that related to the contribution of the specific systems to the organisation achieving or better achieving its mission the following conclusions can be drawn for each of the last five propositions:-

- (5) Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service.

Certainly there have been investments in IT that would have been expected to contribute to response times and the role of dispatching ambulances. The NSW Service embarked on a project to have a Computer Aided Dispatch system developed some three years ago. This system was never implemented, however, something in the order of \$1,000,000 was spend on its development. That project has since been scrapped. The experience with this project would lead to the conclusion that proposition 5 is not supported for the NSW Ambulance Service.

Propositions 6 and 7 relate to IT's contribution to efficiency.

- (6) Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service.

- (7) Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.

From the comments made by the IT manager it is not possible to ascertain what contribution has been made by the total IT investment. As the introduction of IT would have necessitated a staff overhead in terms of input and support among other things, if there is no usable output, the only conclusion that could be reached is that overhead and operational costs would have increased as a result of the introduction of the IT. For this reason, again the only conclusion that could be reached regarding these two propositions is that they are not supported.

Propositions 8 and 9 relate to IT's contribution to quality of care and new business opportunities. The propositions are:

- (8) Investment in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.

- (9) Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service.

There is insufficient data available to ascertain what investments had been made that would have been expected to contribute to an improvement in the quality of the Ambulance Service or that specifically addressed new business opportunities. For this reason no conclusions can be reached regarding propositions 8 and 9.

Summary

The New South Wales Service provides an interesting study because like a number of the other Australian Ambulance Services it is going through significant structural and organisational change. What makes NSW somewhat different from the other states is that by their own description they have very little in terms of output from their IT investment.

The NSW Ambulance Service will spend slightly more than 2% of its total operating expenditure during 1993/94 on IT. The figures given for the NSW

Service are slightly inflated in that some of the staff costs that are included under the area of IT in the NSW Service would not typically come under that area in other services.

The NSW Ambulance Service has gone through major structural changes over the past few years which has seen a change in most of the senior management positions. This meant that gaining details of what happened in the past was somewhat difficult.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation, is supported. This could only be considered in a general sense for NSW as the detail associated with each system was not available. Although the director of Information Technology indicated that efficiency and effectiveness were the major influencing factors he did stipulate that the comments related to where the service was heading rather than where it had come from. Clearly in terms of the past, Government has had the major influence due to the structure and arrangements with the Health Department and the specific funding arrangements with the Health

Department.

The second proposition that the decision to commence a new Information System is not the result of a formal investment methodology is supported in this service . Although this proposition is supported for the existing IT investment like many of the other Australian Ambulance Services there have clearly been procedures and practices put in place that will ensure that this proposition is not supported for future investments by the NSW Service.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is supported for the service in terms of its existing investment.

The fourth proposition that the least determining factor for the level of investment in any particular Information System is the concern for the overall effectiveness of the organisation is supported because although it has been one of the significant factors in determining what to do, when the decision comes about as to the appropriate level of investment there has not been a procedure that evaluates the possible outcomes from that investment against alternate investments that may provide a greater enhancement in terms of the

organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service, is not supported. This conclusion was reached because the NSW Service has expended a significant amount of money on a communications centre system that was eventually scrapped. There was therefore no contribution from the resources committed to this area.

The sixth proposition is that investments in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. Again this proposition has not been supported for the NSW Service. Once again, the reasoning was that significant resources had been committed to IT with little or no usable output for the organisation.

Similar reasoning led to the conclusion that the seventh proposition, that investments in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been

spent elsewhere within the service, was also not supported for this service.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service could not be evaluated for NSW as it was not possible to identify whether any systems had been invested in with this outcome as one of the objectives.

Proposition 9 that investments in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service cannot be answered for the NSW Service as there is no evidence

of systems being developed or implemented with that aim.

The significance of the findings in relation to the research propositions is that the determination of IT investments

Proposition 1	Supported
Proposition 2	Supported
Proposition 3	Supported
Proposition 4	Supported
Proposition 5	Not supported
Proposition 6	Not supported
Proposition 7	Not supported
Proposition 8	N/A
Proposition 9	N/A

Table 21 Summary of the results for each proposition for the NSW Ambulance Service

have been influenced to a greater extent by internal political factors, government influence or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation and the intent of each of the systems, i.e. the aspects of the organisation that would be expected to be affected positively, have not been affected that way.

Propositions 3 and 4 were supported, i.e. that the greatest determining factor in the level of investment for each particular system was the availability of funds and the least determining factor was an assessment of the investment options associated with that level of investment, upon reflection, the organisation's senior management consider that the investments have not contributed toward the organisation's performance indicators and critical success factors by virtue of the fact that they have systems that give them virtually no positive outcomes. The experience in terms of investment levels for the NSW Ambulance Service, as with the services previously looked at, support the finding of Weill and Olson (1989).

The NSW Ambulance Service, as with the other ambulance services and many other organisations, would have difficulty with the concept that proposition 4 is supported for their organisation, i.e. that the least determining factor for the

level of IT investment in any particular Information System is the concern for the overall effectiveness of the organisation.

The comments by Howard Rubin (1991) once again seem most appropriate as the need to evaluate the "outcome" of IT investments is now clearly seen as an objective.

ACT Ambulance Service

Background

The ACT Ambulance Service is a government run ambulance service and comes under the control of the ACT Health Department (Figure 6). The ACT Ambulance Service provides an emergency medical response to citizens of the ACT by delivering effective patient care and safe transportation of the sick and injured.

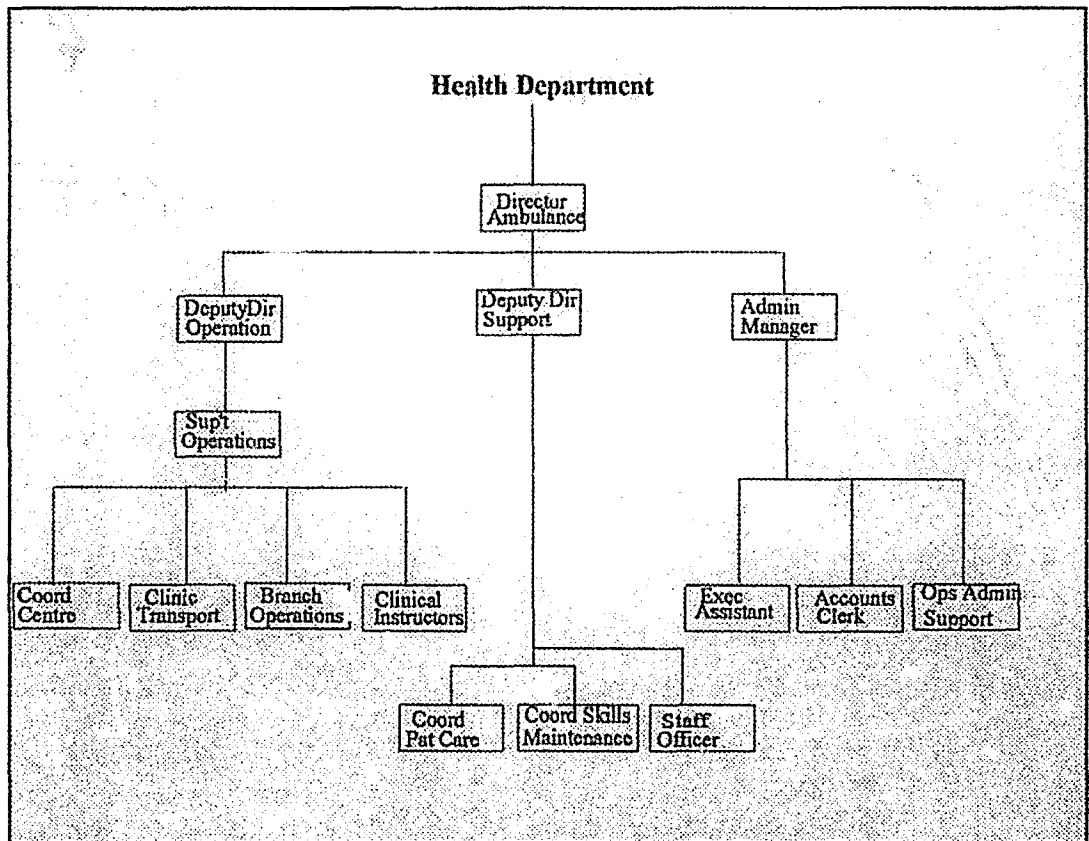


Figure 6 ACT Ambulance Service Organisational Structure

The Ambulance Service provides ambulance cover for a population of 295,891 and has a fleet of 11 ambulances. There are 4 ambulance stations in the ACT and 1 communications centre. There are no volunteers. During 1992/93 the service attended 10,561 cases travelling a total of 222,700 kilometres.

The ACT service has 40 ambulance officers, 5 operational support staff and 4 general support staff. The total expenditure for the 1992/93 financial year was \$3,638,000. The cost per case was \$344.47.

The specific mission is:

In an emergency situation to deliver an ambulance to a patient within ten minutes. To apply appropriate patient care to all patients and to maintain the relevant patient care and ambulance operations skills of all officers.

In the 1992/93 financial year the ACT Ambulance Service dealt with 14,772 cases.

General History of Information Technology

The IT resources used by the ACT Ambulance Service are reasonably modest which is in keeping with the size of the service. The service has no specialised IT staff. The current annual operating budget for IT is \$20,000. There is nothing in the current capital budget for IT and no other budgeted expenses such as training etc. This gives some indication as to the size of the ACT's IT operation.

Current Information Systems and Technology

The current systems being used by the service are:

CARD (Computer Aided Rapid Dispatch)

Accounting - ACCPAC

Windows - Word

- Excel

The hardware and software used for these systems are:

Co-Ordination Centre

2 X 486 PC 4mb RAM Windows 3.1

1 X Toshiba Page Laser 6 Printer

Administration

1 X File Server "Atmax Normerel" + Monitor + Keyboard

2 X Total Peripherals 486 PC + Monitor + Keyboard +
Mouse

2 X AST 286 Drive + Monitor + Keyboard

1 X Laser Printer - Toshiba Pagelaser GX 200

1 X Netcom Modem

1 X Laser Printer - Canon LBP - Mark 3

1 X Protech 386 + Monitor + Keyboard + Mouse

Training

1 X Apple Mac SE + Keyboard + Mouse

1 X Printer Dot Matrix - Apple Imagewriter LQ

1 X Osborne 386 + Keyboard + Mouse

1 X G-Star 386 + Keyboard + Mouse

The level of investment in the IT that is currently in place is also quite modest. (Table 22)

Co-Ordination Centre
Card - \$65,000 (approx)
Accounting
ACCPAC \$12,000 (approx)
Administration
2 X Total Peripherals \$4,500 (approx)

Table 22 Systems used by The ACT Ambulance Service

The ongoing costs associated with these systems include approximately \$10,000 per year for the CARD system. Maintenance and support for the accounting and administration is provided by the Health Departments IT section. Although there is obviously a cost involved in providing this support and maintenance it is not charged directly to the ambulance service and therefore they are not able to identify what the actual cost would be.

The Determination of IT Investments

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

In terms of the investment and systems currently in place there appears to have been a conscious awareness of the systems contribution to the effectiveness of the organisation. Certainly this was the case with the accounting system. Basically, a need was identified in that the organisation had an accounting system in place that was simply not doing what was required by the organisation to fulfil its accounting requirements and obligations. From the description given by the CEO of his understanding of how the process of deciding what to do was carried out there does not appear to have been any influences other than a desire to get the system that best fitted the organisation's needs. What did happen, however, is that a greater emphasis was put on the financial requirements of the system rather than looking at the

broader operations aspects of the organisation. The comments made about this by the CEO is an indication that political influences did play a part. This system would seem to be consistent with the statement made in proposition 1 in that although there was consideration of the contribution to effectiveness, in the end, the political influence of the financial people determined what was chosen. With the administration systems these came about through the health department. Again this indicates a strong government influence in the determination of IT priorities.

The CEO believes that the influences on IT investment decisions have been mainly internal with little external influence. This is perhaps caused by a difference in the definition of internal and external. To some extent the Ambulance Service sees Government (the Health Department) as internal. Of the internal influences the CEO rates efficiency and effectiveness as the main influences with political influence as the minor influence. His rating is as follows:-

<u>External</u>		<u>Internal</u>	
Members/customers	0%	Efficiency	45%
Government	0%	Effectiveness	45%
Vendors	0%	Political	10%

Table 23 Driving Influences for Information System & Information Technology resources in the ACT Ambulance Service

influence although clearly there is government influence via the Health Department because the IT resources of the health department are used by the Ambulance Service.

The statements made by the management representatives do not lead to a conclusion on this proposition. Certainly the statements support the proposition in relation to the accounting system, i.e. internal political factors played a major role, however, generally speaking, the feeling is that efficiency and effectiveness are the major factors.

The Driving Influence in Determining IT Investment Priorities

The second proposition:-

The decision to commence a new Information System is not the result of a formal IT investment methodology.

There is no evidence of a formal methodology or procedure being followed by the ACT Service in terms of their current IT investment or possible future IT.

The following is a quote from the CEO when asked whether their systems were developed as a part of a formal strategy or developed ad hoc because someone just went away and started developing something.

