The Relationship Between IS Strategic Planning and Enterprise Architectural Practice: A Study in NZ Enterprises

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ABSTRACT

Modern businesses face increased levels of competitive pressure, and the IT sector is going through a period of rapid change. These issues have resulted in a drive for new approaches to planning and managing IT services. Two approaches that have emerged in different eras are IS Strategic Planning (ISSP) and Enterprise Architectural Practice (EAP). Despite the apparent similarities between these two approaches, neither IS researchers, nor practitioners, have explored the relationship in any depth. This paper investigates the relationship between ISSP and EAP, utilising results from a survey in NZ enterprises.

INTRODUCTION

Modern businesses face increased levels of competitive pressure, and the following factors will influence the nature and duration of current and future strategic planning: (Wagner, 2004)

- Shorter planning and implementation cycles.
- Frequent and rapid environmental changes, possibly with discontinuities.
- Organization units that extend beyond a single company, such as supply chains or virtual organizations.

In addition, the IT sector is going through a period of rapid change, and the rate of change is expected to at least remain steady, if not accelerate. Many commentators regard rate of change as a key issue in the sector (e.g. CCTA, 1999 11). These pressures have resulted in a drive for new approaches to planning and managing IT services.

Within the corporate world and, to a certain extent, government organisations, ISSP was pre-eminent during the 1980s and 1990s. In the latter half of the 1990s, EAP became prominent in the US Department of Defense; a trend which has flowed on to the government and commercial sectors. Some similarities between ISSP and EAP are apparent.

This paper examines the relationship between ISSP and EAP. Such a comparison is made difficult by the large number of approaches towards ISSP and EAP that have emerged (including proprietary and in-house), and the inherent differences in scope and techniques. However, two typical approaches have been chosen, based on their widespread usage, to enable a theoretical comparison between ISSP (the CCTA methodology) and EAP (the US DoD C4ISR Architectural Framework). An empirical comparison, based on a survey of NZ organisations, has also been conducted. The paper concludes that there are strong similarities between the two activities, and that there are, indeed, opportunities to rationalise the two activities, to eliminate duplication of effort and to develop improved IT planning methodologies based on "best-of-breed" techniques from both.

THEORETICAL UNDERPINNINGS

ISSP

In discussing IT strategic planning, it is important to distinguish between *strategic information systems planning* (SISP) and strategic planning for *all* information systems (ISSP), terms often used interchangeably in the literature. The latter term, referring to the strategic planning of an enterprise's entire IT resources, is the term used in this paper. This is consistent with the terminology used by Fitzgerald (1993) and Cerpa and Verner (1998).

The Central Computer and Telecommunications Agency (CCTA[2]) of the UK Treasury highlights the following concerns of ISSP: (CCTA, 1988)

- Understanding the aims and objectives of the business,
- Establishing the information requirements of the business,
- Outlining the systems to provide the information, and determining the role of technology in supporting the information systems,
- Agreeing policies and plans to develop and implement the information systems,
- Determining the role and use of resources to achieve the information systems required, and
- Managing, reviewing and evolving the strategy.

There are numerous techniques, or *methods* that have been used for ISSP, including Critical Success Factors (CSF) (Rockart, 1979), Business Systems Planning (BSP) (Wiseman, 1988), Porter's Competitive Forces Model (Porter, 1980), Porter's Value Chain (Porter, 1985), and Scenarios (Schwartz, 1991). Methods can be grouped together to constitute a *methodology*. Methodologies used for ISSP include those of the CCTA (1988, 1999) and Boar (2001).

Many IT vendors and consultancy organizations use proprietary methods and/or methodologies, some of which are adaptations of open source approaches. Examples are Arthur Andersen's *Method/1* and Coopers and Lybrand's *Summit* (Lederer and Sethi, 1988, Min et al., 1999). It is also well known that organizations often develop their own in-house methodologies, often based on open or proprietary methods or approaches (Earl, 1993, Lederer and Sethi, 1988).