“Well as best I can understand it was that basically there was a desire within the service to develop some sort of a support system. They had in mind when they actually developed it that they would have a booking and stacking system as well as recording of information and activity. The problem was that they ran into some financial problems and they had to make a decision as to whether they did this bit first or that bit first. They decided to go with the simple database and administrative recording component of the system. They were concentrating on trying to get details and recordings of times for ambulance arrivals and destination points. The decision was made that the booking and stacking systems would be developed as separate components. The problem was that the money was never made available for the subsequent components.” (K. Pasulsen, personal contact 25 February 1994)

This comment and others made during the interview indicate that while the intentions may be appropriate and the desired outcomes certainly in the interests of the organisation there are no formal procedures in place for the determination of IT priorities. The second proposition is supported for the ACT Ambulance Service.

With the ACT Service there was no comparison made between the "overview" perspective, in terms of influences on IT investment decisions, and a system by system consideration due to the fact that there are only three systems and the interview respondents felt that the answers given to the general question were exactly the same for each of the individual systems.

The Determination of the Levels of IT Investments

The third proposition for the case study is as follows:-

The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

There has been no formal methodology or process used to determine levels of investments in IT in the ACT Ambulance Service. A comparison of the dollar outcomes of one course of action versus another is not something that would have been considered by previous administrations of the Ambulance Service in the view of the current CEO. From their point of view : vailability of funds is not the greatest determining factor in terms of determining the level of

investment in an Information System but rather it is the government that determines the level. For the ACT then, the third proposition is not supported.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

To expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other words, if there were a proposed system that was going to cost, say, \$100,000 would the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service?

This would appear to be supported for the ACT Service because they have

some difficulty with the concept of trying to quantify benefits that result from IT spending and quantifying and comparing benefits as a result of the operations of the Ambulance Service. The CEO stated:

“At the end of the day, you have think about what your core business is, which is providing an ambulance service to people to either reduce pain and suffering or to reduce mortality. Now the reduction of pain and suffering can't be quantified in terms of dollars and cents. The only thing you can quantify is reduced mortality in terms of savings to the community through increased productivity or you can actually quantify reduction in morbidity through perhaps earlier ambulance responses that may reduce ambulance stays. I don't think you can really seriously quantify the value of IT in terms of what an ambulance service is really about.” (K. Pasulsen, personal contact 25 February 1994)

If it is reasonable to conclude that IT contributes to the organisation's overall effectiveness only if it helps the organisation to achieve or better achieve its mission and objectives then it would be necessary to conclude that proposition 4 is supported for the ACT Ambulance Service.

Contribution To Overall Effectiveness

The next five propositions address the area of effectiveness. That is, the way in which IT contributes to the organisation's overall effectiveness. As the ACT is such a small service and they basically only have three systems we will look at the five propositions together. The five propositions are:

- (5) Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service.
- (6) Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service.
- (7) Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.

- (8) Investment in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.
- (9) Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service.

With the organisation's CARD (computer aided dispatch system) the CEO made the following comments:

"The impression I have is that the only contribution it could have made is in relation to where your resources are and what stage they are at with the job so it is possible to actually plan the resources better. So there may have been some impact in terms of the utilisation of resources." (K. Pasulsen, personal contact 25 February 1994)

The CEO was not convinced that there had been any real contribution to response times or quality of care as a result of this system. It is reasonable to think that this system would have created some expectation in the minds of

those in management that were approving investment at the time, that the system would make some sort of contribution to these factors. This is not the case so therefore proposition 5 is not supported for the ACT, i.e. Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service.

There is the possibility that the system has made some sort of contribution to the organisations use of resources. With a service of this size it could only be concluded that this system had contributed in some way to a reduction in overhead or operational costs per patient if as a result of the better utilisation of the resources there had been some saving. In other words, if the same number of ambulances would have been on duty with or without the system and the same number of staff would have been in the communications centre regardless, it is unlikely that there would have been any reduction in overhead or operational costs associated with the system. Based on the fact that it is not possible to establish what the actual expectations were for this system no conclusions can be made concerning propositions six and seven because there may never have been any expectation that this system would reduce costs.

The CEO was unable to say what the expectation and actual result had been in relation to the administration systems, ACCPAC and the Word Processing and Spreadsheet facilities because the ACT Service does not have established performance indicators for the areas that might be effected by these systems.

Although it was not possible to use performance indicators to try and establish whether the investment in each of the ACT Ambulance Service's systems had made a positive contribution to the organisation's overall effectiveness when asked for a general impression, taking into account the levels of investment that had occurred, had the investment made a positive contribution to the ambulance service, the response was as follows:-

CARDS "My guess is that in terms of the implementation and development the staff would be in support of the system. So personally I think it has had a positive impact."

WP/SSheet "Has a positive impact."

ACCPAC "Has had a really steep learning curve. Eventually I think it will be positive." (K. Pasulsen, personal contact 25 February 1994)

Summary

The ACT Ambulance Service spends a relatively small amount on IT. It has no specialised IT staff although some of the IT costs are hidden by virtue of the fact that they would be absorbed by the Health Department when projects and support are carried out for the Ambulance Service.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation, is inconclusive for the ACT Ambulance Service. It is difficult to draw a conclusion on this proposition because the IT investment in place is very small compared to other services and this may have had some effect on how investment priorities were determined.

The second proposition that the decision to commence a new Information System is not the result of a formal investment methodology is supported in this service . Although responses made during the interview indicate that the intentions may be appropriate and the desired outcomes in the interests of the

organisation, there is no formal procedures or methodology followed in determining IT investment priorities.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is not supported for the service in terms of its existing investment. The greatest determining factor for the ACT service has been Government.

The fourth proposition that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System is supported because although it has been one of the factors in determining what to do when the decision comes about as to the appropriate level of investment there has not been a procedure that evaluates the possible outcomes from that investment against alternate investments that may provide a greater enhancement in terms of the organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the

service, is not supported as the Communications System (CARD) has not, in the view of the CEO, contributed to reduced response times.

The sixth proposition is that investments in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. Again this proposition has proved supported for the ACT Service.

The seventh proposition that investments in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service is also supported for this service.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service is also supported for the ACT Ambulance Service.

Proposition 9 that investments in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments

been spent elsewhere within the service could not be evaluated as there was no evidence of any systems being developed or implemented with that desired outcome.

The significance of the findings in relation to the research propositions is that despite the fact that generally the investments have contributed to a positive outcome and lived up to expectations i.e. the aspects of the organisation that would be expected to be affected

Proposition 1	Inconclusive
Proposition 2	Supported
Proposition 3	Not supported
Proposition 4	Supported
Proposition 5	Not supported
Proposition 6	Supported
Proposition 7	Supported
Proposition 8	Supported
Proposition 9	N/A

Table 23 Summary of the results for each proposition for the ACT Ambulance Service

positively, have been affected that way. This is with the exception of the communications centre system although despite not contributing to reduced response times it is considered by the CEO that it has contributed positively to other aspects such as staff morale etc.

Despite the fact that proposition 3 was not supported and that the greatest determining factor in the level of investment for any particular system was the

Government, and that proposition 4 was supported, i.e. the least determining factor was an assessment of the investment options associated with that level of investment, upon reflection, the organisation's senior management consider that the investments have contributed positively toward the organisation's outcomes.

Like the other Australian Ambulance Services, the ACT Ambulance Service, would have difficulty with the concept that proposition 4 is supported for their organisation, i.e. concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System. As seen with all of the services examined, the ACT service is not able to relate their MIS spending to the corporate bottom line. As MIS spending cannot be related to the corporate bottom line, it can't be argued that the determination of IT investment levels takes into account the overall effectiveness of the organisation. So once again we see the situation in this service supporting the the point put by Ralph Carlyle (1987).

Similarly, we find the service seems to support the view of Howard Rubin (1991). The ACT service realises that the whole area of the measurement of IT effectiveness is shifting from a technical focus to a business focus and they

are very much aware of the need for IT people to "connect" to the business.
As with all of the other ambulance services studied this is an objective for the future.

South Australian Ambulance Service

Background

The South Australian Ambulance Service is run under the control of the Minister for Emergency Services. Although it is known as the St John Ambulance Service, the service in recent times has not been run by St John Ambulance, but rather an agreement has been reached where the Ambulance Service can continue to use the name St John Ambulance. Of the relationship with the Government and St John Ambulance, the Service states that in setting its own priorities it will be guided by the policies of the South Australian Government and the St John Priory in Australia and, while maintaining its independent status, will work cooperatively with St John Ambulance and the Government and its agencies.

The Ambulance Service provides ambulance cover for a state population of 1.4 million people of which just over one million are located in the metropolitan area. The ambulance service runs a fleet of 186 ambulances and 11 clinic vehicles. Of the 186 ambulances 111 are located outside the metropolitan area. There are 92 ambulance stations in South Australia of which 32 are manned by paid staff and the remainder by volunteers. There are 4 communication centres.

During 1992/93 the service attended 130,839 cases statewide of which 100,584 were in the metropolitan area. The total distances travelled for the 130,839 cases was 3.6 million kilometres. The ambulance service employs 476 ambulance officers, 34 operational support staff, 9 air ambulance personnel and 113 general support staff. The service also has 950 volunteers.

The total expenditure for the 1992/93 financial year was \$46,188,000. The cost per case was \$353.01.

The specific mission is:

The South Australian St John Ambulance Service is committed to the provision of total quality clinical care and transportation of patients.

It identifies its role as the state wide ambulance service which is there to provide pre-hospital health care and transport as part of the state health and emergency services. Its vision is to be the best ambulance service in Australia. The values and guiding principles that it uses are to make its services available to everyone without discrimination of any kind. Also to provide itself with the training, resources and support needed to give the very best care to patients.

It promotes a team spirit throughout the service and recognises outstanding performance and the importance of self esteem and job satisfaction. It aims to maintain the highest standard of ethical behaviour and work in a way which is safe for itself, its patients and the community.

General History of Information Technology

The history of Information Technology in the South Australian Ambulance Service is similar to the path followed by the West Australian Ambulance Service. Up until the late 1980s the South Australian Service had its computer resources provided by a bureau based service. In 1987 it was decided to address the computing needs in-house. The organisation was basically forced into the in-house decision because the bureau being used was going to close down and the costs of a bureau based service were considered too high. At the time of coming off the bureau service the Ambulance Service was paying in the order of \$25,000 per month to the bureau.

Current Information Systems and Technology

The South Australian Ambulance Service was asked to identify each system it had and estimate the level of investment in each of those systems. Table 23 summarises those systems:

<u>System</u>	<u>Level of Investment</u>
<i>General Ledger</i>	32,000
<i>Accounts Payable</i>	10,000
<i>Accounts Receivable</i>	14,000
<i>Supply, Purchasing & Inventory</i>	41,000
<i>Transport Debtors</i>	16,000
<i>Subscriptions</i>	8,500
<i>Assets</i>	5,500
<i>Word Processing</i>)	
<i>Spreadsheet analysis</i>)	250,000
<i>Budgets</i>	750
<i>Payroll/Personnel</i>	43,000
<i>Training</i>	0
<i>Fleet Management</i>	50,000
<i>Rostering</i>	200
<i>Computer Aided Dispatch</i>	14,580
<i>Medic Alert</i>	3,500
<i>Records Management</i>	5,000
<i>Library System</i>	0
<i>These figures do not include the main hardware components which consist of the two Prime machines plus terminals and other peripherals. The following is an estimate of the investment in these.</i>	300,000

Table 23 Systems used by The South Australian Ambulance Service

The South Australian Service has 5.5 IT staff consisting of the manager of computer services, two programmers, a LAN supervisor, a computer operator and a backup operator who works the equivalent of half of a full time position on this function. The service spends approximately \$207,000 on IT salaries per year, \$170,000 for IT operating expenses and for 1993/94 has a capital budget of \$59,000.

The Determination of IT Investments

The majority of the systems that the South Australian Service currently has, were put in place as part of or shortly after the implementation of the in-house system. In terms of methodology and formal approaches used to determine IT investments, there were none as part of the in-house systems development. A consultant was used in the determination of what was needed to bring the operations in-house.

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater

extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

Table 24 summarises the weighting given to the variables in discussions with

<u>External</u>		<u>Internal</u>	
Members/customers	20%	Efficiency	20%
Government	30%	Effectiveness	30%
Vendors	0%	Political	0%

Table 24 Driving Influences for Information System & Information Technology resource in the SA Ambulance Service

management representatives when they were asked to discuss and comment on the those variables. During discussions on these points in the interview it was pointed out to the representatives that the comments being made about the driving influences could reflect the current approach, i.e. the approach that would be used from here on, rather than the influences that drove the current investments, i.e. the systems that are already in place. This was generally agreed and the consensus was that there was a significantly greater emphasis on the efficiency aspects with the systems currently in place. The Manager of Computer Services stated:

“ .. we would look at the process and try to improve the way we did it. We did not look at the global picture. That goes back to the point that there was no plan.