One open source methodology that has been successfully used for IT strategic planning in the government sectors of Australia, UK and NZ is that of the UK government CCTA (1988, 1999). The basic mechanism is a sequence of actions, grouped into the common-sense phases of:

- Where are we now?
- Where do we want to be?
- How do we get there?

The steps include a detailed inventory and cost model of existing systems, a study of business goals and objectives, and a scan of the environment in which the business will operate. Senior management define a vision of where they envisage the organisation will be at the end of the time "window[3]" of the study, both from a business and IT perspective. Options for the provision of systems and services are defined, which are evaluated by a high level steering committee, who decide on the (or a small number of) option(s) to be costed and developed in detail into a strategic plan. The options could include outsourcing, or other innovative approaches to service provision.

In summary, the main strength of CCTA (or a similar strategic planning methodology) is that it gives a methodical, business-driven approach to selecting, funding, operating and managing IT systems. The production of a comprehensive, top-down IT strategic plan represents a low risk approach to any organisation's requirement to manage its IT infrastructure. The existence of a comprehensive strategic plan will allow the organisation to make informed "what if" decisions, such as evaluating the benefits of outsourcing all or part of its IT infrastructure.

Enterprise Architectural Practice (EAP)

Many approaches to ISSP include *IS/IT architecture* as a deliverable of the process (e.g. O'Brien, 2004, CCTA, 1999). However, the scope of "architecture" envisaged in EAP is somewhat more significant – it actually subsumes many of the steps inherent in ISSP.

EAP first became prominent in US government circles. Frameworks include those developed by the US Department of the Treasury (2000) and US Department of Defense (DoD) (1997, 2003). The US Army has developed an extension of the DoD framework, that is described in a separate document (U.S. Army, 1998). Non-government approaches to EAP also exist; e.g. those developed by Zachman (1987), and The Open Group (2003).

The underlying vision of EAP is as follows:

"Architectures are developed to portray the evolution of an IT environment over various points in time, beginning with the baseline, or current situation. ... The architecture envisioned to meet all operational and business requirements is the objective architecture. Migration documents show the progression of architectures from baseline to objective ..." (U.S. DoD, 1997 1-2)

A complementary view of the purpose of EAP is as follows:

"Enterprise architecture is a far-reaching concept that comprises the vision, principles and standards that govern the acquisition and deployment of technology. As such, it provides the foundation for detailed data, application and network architectures. An enterprise IT architecture is a key component of a mature IS organisation that enables alignment of business goals, consistent processes and best practice in software reuse." (Cecere, 1998)

The US DoD framework describes the process of defining an EA in terms of the deliverables; that is, the steps to be undertaken to produce the various elements of the operational, systems and technical architectures. It does not describe in any detail the underlying rationale, or analysis that should be undertaken to produce the various deliverables:

"The situation is further complicated because the framework does not provide a process for generating the products. Thus, an organization developing an architecture that is compliant with the C4ISR Framework could be faced with an unbounded amount of effort." (Barbacci and Wood, 1999)

The opening paragraph of the C4ISR AF (U.S. DoD, 1997) states that: "the application of the Framework will enable architectures to contribute most effectively to building … cost effective military systems" (p. 1-1). However, there is no elaboration of this statement into the development of a business case, or costed options, as is integral to CCTA. There is also no indication in C4ISR AF of any specific time window on which the objective architecture should be based. With rapid advances in technology, it may not be possible to specify a firm objective architecture more than 3-5 years ahead.

THEORETICAL COMPARISON OF ISSP WITH EAP

Even from the cursory descriptions of ISSP and EAP in the preceding sections, there are similarities apparent. A more detailed comparison was conducted by Wilton (2001) who identified the following similarities and differences:

Similarities:

- Basic Intent/Vision: Both are high-level approaches, intended to realize a rational, affordable IT infrastructure that is consistent with business strategy and goals.
- Both include a baseline summary of existing IT infrastructure, and an objective architecture ("where do we want to be?").
- Both establish the information requirements of the business and determine the systems required, to provide and manage the information.
- Both include a financial dimension (however, this is much more heavily emphasized in ISSP).
- Both produce plans/architectures that are dynamic, and need to be reviewed regularly.