There was no IT plan, no strategic plan and no department plan. That is why the focus was on the process rather than on the overall organisational function.” (D. Finlayson, personal contact, 8 March 1994)

When asked to look at the individual systems and consider the general answers given to the driving influences the management representatives considered that the answers given to the general question also applied to each of the specific systems because the majority of the systems were put on board at the time the computing resources were brought in-house. In other words, the general view was that the variable outlines in proposition one as having the greatest influence did not have the greatest influence in South Australia's case. To ensure that the representative from the South Australian Service were reflecting on what had happened as opposed to reaching conclusions about what should happen, I referred them to the computer resources within the organisation that had been implemented for word processing and spreadsheet work. The service has 82 PCs that are used primarily for word processing and spreadsheet work. This represents an investment of somewhere in the order of \$250,000. While the initial response was to say that the driving influence for this investment was efficiency and effectiveness it was acknowledged that there was a fair amount of internal political influence as well.

The CEO stated that he believed every individual probably thought they were

contributing to efficiency and effectiveness but that there certainly was an element of political pressure as well.

Table 25 gives some of the other comments made by the management representatives regarding this issue. The discussion that took place on this issue took the form of a learning experience where the actual levels of investment and the associated benefits or lack of them were somewhat surprising to many of those present. The CEO felt that if there was some measurement of these resources level of use most people would be amazed at how little they were used.

The finance manager felt that it was necessary to draw the line

"There is also a computer literacy element in this as well in that a lot of people want to be involved with computers and they see this as the means of doing it. I mean, I would question myself in that I have a secretary who is a far better typist than I am but I have got that way that I actually think through that (the word processing) program now. I am much quicker that I would be if I got her to do it, I had to come back and correct it at a time when I may have lost my train of thought. I keep asking is that efficient or isn't it and I'm sure that that is the question that everyone must keep asking themselves. So I think that for me it helps to formalise my thinking process but I can see others that are using them because they think that they have to get into this game somehow and that is the only way they know how." (I. Pickering, personal contact, 8 March 1994)

"Some of the PCs popped up around the place as a result of political pressure particularly from the operations area in that they were trying to keep up. Often the justification was "because others have them", there was some political pressure there." (G. Fawcett, personal contact, 8 March 1994)

"You see, the investment in word processing and spread sheet, no really knows the "true" dollar value for the simple reason that I have purchased them on demand. So while we may think "oh, another copy of the software is only worth \$800, what people have to realise is that we have 500 such occasions so we are suddenly talking about \$40,000 and on top of that you have about \$2,500 per PC, so suddenly you have a \$150,000 investment that is invisible to the company because it has been purchased over a period of time. You don't see that creeping up. When you look at the figures, later on, you think gee, that is a lot of money. It is because of that creep effect that has occurred over many years." -(D. Finlayson, personal contact, 8 March 1994)

Table 25 Comments made by three of the management representatives during the research interview concerning efficiency of systems and political influences.

somewhere, possibly through the consultant process where the service's needs were actually identified and the resources then linked to those needs. He stated that:

“We must then put in place a process that actually evaluates the effectiveness and needs.” (D. Gillard, personal contact, 8 March 1994)

There is conflicting evidence then as to whether proposition 1 is supported or not supported for the South Australian Service. Based on their responses to the interview questions and their weighting of the six internal and external variables it would be reasonable to conclude that proposition 1 was not supported. When the discussion that took place concerning the word processing and spreadsheet facilities, which other than the actual hardware associated with the initial investment in the Prime machines represents the single largest investment of any system, is considered it leads to the opposite conclusion, i.e. that proposition 1 is supported. To arrive at a more definitive conclusion it would be necessary to establish whether the discussion that took place on the investment in word processing and spread sheet facilities was typical of other systems or whether it was a unique example. This was considered outside the scope of this research.

The Driving Influence in Determining IT Investment Priorities

The second proposition:-

The decision to commence a new Information System is not the result of a formal IT investment methodology.

The South Australian Ambulance Service certainly has not used a formal approach or methodology in the determination of IT investment priorities. This was clearly stated in relation to the development and implementation of the in-house system in the late 1980s. Although the organisation is working toward that goal now, based on the IT investment currently in place proposition two is supported.

The Determination of the Levels of IT Investments

The third proposition for the case study is as follows:-

The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

To some extent this area was answered previously when it was established that the bulk of the current IT investment was made as part of the development and implementation of the in-house system immediately following the bureau based systems. As mentioned there was no formal methodology or planning process used during that exercise. There was no cost benefit analysis or similar measure to determine the appropriate levels of investment. The management representatives feel that there has been a significant change in the way the organisation approaches this question over the past twelve to eighteen months. They have moved away from a situation where the IT department was driving IT solutions.

The third proposition is therefore supported for the current IT investment, that is the greatest determining factor for the level of investment in any particular Information System is the availability of funds. This is so because in the absence of any methodology that determines the benefits associated with the costs involved and weighs up those benefits as opposed to the benefits of not investing, the only conclusion that can be reached is that an investment proceeds at whatever level because the money is available to achieve a desired outcome.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

To expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other words, if there were a proposed system that was going to cost, say, \$100,000 would the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service? Once again, there is no evidence that any such analysis has occurred in the past with the South Australian Ambulance Service, therefore the conclusion is that proposition 4 is supported.

The CEO stated:

“Funds have been found. I would suggest without a great deal of discussion about what other alternatives they could be applied to. There have been proposed projects that have actually been brought forward because funds have been available as the end of the financial year approached.” (I. Pickering, personal contact, 8 March 1994)

Contribution To The Organisations Effectiveness

South Australian St John Ambulance Service Inc	
Goal	The SA St John Ambulance is committed to the provision of total quality clinical care and transportation of patients.
Role	It is a state wide ambulance service and provides pre-hospital health care and transport as part of the state health and emergency services.
Vision	To be the best ambulance service in Australia.

Table 26 The Goal, Role and Vision of the South Australian St John Ambulance Service Inc

In terms of the organisation’s performance indicators or critical success factors, the situation at the time the current IT investments were made, i.e. at

the time of bringing the computer resources in-house and since then, the organisation had not identified performance indicators in relation to their systems. There were no expectations in terms of effect on performance indicators even though the service had a vision and specific goals (Table 26). Performance indicators were not thought of by the Ambulance Service at the time of bringing the computer systems in house. The only issue for the organisation at that time was looking at response times. This leads to the fifth proposition which is:

- (5) Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service.

At the time of development and implementation the South Australian Service did not expect the CAD system to reduce response times. The only thing that was expected of the CAD system was that it would computerise the manual system and the manual reporting mechanisms.

The following four propositions relate to the other general categories of

performance indicator. They are:

- (6) Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service.
- (7) Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.
- (8) Investment in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.
- (9) Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service.

There was considerable discussion on the question of performance indicators with the management group from the South Australian Service. It was not

possible to address each of these proposition individually because there simply was no expectation in terms of performance indicators. The CEO summed up the situation when he stated that what was being said (by the group) was that the whole emphasis was on doing things faster rather than an evaluation of the output. One of the other management representatives made the following point:

“In all of the original documentation associated with the development of the systems in 1987/88 there is no mention in any of the documents about performance or indicators. There is nothing in those documents at all. The document itself was written in conjunction with an outside consultant. The internal consultant was an accountant therefore it was written in that vein. They had no IT experience at all. ...there was no thought as to what we were going to achieve afterwards.” (D. Finlayson, personal contact, 8 March 1994)

The next interview question asked the CEO to indicate whether in his view, based on the level of investment in each system and considering the fact that that investment could have been made elsewhere in the service with the aim of achieving or better achieving its mission, did each system make a positive or negative contribution to the organisation. The CEO believes that the systems have made a positive contribution although he feels that they have not contributed to the extent that they should have. He also stated:

“Generally, they are all on the positive side of the middle but they are not as far up that line as you would like to see. The negativity for me is that there is no program that is bringing the systems together for executive information. That is the negative aspect of what we are doing. If you look at all of the systems in isolation I believe that there is a positive contribution. The positive aspect I get is that I know it is being done. That is not enough.” (I. Pickering, personal contact, 8 March 1994)

The computer services manager felt that the programs themselves satisfy the immediate needs of each department and therefore are a success. His view was that they were perhaps 51% successful but their greatest failing was their (the systems) inability to talk to each other.

The CEO gave a good example which highlighted the fact that most of the systems were efficiency based. That comment was that if you looked at the payroll system you would say that it is a success because there are less payroll clerks doing the payroll than would be the case if it were done manually. The problem is that they are not getting the results they would if the systems were integrated and could talk to each other.

The comments being made would tend to support propositions six and seven.

(6) Investment in IT to reduce the operational costs per patient have

contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service.

- (7) Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service.

These are the two propositions that relate to efficiency and there seems to be a consensus among the management representative that the current IT investment has led to improved efficiencies.

It is not possible to draw specific conclusions about the other propositions, however, because there have been no expectations in terms of the current systems in relation to these performance indicators. The CEO stated that he felt the investment in IT could have been better used in other areas although it was acknowledged that this statement was made with the benefit of hindsight. One of the other management representative made the point that if the organisation had been more focused on the mission at the time of making the investment decisions things would probably have been done differently.

The CEO concluded the interview by stating:

“I would suggest that there are a lot more people aware of the value of systems than there would have been in 1987. I would imagine that back then they would have been working in a little bit of isolation. It would basically have been a case of produce a report and dump it in front of a manager and saying here is what you want to know. Rather than saying what do you want to know? I think there has been a reluctance on some people's part to question IT. The academics and other people were saying it had to be. Therefore due to a lack of knowledge or whatever it was not being questioned.” (I. Pickering, personal contact, 8 March 1994)

Summary

The South Australian Ambulance Service spends approximately 1.3% of total expenditure per year on IT expenses and salaries. This is based on the 93/94 figures and does include capital expenditure.

The South Australian Ambulance Services has gone through major structural changes over the past few years culminating in the present organisational structure.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation, is inconclusive for the SA Service. There is some indication that the proposition may be supported based on discussions that related to the organisation's word processing and spread sheet facilities. It could not be concluded, however, that it is supported generally as there were other indications that effectiveness might be the overriding consideration.

The second proposition that the decision to commence a new Information System is not the result of a formal investment methodology is supported in this service . Although this proposition is supported for the existing IT investment the South Australian Service is working towards putting such procedures in place for future investments.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is supported for the service in terms of its existing investment although the situation has been changed and levels of investment will be monitored more

closely now from the point of view of examining alternative investment options with a view to maximising the organisation's effectiveness.

The fourth proposition that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System is supported because although it has been one of the factors in determining what to do when the decision comes about as to the appropriate level of investment there has not been a procedure that evaluates the possible outcomes from that investment against alternate investments that may provide a greater enhancement in terms of the organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service, is not applicable to the South Australian Service as the only system that might have affected response times, ie. the CAD system, did not have that expectation placed upon it when it was developed..

The sixth proposition is that investments in IT to reduce operational costs per

patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. This proposition is supported for the South Australian Service.

The seventh proposition that investments in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service is also supported for this service.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service is not applicable because there have been no identified expectations in terms of the systems in place and their possible contribution to quality of care.

Proposition 9 that investments in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service is also not applicable for the South Australian Service.

The significance of the findings in relation to the research propositions is that whether the determination of IT investments have been influenced to a greater extent by internal political factors, government influence or vendors than by a consideration of IT's contribution to the overall

Proposition 1	Inconclusive
Proposition 2	Supported
Proposition 3	Supported
Proposition 4	Supported
Proposition 5	Not Applicable
Proposition 6	Supported
Proposition 7	Supported
Proposition 8	Not Applicable
Proposition 9	Not Applicable

Table 27 Summary of the results for each proposition for the SA Ambulance Service

effectiveness of the organisation is inconclusive yet the intent of each of the systems, i.e. the aspects of the organisation that would be expected to be affected positively, have been affected that way.

Although propositions 3 and 4 were supported, i.e. that the greatest determining factor in the level of investment for each particular system was the availability of funds and concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System, upon reflection, the organisation's senior management consider that the investments have contributed more toward the organisation's performance indicators and critical success factors that had the

same level of investment been made elsewhere within the organisation, although the CEO did state that in some cases it was a pretty close call. The South Australian Ambulance Service, like the other services looked at, uses spending levels that are a flat increment on the previous years budget as a guide in terms of investment levels in IT. Once again, the position with this service supports the finding of Weill and Olson (1989).

As has been the case with all of the services looked at so far, the South Australian Ambulance Service would have difficulty with the concept that proposition 4 is supported for their organisation, i.e. that the least determining factor for the level of IT investment in any particular Information System is the concern for the overall effectiveness of the organisation. The situation is, however, that they are unable to relate their MIS spending to the corporate bottom line. That being the case, how could it be argued that the determination of IT investment levels takes into account the overall effectiveness of the organisation. Once again the situation supports the point made by Ralph Carlyle (1987).

Like all of the other ambulance services looked at, South Australia have identified a need to evaluate the "outcome" of IT investments. This is one of

their objectives for the future.

Victorian Ambulance Service

Background

The Ambulance Service in Victoria is separated into six separate services. The Metropolitan Ambulance Service (MAS) and five rural services. Those five rural services are Western, North Eastern, South Eastern, North Western and South Western.

Ambulance Service Victoria - Metropolitan Region was created from Ambulance Service Melbourne in 1986 under the Ambulance Services Act 1986 and merged with the Peninsula Ambulance Service in 1987. It takes the trading name Metropolitan Ambulance Service (MAS). MAS reports through the Health Department Victoria to the Minister for Health and Community Services.

MAS covers 10,000 square kilometres around greater Melbourne and serves over 3.5 million people in 55 municipalities extending from Whittlesea in the North, Warburton in the East, Koo-wee-rup and the Mornington Peninsula in the South and West to Bacchus Marsh. It operates the Victorian Air Ambulance Service on behalf of Ambulance Service Victoria.

The total population of Victoria is 4.2 million which means the rural services are providing ambulance cover for approximately 700,000 people. The Victorian Ambulance Service has a total fleet of 414 ambulances and 154 clinic vehicles. There are 125 ambulance stations manned by paid ambulance officers and 37 manned by volunteers. There are 13 communications centres throughout Victoria. During 1992/93 the Victorian ambulance services attended 394,141 of which 286,051 were handled by the Metropolitan service. The total distance travelled for these 394,141 cases was 14.3 million kilometres. The Metropolitan Ambulance Service employs 769 ambulance officers and the rural services 581. The total paid staff in the Victorian Ambulance Services 1,638. There are no volunteers.

The total expenditure for the Victorian Ambulance Service was \$111,062,000 for the 1992/93 financial year. The cost per case, therefore, was \$281.78.

The objectives of an Ambulance Service prescribed in the Ambulance Services Act, 1986 are:-

- (i) to respond rapidly to requests for help in a medical emergency.
- (ii) to provide specialised medical skills to maintain life and to reduce

injuries in emergency situations and while moving people requiring those skills.

- (iii) to provide specialised transport facilities to move people requiring emergency medical treatment.**
- (iv) to provide services for which specialised medical or transport skills are necessary.**
- (v) to foster public education in First Aid.**

To enable the service to achieve these objectives an Ambulance Service may:-

- (i) charge reasonable fees for services rendered.**
- (ii) operate or participate in a subscriber scheme.**
- (iii) provide services to members of, or contributions to, a health fund under an agreement with a health fund.**
- (iv) do all things that are necessary or convenient to enable it to achieve its objectives.**

The primary mission of MAS is:

To provide a quality emergency health care and stretcher transport service at a competitive price.

Highest priority must be given to the care and well being of the patient, with rapid response of the most appropriate resources being an essential performance factor.

The objectives of MAS are:

- 1. To be the industry leader in the provision of high quality services,**
- 2. To operate a health care and stretcher transport service as a profitable business,**
- 3. To enable the independent operation of ambulances within MAS,**
- 4. To establish and maintain internal independent funding which will secure the long term future of MAS, and**
- 5. To contribute to an effective emergency response capability by all emergency services when required.**

MAS employs just under 900 staff and its total operating expenses for MAS for 1992/93 was just over \$64,000,000.

As mentioned, in addition to the Metropolitan Ambulance Service (MAS), there are six Regional Ambulance Services in Victoria. Each regional service relates to the office of Ambulance Service within the department of Health and Community Services for all activities of the service.

The mission of the Ambulance Service Victoria - North Eastern Region is:

To provide an ambulance transport service to meet the general Ambulance transport needs of the people situated in the North Eastern and Goulburn Valley part of Victoria. This service shall be provided to the sick and injured irrespective of their location within the region, or of a persons colour, race, religion, sex or social status.

The North eastern region employs approximately 140 staff and had a total operating expenditure of \$9,500,000.

The mission statement of the Western Region is:

To provide pre-hospital care to the sick and injured, and ambulance transport irrespective of race, colour or creed. To maintain a program of training and administration that will meet the needs of the community, all activities should promote and foster the aims of the highest standards of patient care.

The Western region employs approximately 100 staff and in 1992/93 had total expenditure of approximately \$7,000,000.

The South Eastern and South Western Regions have similar missions and objective to the other regions. The South Eastern region employs approximately 150 staff and had total operating expenditure of around \$12,000,000 for 1992/93. The South Western Region employs approximately 140 staff and had total operating expenditure of \$9,500,000 for 1992/93.

General History of Information Technology

The history of Information Technology in MAS is quite checkered in that there have been some large mistakes made that have cost the ambulance service, Health Department and the Victorian community significant amounts of money. MAS as an organisation has gone through and still is going through massive changes. For this reason it is difficult to get detailed information on what has happened in the past. Part of the massive changes that have been occurring has been a complete revamp of where the organisation is going in terms of IT.

The following description is a summary of a presentation given by MAS and their consultants in November 1993 outlining the direction the organisation was proposing to take and the part that Information Technology would take in that process.

There were presentations from the four major parties that make up the overall project. These are:-

MAS

Griffiths Consulting

Arthur Anderson

Intergraph

The CEO at MAS, began the presentation by outlining some of his "visions" for MAS. He believes that in the interests of *quality* there must be a separation of the emergency and non-emergency components of the ambulance service. His view is that the non-emergency service can operate profitably and thus provide funds for the emergency service. He said he believes that by 94/95 there will be no Government funding for MAS. He sees the service being fully funded by the profitability of the non-emergency service, subscriptions and a "user pays" concept for the emergency service.

As part of the re-organisation his aim is to have no more than one ambulance per station, the communications role within the organisation to be its own independent business and for other support services to either become efficient or be outsourced.

His vision sees the communications business paying for its Information Systems and then for MAS business managers to "buy" services from the

communications. Likewise, the workshop will service regions and recover costs through vehicle charges. MAS will contract to hospitals on a "fee-for-service" basis. The arrangement will involve private contractors sub contracting to MAS to service hospitals.

Information Needs

The information needs associated with the "vision" are:-

- ⊗ ability to identify poor ambulance coverage
- ⊗ ability to analyse poor response times
- ⊗ ability to monitor patient outcomes
- ⊗ ability to monitor the skills of ambulance officers
- ⊗ ability to analyse profit by market segment

There were five commercial considerations identified with the plan:-

- Efficiency

- Integrated Support Systems

- Single entry of data

- **Business Principles**
 - Private enterprise accounting

- **Competition to be encouraged**
 - (Even emergency component)

- **Empowerment within the service**
 - Performance Contracts

- **Outsourcing**
 - Subscriptions
 - Support Systems
 - Support Activities

A number of problems were identified with MAS as things currently stood.

These included:-

- | | |
|----------------------------------|----------------------|
| Labour intensive support systems | Non commercial focus |
| Poor information | No money |
| Lack of expertise | |

Things are so bad with the current systems and procedures that the consultants from Arthur Andersen estimate that MAS is loosing between \$400,000 and \$500,000 per month in lost transport fees *simply* due to inadequate procedures.

Under the re-engineering process that is being carried out all computer hardware and software will be owned by the suppliers. MAS will pay a fee for service. The initial contract is for four years at \$5.25 million per year. This figure represents approximately 8% of the gross income figure for MAS for 1992/93.

The representative from Griffiths consulting outlined the project stages, changes that will occur to MAS, and the potential benefits of the project. In the commercial review that was carried out, MAS recognised (with the help of the consultants) that:-

- existing systems were totally inadequate
- change must be commercially driven
- cultural change would be difficult to achieve
- private sector commercial bench marking would be essential

The commercial review involved looking at the operating structure of MAS, the human resource utilisation, the fixed asset allocation/utilisation, existing systems functionality and the flow of money.

The conclusions from the review were:-

- Existing systems were 10-20 years behind
- No further patching could occur
- EIS was non existent
- Competition would come
- Cultural change would be difficult to manage
- There is considerable scope for
 - increasing revenue
 - reducing costs
- A totally new "vision" required
 - new system with reliable, prompt financial and management information which must be fully integrated and where the integration must be seamless

The principal recommendations from the review were:-

- **Totally re-engineer rather than patch all new systems**
- **Centralised and decentralised function implementation**
 - integrate activities**
 - eliminate duplication/reduce costs**
- **Outsource subscriptions**
- **Introduce**
 - Computer Aided Dispatch (CAD)**
 - Vehicle Location System (AVL)**
 - Data transfer to/from vehicles**
- **New system including Executive Information System (EIS) must allow management by exception**
- **Move toward electronic capture of all data (from terminals in the ambulances)**
- **Establish profit centres**
- **Bring payroll processing in-house**
- **Contract out the supply department**
- **Hospitals must be more accountable**

In terms of cost benefit MAS, Arthur Andersen and Griffiths Consulting believe that over a four year period there will be a \$26 million saving. This is after allowing for the four year cost of the Information Technology project and services which amounts to \$21 million.

The preceding description includes areas that go beyond the scope of this research. They have been included, however, to create a picture of the environment in which Information Technology needs to be considered.

MAS has gone from a mainframe based system to a PC based system although the mainframe is still in place and still accounts for a number of the systems.. There is an existing LAN with mini computers providing most of the server capability. There is a long term strategy to have a fully integrated system. Technical difficulties are being experienced in trying to get integration between the Computer Aided Dispatch (CAD) system, the financial system and the subscription system. That is, however, certainly the plan.

The rural services have one IT Manager who oversees the area of IT for all of the rural services. When he was appointed a few years ago, it was his task to ensure that there was some direction in terms of IT and to coordinate the rural

services into a cohesive unit. The first step he took was to develop a set of standards and within that to massage the systems that were already in place into something that would meet the core needs of the services.

Current Information Systems and Technology

Table 28 summarises the list of systems that were provided by the six services that make up the Victorian Ambulance Service. It should be noted that the Subscription system has not been included in the list of the MAS systems.

This is because the Subscription scheme in Victoria has been outsourced. This is not the case for the rural services.

<u>MAS</u>	<u>Sth Western</u>	<u>Sth Eastern</u>	<u>Western</u>	<u>Nth Western</u>	<u>Nth Eastern</u>
Accounting	Transport Fees/	Accounting	Accounting	Accounting	Accounting
Patient Recording	Patient a/cs	Payroll	Payroll	Payroll	Payroll
AO Training	Accounting	Patient Rec.	Patient Rec.	Statistics	Transport
Personnel	Payroll	Personnel	Diary	Debtors	Subscrip.
Payroll	Subscriptions	Subscriptions	Subscriptions	Subscriptions	
Communications	Fixed Assets	Word Processing	Word Processing	Word Processing	
Word processing			Spread Sheets	Spread Sheets	
Admin services			Communications		
Sub Centre Systems			Inventory		
IT Maint & Dev.					
Rosters					

Table 28 Systems used by The Victorian Ambulance Services

Specific costing for the IT in the Victorian Services were difficult to identify because of the major changes that had occurred and were occurring in the MAS. Also specific details of the rural services were difficult to isolate due to the reuse of systems throughout a number of services. The estimates in table 29 were made by MAS concerning the level of investment in their existing systems.

<u>System</u>	<u>Hardware</u>	<u>Estimated Level of Investment</u>
Accounting	Mainframe/PC	15,000
Patient Recording	Mainframe	20,000
AO Training	PC	4,000
Personnel	PC	2,000
Communications	Mainframe	450,000
Word Processing	PC	5,000
Admin Services	Mainframe/PC	20,000
Sub Centre Systems	PC	10,000
IT Maintenance/Dev.	Mainframe/PC	15,000
Rosters	PC	6,000
		<u>612,000</u>

Table 29 Estimated investment level in Information Systems by MAS.

The estimates for MAS must be considered in the light of the short amount of time the current management structure has been in place and the fact that such dramatic changes are occurring in all areas of the service including IT. For example, the figure placed on Word Processing, i.e. \$5,000 would be less than

the cost of two new stand alone PCs running Word Processing packages such as Word Perfect or Microsoft Word. In terms of understanding the level of investment by the Victorian Ambulance Services in IT it is more appropriate to focus on the level of on-going expenditure by the various services.

MAS has an IT salary budget for the 93/94 financial year of \$130,000. It has an operating budget of 2.6 million, although this is an exaggerated figure because of the major redevelopments that are occurring in the 93/94 year. The capital budget for the year is \$650,000 with an additional \$10,000 allocated for IT training.

The rural services have a combined IT staff salary of \$52,500. This is a conservative view of the IT salary costs of the rural services as these costs are not a separately identified budget item and are based upon estimates. Two of the services indicated the IT salary budget as nil. The combined operating budget for IT was \$70,000 for 1993/94. The only capital expenditure indicated was by one of the rural services and the budgeted amount for 93/94 was \$25,000.

The Determination of IT Investments

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

When asked to put a subjective rating on the level of influence of each of the six variables defined in this research, the results were as follows:-

<u>External</u>	<u>MAS</u>	<u>Rural</u>	<u>Internal</u>	<u>MAS</u>	<u>Rural</u>
Members/customers	20%	10%	Efficiency	30%	25%
Government	10%	20%	Effectiveness	30%	40%
Vendors	5%	5%	Political	5%	0

Table 30 Driving Influences for Information System & Information Technology resources in the Victorian Ambulance Services.