Table 1. ISSP and EAP - differences

	ISSP	EAP
Scalability	Tends to be targeted at a single enterprise entity	Can be adapted to fit a multi-level or multi-organisation enterprise (intended to produce nested architectures, or "systems of systems")
Deliverables	Not tightly defined within any particular methodology	Tend to be tightly defined, and grouped as mandatory and optional.
Process	Well defined. Tightly coupled to business strategy and cost effectiveness.	Not particularly well defined
Time window for objective strategy or architecture	3-5 years (limited by rapid advances in IT)	Not specified
Interoperability focus	Not specifically emphasized	Inter - and intra - organisational interoperability is a key focus
Summary of overall approach	Process-oriented	Product oriented

Differences are shown in Table 1.

In summary, the high-level intent of the two approaches is nearly identical, and the general scope and factors considered during the respective processes are very similar. However, the major difference is that ISSP tends to be process-oriented, with relatively little specification of the deliverables, whereas EAP is rather the opposite. US DoD EA practice, as espoused in (U.S. DoD, 1997, U.S. DoD, 2003), does not attempt to define any business processes or models which could be used to derive cost-effective objective architectures. The use of ISSP methods could remedy this shortfall.

The similarities between ISSP and EAP are reinforced by Beveridge and Perks (2003 12-13) who state:

"In many ways there is synergy between the Enterprise IT architecture and the concepts that embodies ... ISSP. Both provide a medium- to long-term vision and framework within which the IT environment is implemented, including people, structure and technologies. Both the ISSP and enterprise architecture provide guidelines for systems to be implemented, technologies to be considered, and information to be gained."

EMPIRICAL COMPARISON OF ISSP AND EAP

In order to compare ISSP and EAP from a more practical basis, a survey was conducted of NZ organisations. A research model was developed, containing the variables that are considered to be of interest in the problem domain and the anticipated inter-relationship between them. Some initial hypotheses were also proposed. These are not included in this paper due to space limitations. A survey instrument was designed utilising constructs and questions derived from the literature where possible. The draft survey was subjected to faculty review (including review by a senior statistics academic) and pilot tested on several large organisations and SMEs then subjected to fine tuning.

It is generally accepted in statistical analysis that a sample of at least 100 valid responses is required to constrain the margin of error to no more than 10%, and

therefore to provide results that can be generalised across the whole population. However, the use of a stratified sample (as used in this survey) introduces a design effect that reduces the likely margin for error to 80-90% of that of a truly random sample (Page and Meyer, 2003 pp.107-108). In this particular survey, there were difficulties in obtaining valid responses, due to the following reasons:

- The length and complexity of the survey instrument, which necessitated the use of a simplified instrument for small and medium organisations.
- The relatively small size of NZ, coupled with the fact that 97% of NZ enterprises are classified as small or medium. (N.Z. Ministry of Economic Development, 2003).

The small number of responses (53), and the even smaller number of organisations (26) which had (or were developing) an IS strategic plan and/or enterprise architecture represents a limitation on this study that must be taken into account when interpreting the results. However, according to the NZ Ministry of Economic Development (2005), as at February 2004, there were fewer than 2000 "large" enterprises in NZ. Therefore, a response by 20 large enterprises represents more than 1% of the population. Further, it is noted that surveys with less than 100 valid responses feature prominently in the IS strategic planning literature, for example: (Lederer and Sethi, 1988 - 80 responses, Flynn and Goleniewska, 1993 - 18 responses).

The small sample size must be regarded as a limitation on generalisability of the results, but does not negate this survey being used as the basis for a preliminary investigation into ISSP and EA practices and issues in NZ enterprises.

SURVEY RESULTS

The survey instrument used was intended to gather a wide variety of data. Only certain key results - those relating to a comparison of ISSP and EAP - are included in this paper due to space limitations. Data from the survey responses was entered into the statistics application *SPSS - Version 13 for Windows*, and processed using appropriate techniques. Results were as follows.