On the question of these variables generally, the IT manager for the rural services said:

“There has certainly been some external factors that have been part of the process of change for some of our existing systems. Things such as the change in transport fees, requirements of government and that is probably it. They are certainly there and I could not exclude them, but I think generally the change is internal, it is driven by perceived need. A part of it is coming from me as I observe things. At other times I get formal requests for change. I would have to say that the majority of change is internal.” (personal contact, 21 February 1994)

As far as MAS was concerned the answer to this question was mainly focused on where MAS was going rather than what had already happened. This was due to the lack of knowledge as to what had happened in the past.

In addition to answering the above question generally, the respondents were asked to look at each of their identified systems and rate the six variables for each of those systems. The results were as follows:

MAS

	Memb/ Customers	Gov't	Vendor	Efficiency	Effective	Polit.
Accounting	5%	15%	15%	30%	30%	5%
Patient Recording	5%	15%	15%	30%	30%	5%
Personnel	5%	20%	5%	25%	25%	20%
Payroll	5%	15%	10%	15%	15%	40%
Communications	5%	10%	5%	30%	30%	20%
Word Processing	0%	0%	20%	20%	20%	40%
Admin Services	10%	10%	10%	20%	20%	30%
Sub Centre Systems	5%	5%	20%	5%	5%	60%
Rosters	5%	5%	20%	5%	5%	60%
Averages	5%	10.5%	13.5%	20%	20%	31%

Chart 5 Driving Influences on Each System within the Victorian Metropolitan Ambulance Service (MAS)

Rural Services

	Memb/ Customers	Gov't	Vendor	Efficiency	Effective	Polit.
Accounting	0%	30%	0%	10%	60%	0%
Patient Recording	10%	20%	10%	10%	50%	0%
Payroll	0 %	60%	5%	5%	30%	0%
Subscriptions	20%	30%	10%	10%	10%	20%
Word Processing	0%	0%	10%	30%	60%	0%
Spread Sheet	0	0	0.1	0.3	0.6	0
Communications	0%	0%	30%	30%	30%	10%
Averages	4%	20%	11%	18%	43%	4%

Chart 6 Driving Influences on Each System within the Victorian Rural Ambulance Service

MAS was not able to put a rating on the AOTC system and the rural services

could not rate Inventory or Diary systems.

On a system by system basis the results differ from those given as a general perception by the management representatives. For MAS the results were:

		<u>General</u>	<u>System by System</u>
<u>External</u>	Members/customers	20%	5%
	Government	10%	10.5%
	Vendors	5%	13.5%
<u>Internal</u>	Efficiency	30%	20%
	Effectiveness	30%	20%
	Political	5%	31%

For the rural services the results were:

		<u>General</u>	<u>System by System</u>
<u>External</u>	Members/customers	10%	4%
	Government	20%	20%
	Vendors	5%	11%
<u>Internal</u>	Efficiency	25%	18%
	Effectiveness	40%	43%
	Political	0%	4%

For this reason, it is concluded that proposition one is supported for MAS, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation. The combined rating of internal political factors, government influence and vendors was 54%. It should be stated, however, that this is the situation with the current IT and indications are that proposition one would not be supported for IT developments and implementations being put into place by the current management.

Proposition 1 is not supported for the rural services because as can be seen from the chart, although on a system by system basis the factors referred to in

proposition 1, i.e. internal political factors, government influence and vendors do have more impact than when considered generally, the perceived contribution to effectiveness is still the major contributing factor.

The Driving Influence in Determining IT Investment Priorities

The second proposition is:-

The decision to commence a new Information System is not the result of a formal IT investment methodology.

From the central perspective, i.e. from the Health Department's perspective, there has been no formal approach to the planning process for IT. The Manager of the Ambulance Service program within the Health Department made the point that although the services themselves may have formal approaches to the determination of IT investment priorities, on a centralised state wide basis there was no such procedure. Recently, approximately two years ago, performance indicators were developed on a state wide basis and IT requirements were determined based on what was considered necessary to

satisfy those needs.

From the rural perspective systems were approached along a strategic pathway following the appointment of the IT Manager for the rural services a few years ago. As mentioned in the outline at the beginning of the Victorian case study, the first step following the appointment of the rural services IT Manager was to develop standards and then try to massage the systems that were already in place into something that would meet the core requirements of the services. Within a general strategy they approach each system on the basis of what is required to perform identified key tasks appropriately. That covers things such as performance indicators. On top of that process is the budgetary process which apply certain constraints.

With MAS there was a strategy based on the continuation of the mainframe and sub systems that would draw data from the mainframe. This strategy proved to have serious problems and six months ago was completely changed.

Until quite recently, an additional constraint was imposed by the Health Department in that the Ambulance Services were required to use the Health

Departments computer services. What has happened recently is that this requirement has now been freed up and agencies such as the Ambulance Services have the freedom to choose whether they use the Health Department's computer services or not.

In trying to determine whether proposition two was supported or not for the Victorian Services, due to the massive changes occurring and the short amount of time that the Finance Director had been involved with MAS, it was necessary to look closely at each system and try to rebuild the process by which the system would have come about. The result was that it was identified that each system came about as a result of a formal methodology or approach to the determination of IT investment priorities or as part of an ad hoc arrangement or a combination of both. The accounting system was a combination of a formal strategy and ad hoc approach resulting in three different systems sitting on three different machines.

Patient recording has always been a formal system within MAS although it has never been a proper patient recording system in terms of recording clinical data nor has it completely fulfilled the requirements in terms of transport data. The AOTC system was ad hoc. The communications centre was ad hoc and had

actually been written by an ambulance officer at some stage.

Word Processing started as a formalised approach but deteriorated into an ad hoc approach. The administrative services systems were the same, i.e. initially started via a formalised approach but then became ad hoc. The Sub Centre systems have also been an ad hoc evolutionary process. The subscription scheme was developed by the Health Departments computer services people and then taken on board by MAS. Chart 7 summarised the approach to each system:

System	Formal Approach	Ad Hoc Approach	Combined Formal and Ad Hoc Approach
MAS - Accounting			√
Patient Record	√		
AOTC		√	
Comms Ctr		√	
Word Proc			√
Admin Serv			√
Sub Centre		√	
Subscrip.	√		
Payroll	√		
Rural - Patient Rec.	√		
Accounting	√		
Word Proc.	√		
S/Sheet	√		
Comms Ctr		√	
Inventory		√	

Chart 7 Approaches to the Development of New Systems within The Victorian Ambulance Services

The results in chart 7 show a different story for MAS as opposed to the rural services. The systems that had a formal approach for MAS were the ones that were driven by the Health Department. For MAS 33% had a formal approach, 33% had a combination of formal and ad-hoc while 33% were purely an ad hoc approach. This means that a conclusion for proposition two cannot be reached for MAS. For the rural services the picture was much clearer. 66% of their systems had a formal approach or methodology. For this reason it can be

concluded that proposition two, i.e. the decision to commence a new Information System is not the result of a formal IT investment methodology, is not supported for the rural services.

The Determination of the Levels of IT Investments

The third proposition for the case study is as follows:-

The greatest determining factor for the level of investment in any particular Information System is the availability of funds.

The management representatives were asked whether a formal methodology or process was followed during the process of determining the appropriate level of investment for a proposed system within their organisation.

The situation with MAS was that there were attempts made at cost benefit analyses, however, they tended to be in an ad hoc manner. The analyses were done in an isolated way and in some ways tended to be influenced by the personal preferences of the people who were driving the projects. To quote the MAS representative:

“There was a fairly strong bias toward the view of the IT manager at the time and his wants and needs. Certainly he took into account 'what' a system was supposed to deliver. So therefore, I think there was some analysis, however, from what I have seen of the documentation, it tended to be weighted to his personal preferences.”
(personal contact, 21 February 1994)

The situation with MAS now is that there is a formal process of commercial review which is a part of the overall management change and organisational change at MAS. IT was a part of that commercial review. The commercial review included a process whereby a principle was followed that looked at what systems were available first to address the identified needs of the service. The associated investment options were then assessed. This has led to different investment options being used for different areas. It is all part of a formal process that follows two separate models. One for outsourcing options and the other for internal solutions.

The conclusion for MAS for the third proposition was that with the systems that were already in place there was not much evidence to suggest that formal procedures or methodologies had been followed in determining investment levels. For this reason it can be concluded that proposition 3 is supported for the IT that was in place for MAS at the time of the research. Once again,

however, there is strong evidence that this situation had changed as a result of the management and organisational changes that have been and are being implemented at MAS.

The rural services have not followed a formal procedure or methodology in determining investment levels in their organisations partly because they have not considered the solutions to their IT needs as large investments. For this reason it can be concluded that proposition 3 is supported for the rural services.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

To expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other words, if there were a proposed system that was going to cost, say, \$100,000 would

the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service?

With the systems that are currently in place proposition 4 is supported for both services. There is no evidence or indication that evaluations such as that described above have been carried out, although both MAS and the rural services have more formalised procedures in place now and it would be expected, as part of the commercial perspective being taken by the Victorian Ambulance Service that the situation will be markedly different for systems being currently implemented and those that will be implemented in the future.

Contribution To The Organisations Effectiveness

The contribution of each system to the organisation's overall effectiveness is not necessarily a conscious consideration during the process of determining what IT priorities should proceed and when as well as determining what is the appropriate level of investment that should be committed to each project to

ensure the maximum return and thus the maximisation of the organisation's effectiveness. Having said this, it is reasonable to assume that there would be some belief by those driving an IT project that each system would contribute to the organisation performing better than it would without the system.

The next part of this research attempts to ascertain the views of senior management representatives as to whether the levels of investment that have been made in each of the systems have contributed toward the organisation being more effective. The definition of whether a system contributes to the organisation's overall effectiveness is whether it contributes toward the organisation achieving its mission to a greater degree than would have been the case without that system or technology.

In terms of performance indicators or critical success factors the five broad categories will be used as the Victorian Ambulance Service, like a number of others, is in the process of establishing nationally agreed to standard performance indicators. The categories used for this research are:

Response Times	Does the IT/IS contribute more to the reduction of response times than would be the case if the amount
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of money spent on the particular system were spent elsewhere within the service.

Operational Cost

per Patient

Does the IT/IS contribute more to the reduction in the operational costs per patient more than would be the case if the amount of money spent on a particular system were spent elsewhere within the service.

Overhead Cost

per Patient

Does the IT/IS contribute more to the reduction in the overhead costs per patient more than would be the case if the amount of money spent on a particular system were spent elsewhere within the service.

Quality of

Ambulance Care

Does the IT/IS contribute more to the improvement in the quality of ambulance care delivered to a patient than would be the case if the amount of

money spent on a particular system were spent elsewhere within the service.

New Business

Opportunities: New business opportunities include any areas for raising additional revenue, i.e. by being able to market services to additional clients, by being able to market new services etc.

With MAS the situation was again difficult because the current management can only speculate as to what the expectation would have been when the current systems were introduced. A summary of that expectation is as follows:-

MAS

	Response Times	Operational Cost	Overhead Cost	Quality of Care	New Business
Accounting			√		
Patient Recording	√	√	√		
Personnel			√		
Payroll			√		
Communications	√	√	√	√	
Word Processing			√		
Admin Services			√		
Sub centre Systems			√		
Rosters		√	√		

Table 31 Systems and the Performance Indicators those systems were expected to influence - MAS

Rural Services

	Response Times	Operational Cost	Overhead Cost	Quality of Care	New Business
Accounting			√		
Patient Recording	√	√	√		
Payroll			√		
Communications	√	√	√	√	
Word Processing			√		
Spread Sheet			√		
Subscriptions			√		√

Table 32 Systems and the Performance Indicators those systems were expected to influence - Rural Services

Having identified the areas in which the system or technology was expected to contribute toward the organisation achieving or better achieving its mission the next step was to determine whether the system had made a positive

Rural System	Result
Accounting	+
Patient Recording	+
Payroll	-
Communications	+
Word Processing	+
Spread Sheet	+
Subscriptions	+
Diary	+
Inventory	+

Table 34 Positive or Negative Contribution of each system - Rural Services

Both MAS and the Rural Services had only invested in one system that was expected to have an impact on response times. The system was the communications system. The results are different for MAS and the Rural services. This is in many ways probably attributable to the fact that MAS has invested far greater levels of expenditure. With communications there have been large projects scrapped and significant amounts of money written off by MAS.

Proposition number 5, i.e. investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the

service.

For MAS proposition 5 is not supported. For the rural services it is supported.

Proposition number 6 states that "Investment in IS/IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service". The Victorian Services have three systems which were expected to contribute to a reduction in operational costs per patient. These systems are the patient recording, communications and for MAS only the rosters system. For MAS patient recording and communications have not made a positive contribution but rosters has. On the basis that two of the three systems have not contributed positively the conclusion is that proposition number 6 is not supported for MAS.

For the rural services both patient recording and communications have contributed positively and therefore the conclusion is that proposition 6 is supported.

Proposition 7 is that "Investments in IS/IT to reduce the overhead costs per

patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service. All of the systems in both the MAS and Rural Services were expected to contribute to efficiency measures which means they would be expected to contribute to this performance indicator. With MAS, five of the nine systems were identified as making a positive contribution to the organisation achieving its mission. In the case of the rural services it was eight out of nine. This leads to the conclusion that proposition number 7 is supported for the Victorian Services.

Due to the lack of clinical data analysis from the patient recording system, the only system that could have been expected to make some contribution in the area of quality of patient care was the communications centre system. Proposition 8 states that Investment in IT to improve the quality of ambulance care has contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service.

Again the situation will differ between MAS and the Rural services. With MAS this proposition is not supported because the perceived contribution of the communications centre system is not positive whereas with the rural service it is.

Proposition 9 relates to the area of new business opportunities. Due to the fact that the subscription scheme has been outsourced by MAS this system was not considered here. For the rural services however, there was some expectation that the subscription would lead to new business opportunities or at least an extension of those already in existence. As the subscription scheme is perceived as making a positive contribution to the rural services, proposition 9, which states that Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service is supported.

Summary

The Victorian Ambulance Service is actually made up of six ambulance services. The Metropolitan Ambulance Service (MAS) and five rural services. For this research the five rural services will be treated as one in terms of the conclusions.

The Victorian Ambulance Services has gone through

major structural changes over the past few years with the greatest changes occurring in MAS. The major structural changes have obviously had a significant effect on the development of their IT resources.

Asked whether as an overall perception, IT had made a positive contribution to the Ambulance Service over the past decade these were the responses:

Rural IT Manager

: "It has become more effective over the last 18 months, I think. It provides a lot of information. People have their bitch about it not doing this or that, but a lot of things we do now in terms of trying to improve the service we bring to the public, wouldn't be happening. I think IT is an inevitable part of an organisation. We have put in systems that have been fairly cost effective in that they haven't cost a lot of money and they have provided a service. Although the service they have provided isn't ideal, we are looking to rectify that over a period of time. I would say that it has been a positive contribution." (personal contact, 21 February 1994)

Manager, Ambulance Service Program - Department of Health and Community Services

"From the country perspective, I think the investments they have made, after probably not the best start has produced positive outcomes. From our perspective in terms of country's ability to report in the way we want them to report they are close to the point where they are satisfying the department in that regard. It has been a fairly gradual process to get to that point.

In terms of metro, I guess all I can say is that we have confidence in the direction that is being taken in terms of producing the outcomes that we require." (personal contact, 21 February 1994)

Table 35 Comments on IT's contribution to the Ambulance Service's effectiveness.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation, is supported for MAS but not supported for the rural services..

The second proposition that the decision to commence a new Information System is not the result of a formal investment methodology is inconclusive for the MAS and not supported for the rural services . Although this proposition is inconclusive for the existing IT investment by MAS there have clearly been procedures and practices put in place that will ensure that this proposition is not supported for future investments by them.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is supported for both of the services in terms of its existing investment although, certainly for MAS, the situation has been changed and levels of investment will be monitored more closely now from the point of view of examining alternative investment options with a view to maximising the organisation's effectiveness.

The fourth proposition that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System is supported because although it has been one of the significant factors in determining what to do when the decision comes about as to the appropriate level of investment there has not been a procedure that evaluates the possible outcomes from that investment against alternate investments that may provide a greater enhancement in terms of the organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service, is not supported for MAS basically because of the lack of any improved outcomes as a result of investments in CAD systems to date. For the rural services the opposite is true in that benefits have been obtained where a CAD system has been implemented.

The sixth proposition is that investments in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. This proposition

has not been supported for the MAS but supported for the rural services.

The seventh proposition that investments in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service is also supported for both services although more conclusively for the rural services.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service is not supported for MAS but supported for the rural services.

Proposition 9 that investments in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service is also supported for the rural Victorian Services but not applicable for MAS because there are no systems in place that have had this expectation.

The significance of the findings in relation to the research propositions is that MAS has tended to have no formalised approach to the way it determined its investment priorities or the way in which it determined its investment levels. Not surprisingly the outcomes have not been very positive. On the other hand, the rural services have had a more formalised

Proposition No.	MAS	Rural
Proposition 1	Supported	Not supported
Proposition 2	Inconclusive	Not supported
Proposition 3	Supported	Supported
Proposition 4	Supported	Supported
Proposition 5	Not supported	Supported
Proposition 6	Not supported	Supported
Proposition 7	Supported	Supported
Proposition 8	Not supported	Supported
Proposition 9	Not Applicable	Supported

Table 36 Summary of the results for each proposition for the Victorian Ambulance Services

approach in that what was happening in IT was more linked to the overall effectiveness of the organisations concerned. It didn't have formal procedures or methodologies in terms of deciding appropriate investment levels, however the outcomes have been positive.

The experience in terms of investment levels for the Victorian Ambulance Service support the finding of Weill and Olson (1989). Once again their point

that unfortunately much of the investment is based on blind faith that real returns will occur seems to accurately reflect what has happened in the past with this service.

Proposition 4 is supported for this organisation, i.e. concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System. The Victorian services are, generally, unable to relate their MIS spending to the corporate bottom line, a situation similar to that identified by Ralph Carlyle (1987). As MIS spending cannot be related to the corporate bottom line, how could it be argued that the determination of IT investment levels takes into account the overall effectiveness of the organisation.

The Victorian Ambulance Services in general, and MAS in particular have gone to great lengths in recent times to put in place procedures that will ensure that the measurement of IT effectiveness will shift from a technical focus to a business focus, i.e. as described by Howard Rubin (1991). He states that people are no longer asking how much output they get from their IT investment but rather are evaluating that outcome. Like the other services that have been looked at, this certainly appears to be the case for the Victorian Ambulance

Service as the need to evaluate the "outcome" of IT investments is now also clearly seen by them as an objective and in the case of MAS significant effort is being put into this process.

Northern Territory Ambulance Service

Background

The Northern Territory Ambulance Service is run by St John Ambulance Australia in much the same way as the Ambulance Service in Western Australia. The organisation in the Northern Territory employs just under 100 staff and also has in excess of 400 volunteers.

The Ambulance Service provides ambulance cover for a population of 175,891. The ambulance service has a fleet of 21 ambulances and 7 clinic vehicles. There are 7 ambulance stations manned by paid staff and 1 manned by volunteers. There are two communication centres in the Northern Territory.

During 1992/93 the service attended 20,073 cases travelling a total of 418,272 kilometres. There are 56 ambulance officers employed in the Northern Territory and 6 operational support staff. In addition, there are 26 general support staff. There are a total of 46 volunteers. The total expenditure for 1992/93 was \$6,054,000. The cost per case therefore was \$301.60.

In the Northern Territory the services provided by St John include:

Training Branch: - The instruction of members of the public in the principles and practice of First Aid, Nursing, Hygiene and other allied ancillary subjects.

Operations Branch - The organisation, training and equipping of men, women and young persons to undertake, on a voluntary basis either as individuals or as organised groups, First Aid, nursing and allied activities. The Operations branch supports the St John Ambulance Service by the provision of volunteer ambulance officers and medical advisory input.

St John Ambulance Service - Which provides, by agreement with the Northern Territory Government, a modern, well equipped ambulance service throughout the Northern Territory. The responsibility for the administration and management of the St John Ambulance Service is delegated to the General Manager and his executive staff and utilises career and volunteer personnel on ambulances.

St John in the Northern Territory provides a comprehensive response service to the sick and injured. It commences with immediate First Aid Training of the public, extends to the provision of First Aid Services at public events and culminates in a high quality ambulance service.

General History of Information Technology

The Northern Territory Service has a reasonably stable history in terms of its Information Technology. The organisation brought its computer operations in-house in 1982. It progressed through three different platforms ending up with the current mini computer and PC network. One of the overriding factors in determining the direction of IT for the Northern Territory Service has been the availability of support. Since the introduction of the in-house system in the early 1980's the Service has strived to implement systems that could be supported locally. Naturally, due to the size of Darwin, this has meant that the choices available were not always as comprehensive as those in larger cities.

Current Information Systems and Technology

The current IT resources used by this service consist of a number of core systems running on an IBM RT mini computer with users having access via ASCII terminals. These core systems are supported by a growing number of networked PCs that are used for word processing, spreadsheet and some database functions.

The Northern Territory was asked to identify each system it had and estimate the cost of that system. The cost of each system was defined as the investment in both hardware and software in the system in its existing form.

The systems in table 36 represent a total investment of \$133,000.

TABS Accounting Package)	
Subscriptions)	
CSM Radphone package - VJY)	85,000
Word Perfect - RT)	
Snow - Query program)	
SBM - Training)	
Spreadsheet - Networked PCs]	
Q & A database PCs]	48,000
Word Perfect Networked PCs]	

Table 36 Northern Territory Systems and estimated investment levels.

As the Northern

Territory Service is a small service it does not have specialised IT staff as such although the business manager does have an IT background. Systems and/or development are obtained from sources outside the St John Ambulance organisation.

The Determination of IT Investments

The first proposition for the case study is:-

The determination of an IT investment is influenced to a greater

extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation.

Throughout the history of the development of IT within the Northern Territory, the service believes it has been driven by the need for timely and accurate accounting information and the cost effectiveness of providing that in a timely manner. At the time the organisation first brought its operations in-house the General Manager (who was then the finance manager) made the point that a lot of the accounting information was only available on an annual basis. It was produced manually and was not timely. In addition, there were questions about its accuracy.

The Northern Territory service has been driven mainly by internal factors. The General Manager stated that in the early days of the first in-house computer system, i.e. the early 1980s, approximately 25% of the driving influence was external factors. The figures in table 37 represent the weightings given to the

factors that influenced
IT investments.

<u>External</u>	<u>Internal</u>
Members/customers	8.5% Efficiency 50%
Government	8.5% Effectiveness 20%
Vendors	8.5% Political 5%

During the interview
process covering this

Table 37

Driving Influences for Information System & Information Technology resources in the Northern Territory Ambulance Service

area the General Manager was able to answer these questions drawing on his knowledge of the specific systems used by the Northern Territory Service. For this reason a separate analysis of the same variable on a system by system basis was not carried out. The figures above represented the view of the management team both generally and as a result of considering the investment in IT on a system by system basis.

The results from table 37 show that proposition one is supported for the Northern Territory Service, i.e. the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation. While efficiency was a significant factor throughout the period that the current investment took place, effectiveness was a lesser influence than the three mentioned variables.

The Driving Influence in Determining IT Investment Priorities

The second proposition:-

The decision to commence a new Information System is not the result of a formal IT investment methodology.

The General Manager described their approach to what was to be invested in as far as Information Technology was concerned as basically a day to day thing. This was so, he believes, because the Northern Territory Service has always tended to be focused on what it is that it should be doing. There has been a process where hardware investments have been part of a strategic plan, however systems have been more of a day to day thing. For this reason, proposition 2 is supported for the Northern Territory.

The Determination of the Levels of IT Investments

The third proposition for the case study is as follows:-

The greatest determining factor for the level of investment in any

particular Information System is the availability of funds.

This service does not have a formal methodology or model that is used to determine the appropriate level of investment in a desired system. Their approach is that in deciding whether or not to proceed with a proposed IT investment they would form a view as to the "ball park" figures that would be expected in terms of the level of investment required. Unless a quotation for a system involved figures totally outlandish in comparison to the "ball park" figures that were expected at the time of making the initial decision to proceed, the investment process would proceed. If the quotation was higher than expected, but not "outlandish" the only effect would be in terms of timing. There is no formal methodology to determine appropriate levels of investment such as cost benefit analysis etc.

The view of this service is that this approach is the most appropriate particularly in light of the fact that the actual investments made in IT are quite modest. The third proposition is therefore supported for the Northern Territory Service.

The fourth proposition for this research is that:-

Concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System.

To expand on this statement, what we are really saying is that the Australian Ambulance Services do not consciously evaluate the most effective way to spend each dollar that may be available for an IT investment. In other words, if there were a proposed system that was going to cost, say, \$100,000 would the organisation go through some sort of evaluation which said "what is the most effective way to spend that \$100,000 such that we will be achieving or better achieving our mission and objectives?" Does the proposed IT investment stand up against other possible benefits that could be obtained with that amount of money if it were invested elsewhere within the service?

This proposition is also supported for the Northern Territory Service because as previously stated there is no process that evaluates the return on a given level of investment against other possible investment options that may or may not have a greater impact in terms of improving the outcome of the service in

relation to its mission and objectives.

Contribution To The Organisation's Effectiveness

Although the actual contribution of each system to the organisation's overall effectiveness may not be a conscious consideration at the time of deciding to proceed with a particular Information System or Technology, it would be reasonable to assume that there is an underlying belief that this is the case. The next part of the research seeks to ascertain the view of the CEO in terms of whether the levels of investment that have been made in each of the systems and in Information Technology generally have contributed toward the organisation being more effective. The definition of whether a system contributes to the organisation's overall effectiveness is whether it contributes toward the organisation achieving its mission to a greater degree than would have been the case without that system or technology.

The Northern Territory Service has its mission as previously stated which is "St John in the Northern Territory provides a comprehensive response service to the sick and injured. It commences with immediate First Aid Training of the

public, extends to the provision of First Aid Services at public events and culminates in a high quality ambulance service". For an Information System or Technology to contribute to the organisation's overall effectiveness it would have to contribute toward the service better achieving this mission than would have been the case without the system or technology. Each service will measure various factors as a means of monitoring how well it is achieving its mission. While each of the services may have different terms or names for the critical success factors or performance indicators it uses, each will have some factors.