Existence of IS Strategic Plan and/or Enterprise Architecture

Grouping the results according to organisational size (small/medium or large) (see Figure 1), provides an interesting perspective.

All large organisations who responded have an ISSP or one under development, whereas only 87% of large organisations either have an EA (or one under development). A minority (20%) of small or medium organisations have an ISSP (or one under development) and only 17% have an EA (or one under development).

The low proportion of SMEs (20%) that have either an ISSP or EA, and the fact that around 97% of NZ enterprises are SMEs, is noteworthy. While the IT requirements of many SMEs may be relatively modest or simple, it is likely that a significant number of organisations are not realising the full benefits, or potential competitive advantage, that modern IT can offer. This may be having a detrimental effect on the national economy, but that is outside the scope of this research. One approach that could alleviate the situation would be the development of a simple, short-duration IS strategic planning methodology that the owners or staff of SMEs, who generally would not have in-depth IT knowledge, can conduct themselves. This would alleviate the need for costly consultancy services to produce ISSP and/or EA.

Figure 1. Existence of ISSP and/or EA – Small/medium and large enterprises

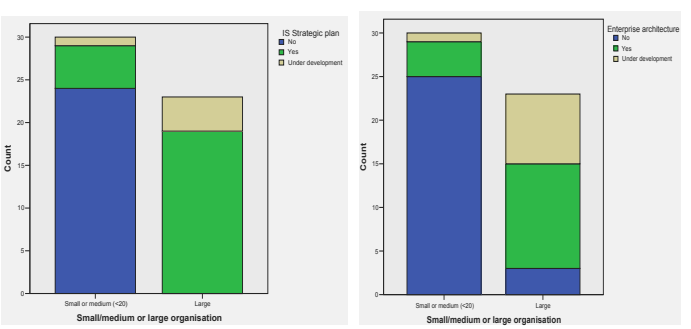

Table 2. Comparison of ISSP and EA development parameters

	Maximum	Minimum	Mean	Median
"Window" of ISSP (years)	10.0	3.0	4.4	3.0
"Window" of EA (years)	10.0	2.0	4.1	3.0
Internal staff effort for ISSP (person-months)	99.0	2.0	16.97	9.0
Internal staff effort for EA(person-months)	420.0	0[1]	38.8	12.0
Direct financial cost of ISSP	$600,000	$0	$66,833	$20,000
Direct financial cost of EA	$130,000	$0	$23,667	$0
Duration of ISSP development exercise (weeks)	52.0	5.0	23.6	24.0
Duration of EA development exercise (weeks)	52.00	0[1]	24.73	24.00

Characteristics of the Development Processes

A set of questions collected data associated with the ISSP and EA development processes, e.g. duration, cost, staff effort. Results are summarised in Table 2.

The mean cost of EA development is less than half that of ISSP, possibly indicating that EA development is not regarded as such a business-critical function as IS strategic planning. The fact that the median cost of EA development was zero (indicating that over half the organisations that had an EA developed it without dedicated funding) and the higher mean (almost double) for staff effort tend to reinforce this observation.

Investigating the Relationship between ISSP and EAP

One of the major goals of this research was to determine the relationship between ISSP and EAP. One of the key indicators of this was a hypothesis which examined the coincidence of topics in IS strategic plans and enterprise architectures:
Topics in ISSP] ∩ [Topics in EA] ≠ 0

To assist in visualising the situation, a comparative table was formed that displays the topics contained in an ISSP or EA (as reported by respondents) displayed as a percentage of organisations with that topic in their ISSP and/or EA. Results are presented in Table 3.

All listed topics (apart from two *other items* in ISSP) were present in both ISSP and EA. The lowest figure in any cell was 28.6%, representing the lowest incidence of topics in either type of document. This indicates a considerable overlap between the topics in ISSP and those in EA.

The results of a Spearman bivariate correlation test produced a correlation coefficient of 0.447, indicating significant correlation at the 0.05 level (two-tailed). Therefore, the hypothesis is demonstrated to be correct.

Another indicator of the relationship between ISSP and EA is a comparison of the ranked lists of objectives for both activities. These are shown in Table 4.

The primary objective is identical for both activities, but there is some variation in objectives 2-4 (in particular, *establish technology path and policies* is ranked 2nd in EA, but 4th in ISSP). Apart from this variation, the lists are identical.

The considerable overlap between the objectives and contents of ISSP and EA suggests that there may be confusion about the role and scope of both activities, and this could lead to a risk of duplication of effort and resources. One possible solution is to combine them into a (conceptually) single activity. This would not

Table 3. Topics included in ISSP and EA

Topic	Included in ISSP	Included in EA
	(% of organisations):	
Business objectives &/or vision	87.5	50.0
Model of the business	56.3	57.1
Business processes	37.5	42.9
Review of the business environment	68.8	35.7
Information requirements &/or flows	62.5	71.4
Enterprise data model	25.0	42.9
IT vision	75.0	71.4
Review of the technology environment	93.8	71.4
Applications portfolio	75.0	66.7
Networking requirements	37.5	57.1
Hardware requirements	31.3	57.1
Requirement for collaboration tools	37.5	28.6
Requirement for decision support tools	37.5	28.6
IT policies &/or procedures	50.0	35.7
IT standards and protocols	56.3	64.3
Security requirements or strategy	37.5	57.1
IT funding requirements &/or issues	62.5	28.6
IT procurement&/or sourcing strategies	56.3	35.7
IT organisation &/or management responsibilities	62.5	28.6
IT projects portfolio	81.3	50.0
IT architecture	68.8	64.3
Other items	12.5	0

preclude an approach where different deliverables are produced in successive phases.

This suggestion is in line with the statement that: "…there are distinct similarities in the objectives and scope of both approaches [ISSP and EA]. … The two approaches can be viewed as complementary, rather than mutually exclusive, and there could well be significant benefits in combining elements of both, to produce a new paradigm in IT planning and management." (Wilton, 2001)

SUMMARY AND CONCLUSIONS

Theoretical and empirical comparisons of ISSP and EAP indicate a strong correlation between these two activities. Organisations that undertake both, as separate activities, incur a risk of overlap, duplication of resources and possible difficulty in obtaining management commitment for both. There is the potential for development of a comprehensive methodology which combines best-of-breed methods from both disciplines. The research conducted in this area to date, has also produced some other significant results, such as the very low incidence of IS strategic plans and/or enterprise architectures in SMEs in NZ. Coupled with the fact that approximately 97% of NZ enterprises are SMEs, this may indicate that a significant number of organisations may not be realising the potential advantages that modern IT offers.

FUTURE WORK

The next stage of the study will consist of detailed Case Studies in a small number of selected organisations. The purpose of the studies will be to obtain detailed information on issues that emerged from the survey: in particular, the attitudes towards ISSP and EA, and detailed reasons why certain paths were followed (or not followed). This includes the low incidence of ISSP and/or EA in SMEs. The final stage will be the development and testing of an improved methodology that includes elements drawn from ISSP and EAP.

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Table 4. Key Objectives - ISSP and EA

Key objectives - ISSP	Key objectives - EA
1. Align IT with business needs.	1. Align IT with business needs.
2. Forecast IT requirements.	2. Establish technology path and policies.
3. Gain senior management commitment.	3. Forecast IT requirements.
4. Establish technology path and policies.	4. Gain senior management commitment.
5. Seek competitive advantage from IT.	5. Seek competitive advantage from IT.
6. Revamp the IT function.	6. Revamp the IT function.
7. Other reasons	7. Other reasons

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ENDNOTES

[1] One organisation reported that their EA development had been conducted as part of normal business planning, and therefore reported staff effort and duration of the EA activity as zero

[2] The CCTA is responsible for formulating IT policy, procedures and methodologies for all UK government departments. More recently known as the UK Office of Government Commerce OGC).

[3] Due to environmental volatility, a window of 3-5 years is fairly typical in a commercial organisation