The Northern Territory Service only uses performance indicators from time to time. The general categories for this research were outlined, i.e.

Response Times

Quality of Care

Overhead costs per patient

Operational costs per patient

New business opportunities

Table 38 summarised the systems and the performance indicator that system would effect:

	Response Times	Operational Cost	Overhead Cost	Quality of Care	New Business
TABS Accounting		✓	✓		
Subscriptions			✓	✓	✓
CSM Radphone				✓	
Word Perfect RT			✓		
Snow Query			✓		
SBM Training			✓	✓	
Spreadsheets			✓		
Q & A Database			✓		
Word Perfect -PCs			✓		

Table 38 Systems and the Performance Indicators those systems were expected to influence

Having identified the area in which the Information System or Technology was expected to affect the organisation, i.e. what performance indicator was expected to be effected, the General Manager was asked to identify whether or not the system had made a positive contribution to the organisation. The way in which the General Manager was asked to determine whether or not the contribution was positive was to consider whether or not the same level of investment made elsewhere within the service would be expected to provide a greater contribution to the organisation in terms of the organisations better achieving its mission. Table 39 gives a summary of the perceived positive or negative contribution of each system:

TABS Accounting	+
Subscriptions	+
CSM Radphone	+
Word Perfect RT	+
Snow Query	+
SBM Training	+
Spreadsheet	+
Q & A Database	+
Word Perfect PCs	+

Table 39 Positive or Negative Contribution of each system as perceived by senior management.

Proposition number 5 states that "Investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in response times than had the investments been spent elsewhere within the service". As there have been no investments in the Northern Territory Service where there has been this expectation, this proposition cannot be evaluated.

The sixth proposition states that "Investment in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. The Northern Territory Service has invested in one system where there has been an expectation that operational costs per patient would be reduced as a result of the system. That system was the TABS accounting system. The belief of the

General Manager is that the accounting system has made a positive contribution, i.e. the same investment made elsewhere within the service could not have produced a better result in terms of operational costs per patient. Proposition number 6 is therefore supported.

The major expected benefit of the IT investment by this service has been in the area of efficiency, i.e. overhead costs per patient. The seventh proposition states that "Investment in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service." All of the systems, with the exception of the CSM Radphone system, were expected to contribute to a reduction in overhead costs per patient. The belief of the General Manager is that this is the case therefore proposition 7 is supported for the Northern Territory Service.

The Northern Territory Service had three systems where the expectation in relation to these systems included a belief that the investment would lead to some improvement in the quality of care delivered to the Northern Territory public. Proposition number 8 states that "Investment in IT to improve the quality of ambulance care have contributed to a greater improvement in the

quality of care than had the investments been spent elsewhere within the service". The three systems were Subscriptions, CSM radphone and SBM Training. The perception of the General Manager is that these three systems have contributed positively, i.e. the same level of investment in other areas of the organisation would not have resulted in greater improvements in the quality of care, therefore, proposition number 8 is supported for this service.

Proposition number 9 is that "Investment in IT to open up additional sources of revenue have contributed to the generation of more revenue than had the investments been spent elsewhere within the service". The Northern Territory Service has one system that was expected to contribute to the creating of new business opportunities. That system was subscriptions. The belief of the General Manager again is that this system has lived up to this expectation proposition number 9 is therefore supported for the Northern Territory Ambulance Service.

Summary

The Northern Territory Service is a small service that has a history of stability in terms of its management and particularly in relation to its Information Technology. There was no evidence that the service had experienced any disasters in terms of investing significant amounts in IT and then finding that a project was unworkable or did not deliver the outcomes required. The IT in this service has tended to follow a steady evolutionary development.

The first proposition for the research, i.e. that the determination of an IT investment is influenced to a greater extent by internal political factors, government influence, or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation, is supported.

The second proposition that the decision to commence a new Information System is not the result of a formal investment methodology is supported in this service as the decisions to invest in most of the systems have come about as a result of day to day decision making. This approach is considered appropriate by the Northern Territory Service as it believes it is totally focused on the real issues that confront the organisation and is in a position to make the

right IT investment decisions on a day to day basis.

The third proposition that the greatest determining factor for the level of investment in any particular Information System is the availability of funds is supported for the service. Once the decision has been made to invest in a particular system, the actual level of investment required will influence the timing of the investment not the actual question as to whether or not the investment goes ahead.

The fourth proposition that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System is supported because when the decision comes about as to the appropriate level of investment that should be made in an Information System there has not been a procedure that evaluates the possible outcomes from that investment against alternate investments that may provide a greater enhancement in terms of the organisation better achieving its mission.

The fifth proposition, that investments in IT to assist in the role of despatching ambulances to ambulance calls have contributed to a greater reduction in

response times than had the investments been spent elsewhere within the service, cannot be evaluated because there have been no systems with that expectation.

The sixth proposition is that investments in IT to reduce the operational costs per patient have contributed to a greater reduction in operational costs than had the investments been spent elsewhere within the service. This proposition has been supported for the Northern Territory Service.

The seventh proposition that investments in IT to reduce the overhead costs per patient have contributed to a greater reduction in overhead costs per patient than had the investments been spent elsewhere within the service is also supported for this service.

Proposition 8 that investments in IT to improve the quality of ambulance care have contributed to a greater improvement in the quality of care than had the investments been spent elsewhere within the service is also supported for the Northern Territory.

Proposition 9 that investments in IT to open up additional sources of revenue

have contributed to the generation of more revenue than had the investments been spent elsewhere within the service is supported because there was such an expectation with the Subscription system and the view of the General Manager is that the system has lived up to this expectation.

The significance of the findings in relation to the research propositions is that despite the fact that the determination of IT investments has been influenced to a greater extent by internal political factors, government influence or vendors than by a consideration of IT's contribution

Proposition 1	Supported
Proposition 2	Supported
Proposition 3	Supported
Proposition 4	Supported
Proposition 5	N/A
Proposition 6	Supported
Proposition 7	Supported
Proposition 8	Supported
Proposition 9	Supported

Table 40 Summary of the results for each proposition for the Northern Territory Ambulance Service

to the overall effectiveness of the organisation the intent of each of the systems, i.e. the aspects of the organisation that would be expected to be affected positively, have been affected that way.

Although propositions 3 and 4 were supported, i.e. that the greatest determining factor in the level of investment for each particular system was the

availability of funds and the least determining factor was an assessment of the investment options associated with that level of investment, upon reflection, the organisation's senior management consider that the investments have contributed more toward the organisation achieving its mission and objectives than had the same level of investment been made elsewhere within the organisation. The experience in terms of investment levels for the Northern Territory Ambulance Service, as with the other Ambulance Services previously looked at, support the finding of Weill and Olson (1989) in relation to spending guidelines.

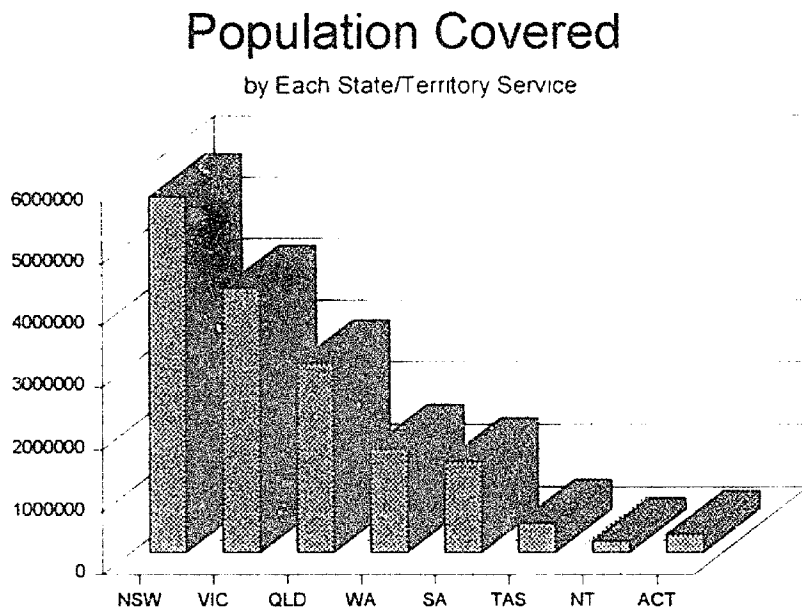
As with all of the other Ambulance Services studied during this research, the Northern Territory Ambulance Service, would have difficulty with the concept that proposition 4 is supported for their organisation, i.e. that concern for the overall effectiveness of the organisation is not a major factor in the determination of investment levels for any particular Information System. As pointed out with each case study, the proposition supports the point put by Ralph Carlyle (1987) that corporations were unable to relate their MIS spending to the corporate bottom line. That being the case, if MIS spending cannot be related to the corporate bottom line, how could it be argued that the determination of IT investment levels takes into account the overall

effectiveness of the organisation.

Howard Rubin's (1991) comments once again are most appropriate, i.e. the whole area of the measurement of IT effectiveness is shifting from a technical focus to a business focus. He talks about the need for IT people to "connect" to the business. He states that people are no longer asking how much output they get from their IT investment but rather are evaluating that outcome. This certainly appears true for the Northern Territory Ambulance Service.

Summary and Conclusions

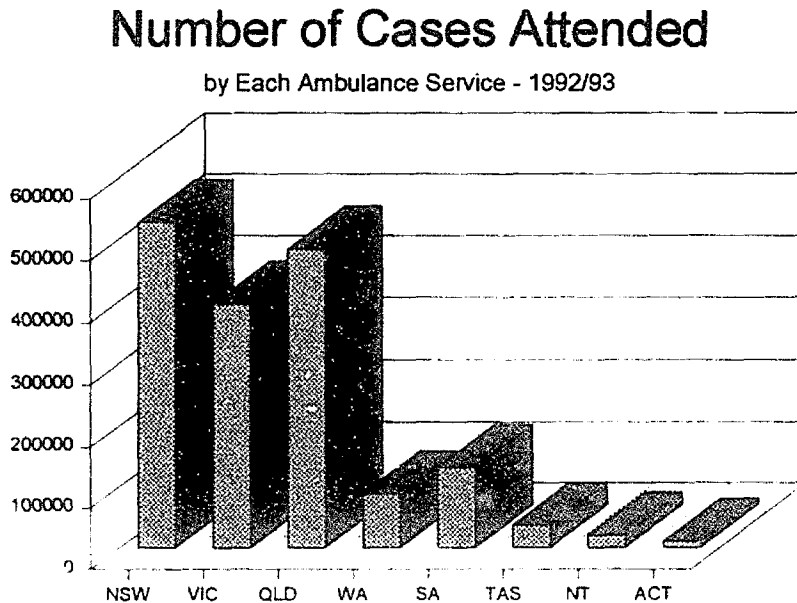
The research studies the Information Technology Investments of the Australian State Ambulance Services. These services vary considerably in size and structure. Some of the services are predominantly private in nature, i.e. those run by St John Ambulance, while the majority are government run services. The following is some comparative data to illustrate the differences in the size and structure of each of the services.



Graph 1

Graph 1 of the population covered by each service shows the three distinct groups. The large ambulance services covering large populations are New South Wales, Victoria and Queensland. Western Australia and South Australia

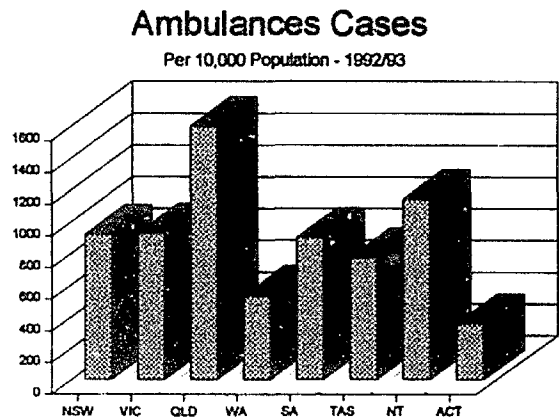
covering medium sized populations and the other three services being classed as small.



Graph 2

When the details in graph 2 are compared to graph 1 it can be seen that the number of cases attended is not totally dependent on population. This is an important point because it illustrates the independence of each state in terms of the general philosophy in terms of the provision of ambulance services. The actual relationship, if any, between this philosophy and the approach to the management of IT investments is outside the scope of this research other than to draw attention to the fact that there is a different approach used by each service.

Graph 3 gives an illustration of the proportion of the population transported by each service and further illustrates the above point.



Graph 3

Information Technology - What to do

Each of the Australian State or Territory Ambulance Services has been examined in the preceding case studies. The first question posed by this research is "How are IT investment decisions determined?" There was considerable variation between the ambulance services. To answer the question of how IT investments are determined it was necessary to look at a number of questions, these were.

- What are the major influences in determining whether or not to proceed with an IT investment?

- ⊙ Whether or not the decision to proceed with an IT investment is the result of a formal methodology or procedure.

The research gives six variables that might influence the decision to determine whether to proceed with an investment in Information Technology. These variables fall into two categories, external and internal. The external variables are "members/customers", "government", "vendors" while the internal variables are "efficiency", "effectiveness", and "political". The first proposition for the research is "The determination of an IT investment is influenced to a greater extent by internal political factors, government influence or vendors than by a consideration of IT's contribution to the overall effectiveness of the organisation."

Proposition 1

The results of the first proposition are shown in the table 41 opposite.

The proposition was supported for six of the services, not supported for one and inconclusive for the other two.

<u>State/Territory</u>	<u>Result</u>
Western Australia	Supported
Tasmania	Supported
Queensland	Supported
New South Wales	Supported
ACT	Inconclusive
South Australia	Inconclusive
Victoria MAS	Supported
Rural	Not supported
Northern Territory	Supported

Table 41 Results from each of the services for proposition 1.

Proposition 2

Table 42 shows that seven of the nine ambulance services do not use any sort of formal procedure or methodology in determining what Information Systems will be introduced into their systems.

The exceptions are Western Australia

and the Victorian Rural services. This leads to the conclusion that generally speaking the ambulance services in Australia do not use formal procedures or methodologies in the determination of their Information Technology

<u>State/Territory</u>	<u>Result</u>
Western Australia	Not supported
Tasmania	Supported
Queensland	Supported
New South Wales	Supported
ACT	Supported
South Australia	Supported
Victoria MAS	Inconclusive
Rural	Not supported
Northern Territory	Supported

Table 42 Results from each of the services for proposition 2.

investments.

In answer to the first research question, then, "How are IT investment decisions determined?, for the Australian Ambulance Services they are determined as a result of informal and/or ad-hoc approaches with the major driving influences being a combination of internal political factors, government influence and vendors rather than a conscious consideration of the potential contribution of the proposed Information Technology to the organisation's overall effectiveness.

This finding raises some concern in that it demonstrates a lack of direction in terms of the determination of IT investments by the Australian Ambulance Services. It raises concerns as to whether the services can use IT to improve or enhance the effectiveness of the organisation if the approach to that IT is ad-hoc. Davenport, Hammer and Metsisto (1989), in a study of the IT decision making processes of more than 50 large organisations found that many of those organisations were lacking direction. They stated that a few companies have articulated their basic philosophies about IT and they seemed to be using technology more effectively.

The findings raise an interesting question in light of findings by Pervan (1994). In his research titled "Information Systems Management: An Australian View of The Key Issues" Pervan observed that IS strategic planning is a top ranking issue among IS managers. He noted that many of the other highly ranked issues such as responsive IT infrastructure, aligning the IS organisation with the enterprise, effective use of the data resource, IS for competitive advantage and a comprehensive information architecture, all arise from or are promoted by effective IS strategic planning. Based on the findings for the first research question in this research, IS strategic planning does not seem to rate as highly by the Ambulance Services or if it does it is not being used or at least is not having an effect in terms of the way the organisations proceed with their IT investments. These findings are consistent with those by Hammer and Metsisto in that IT strategic planning is seen as an important issue at a time when research indicates that few companies have articulated their basic philosophies about IT.

Information Technology - How Much to Spend

The second question posed by the research is "How are levels of IT investments determined? Once again, to answer this question in relation to the Australian Ambulance Services two specific areas were looked at. These were:

- ⊙ Whether the greatest determining factor for the level of investment in any particular Information System was simply the availability of funds

- ⊙ Whether the least determining factor was in fact the consideration of whether the potential level of investment was the best use of those funds in terms of contributing to the organisation's overall effectiveness.

Proposition 3

The results of this proposition are shown in table 43.

The results show that eight of the nine ambulance services determine the level of investment in Information Systems as a

<u>State/Territory</u>	<u>Result</u>
Western Australia	Supported
Tasmania	Supported
Queensland	Supported
New South Wales	Supported
ACT	Not supported
South Australia	Supported
Victoria MAS	Supported
Rural	Supported
Northern Territory	Supported

Table 43 Results from each of the services for proposition 3.

result of the availability of funds rather than as the result of any methodology or formal procedure of evaluation. There are many varying reasons as to why this occurs. For example, in some services as a result of the funding arrangements with Government money that may be available for projects such as the implementation of IT may not be available to apply to other areas of the service. The one service where the conclusion that proposition 3 was not supported was the ACT. In their case the proposition was not supported because the greatest determining factor in the level of investment that could be made in any IT project was government.

Proposition 4

The results for this proposition are shown in table 44.

The results for this proposition were quite conclusive. There was little evidence that investments levels in IT were

<u>State/Territory</u>	<u>Result</u>
Western Australia	Supported
Tasmania	Supported
Queensland	Supported
New South Wales	Supported
ACT	Supported
South Australia	Supported
Victoria	MAS
	Rural
Northern Territory	Supported

Table 44 Results from each of the services for proposition 4.

evaluated in such a way as to determine if a particular level of investment would provide the maximum contribution to the organisation's overall effectiveness in terms of that organisation achieving or better achieving its mission and objectives. The results from all of the services support the findings of Weill and Olson (1989) that frequently the only spending guidelines managers have for IT investments are the spending levels of competing firms in their industry or a flat increment on the previous years budget.

The Ambulances Services again fit the picture painted by Weill and Olson in that much of the investment is based on blind faith that real returns will occur. When Ralph Carlyle (1987) concluded that corporations were unable to relate their MIS spending to the corporate bottom line, he reached a conclusion that

based on this research question, would appear to accurately describe the situation within the Australian Ambulance Services.

In answer to the second research question, "How are levels of IT investments determined?", within the Australian Ambulance Services they are determined by the amount of money that is available to be spent on them. This is, as opposed to the levels being determined by some sort of an investment methodology or evaluation process aimed at determining the optimum level of investment required to achieve an identified list of objectives. There is little evidence to suggest any link between the determination of IT investment levels and a conscious evaluation of the contribution to the organisation's overall effectiveness in terms of a consideration of alternative investment options.

Information Technology - Contribution to Organisation's Overall Effectiveness

The third question posed by the research is "Do IT investments contribute to the organisation's overall effectiveness? To answer this question in relation

to the Australian Ambulance Services a number of specific areas were looked at. These were:

- Contribution to reduced response times
- Contribution to reduced operational costs
- Contribution to reduced overhead costs
- Contribution to improved quality of patient care
- Contribution to additional business opportunities

The issue as to whether investments in Information Technology have contributed to the organisation's overall effectiveness comes back to a subjective evaluation because the concept of effectiveness within these organisations involves so many variables and it is not possible to establish an objective scientific evaluation or measurement that can be used and applied by these organisations. Crowston and Treacy (1986) expressed similar sentiments when they stated that it is very difficult to trace and measure the

effects of Information Technology through a web of intermediate impacts upon enterprise level performance.

Symons (1991) made the point that evaluation of Information Systems is generally aimed at the identification and quantification of costs and benefits even though the current use of IS in support of business strategy has consequences which are both complex and difficult to measure. He states that the benefits of IT are increasingly strategic or qualitative. In his view, evaluation of Information Systems should involve the consideration of two separate but related areas. Those are the linkage of IS strategy to business goals and the contribution of IS to organisational effectiveness.

Hirschheim (1984) argued that information systems should be regarded more as social systems and less as technical systems. The four reasons that were given by Keen and Scott Morton (1978) as to why evaluation of IT effectiveness was so difficult, i.e.

- 1) Systems do not have an initial adequate definition of objectives and criteria for "success" and "failure".

- 2) Evaluation must take into account social (qualitative) aspects, yet most attempts at assessment only include efficiency oriented and easily quantifiable aspects, i.e. technical objectives.
- 3) Because of what evaluation must embrace, it is intrinsically subjective, based on individual value judgements which will differ from one person to the next.
- 4) Even if initial system objectives could be set, they would be considerably different from the final objectives due to the fact that user requirements evolve and change over time.

all support the experience in this research. For this reason the measurement or determination of the success or otherwise in terms of IT investments contributing to an organisation's overall effectiveness are based on the perceptions of the organisation's senior management representative.

Proposition 5

The results of this proposition are shown in table 45.

The conclusions were that this proposition was supported for four of the services, not supported for three of the

services and not applicable for the other two. In other words, for those services that had developed and/or implemented systems to perform or assist in this role, 57% were successful in contributing to reduced response times to a greater extent than had the investment be made in some other area aimed at reducing response times.

State/Territory	Result
Western Australia	Supported
Tasmania	Supported
Queensland	Supported
New South Wales	Not supported
ACT	Not supported
South Australia	Not applicable
Victoria	MAS Rural
	Not supported Supported
Northern Territory	Not applicable

Table 45 Results from each of the services for proposition 5.

Proposition 6

The results of this proposition are shown in table 46 opposite.

The conclusions were that this proposition was supported for

State/Territory	Result
Western Australia	Supported
Tasmania	Supported
Queensland	Supported
New South Wales	Not supported
ACT	Supported
South Australia	Supported
Victoria	MAS Rural
	Not supported Supported
Northern Territory	Supported

Table 46 Results from each of the services for proposition 6.

seven of the services and not supported for the other two. In other words, as far as the senior management representatives of the Australian Ambulance Services are concerned, investments in IT that were made with an expectation of reducing operation costs have been successful in achieving that objective.

Proposition 7

The results of this proposition are shown in table 47.

State/Territory	Result
Western Australia	Supported
Tasmania	Supported
Queensland	Supported
New South Wales	Not supported
ACT	Supported
South Australia	Supported
Victoria	MAS
	Rural
Northern Territory	Supported

The conclusions were that this proposition was supported for eight of the services and not supported the other one. In

Table 47 Results from each of the services for proposition 7.

other words, as far as the senior management representatives of the Australian Ambulance Services are concerned, investments in IT that were made with an expectation of reducing overhead costs per patient have been successful in achieving that objective.

Proposition 8

The results of this proposition are shown in table 48.

The conclusions were that this proposition was supported for six of the services, not supported for two and not applicable for

the other one. In other words, as far as the senior management representatives of the Australian Ambulance Services are concerned, investments in IT that were made with an expectation of contributing to an improvement in patient care have been successful in achieving that objective.

<u>State/Territory</u>	<u>Result</u>
Western Australia	Supported
Tasmania	Supported
Queensland	Supported
New South Wales	Not supported
ACT	Supported
South Australia	Not Applicable
Victoria MAS	Not supported
Rural	Supported
Northern Territory	Supported

Table 48 Results from each of the services for proposition 8.

Proposition 9

The results of this proposition are shown in table 49.

The conclusions were that this proposition was supported for the two services that had

<u>State/Territory</u>	<u>Result</u>
Western Australia	Not Applicable
Tasmania	Not Applicable
Queensland	Supported
New South Wales	Not Applicable
ACT	Not Applicable
South Australia	Not Applicable
Victoria MAS	Not Applicable
Rural	Supported
Northern Territory	Not Applicable

Table 49 Results from each of the services for proposition 9.

introduced IT with this expectation, however, the other seven services had not introduced any IT with the aim or expectation of opening up additional sources of revenue. In other words, as far as the senior management representatives of the Australian Ambulance Services are concerned, investments in IT that were made with an expectation of opening up additional sources of revenue have been successful in achieving that objective.

In answer to the third research question, "Do IT investments contribute to the organisation's overall effectiveness?", within the Australian Ambulance Services IT investments do contribute positively to the overall effectiveness of the organisations. By contributing positively the IT investments are considered to assist the various organisations achieve or better achieve their missions and objectives to a greater extent than had the investment been made elsewhere within the organisation.

In answer to the three research questions, the Australian Ambulance Services IT investment decisions are determined as a result of informal and/or ad-hoc approaches with the major driving influences being a combination of internal political factors, government influence and vendors rather than a conscious consideration of the potential contribution of the proposed Information

Technology to the organisation's overall effectiveness. The level of IT investments is determined by the amount of money that is available to be spent on them. This is, as opposed to the levels being determined by some sort of an investment methodology or evaluation process aimed at determining the optimum level of investment required to achieve an identified list of objectives. In spite of these approaches to investment decisions and the determination of the appropriate level of investment, the Australian Ambulance Services consider that the investments that have been made in IT have or are contributing positively to the organisations achieving or better achieving their missions and objectives.

The general feeling by the ambulance service CEOs is that the investment in IT has been worthwhile in terms of contributing to the organisation being more effective. These findings are contrary to a study by United Research/Business Week and described by LaPlante (1988) where less than half of CEOs surveyed felt that their organisation did an excellent job of linking computer strategy to corporate goals.

The research has raised a number of questions that could be addressed with future research:

- Is the experience in the Australian Ambulance industry typical of other industries, i.e. that despite some shortcomings in terms of the way the organisations go about determining what to do in terms of IT and how much to invest, overall, they achieve results that are quite acceptable to senior management?
- How accurate is the perception of senior management in regard to whether an Information Technology investment contributes positively to the organisation's effectiveness in terms of it better achieving its mission and objectives?
- Is the level to which the Australian Ambulance Services generally are unaware of the precise levels of investment in their IT typical of other industries?
- Is the experience in the Australian Ambulance Services whereby there is a general feeling that the approach to future investment in IT will be different to the approach that has been taken in the past, typical of other industries?

- Is the level of organisational structural change that is occurring within the Australian Ambulance Services, particularly in relation to IT departments, typical of other industries?

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