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Abstract

This paper describes a five-stage Strategic Information Systems Planning (SISP) maturity model and a model for assessment of SISP in organisations based on the 'Integral SISP Engineering' approach and a unique implementation of the Analytical Network Process theory (ANP). The lack of SISP maturity definition is evident, and the literature has no segregation between SISP maturity and IS/IT departmental maturity. The SISP assessment model can be used as an early warning diagnostic tool to draw attention to particular aspects of the SISP that need improvement. The models are used to determine the degree of SISP maturity in Australian organisations.

Keywords

SISP, Strategic Information Systems Planning, SISP maturity stages, SISP assessment, IS, ANP, AHP, SEM

INTRODUCTION AND MOTIVATION

Strategic Information Systems Planning (SISP) is "the process of identifying a portfolio of computer-based applications to be implemented, which is both highly aligned with corporate strategy and has the ability to create an advantage over competitors" (Doherty, Marples and Suhaimi, 1999). The need for SISP is of paramount importance to any organization (Palvia & Palvia, 2003) as a number of different problems (such as costly IT projects) and overlooked opportunities (such as becoming a market leader by implementing new services) have been reported as a result of lack of SISP. There are numerous empirical and prescriptive SISP studies which address questions and dilemmas to help industry. Still, given the increasing proliferation of IT throughout the economy, derived benefits from IT investments are not adequate. The literature is unanimous in claiming that most industrial surveys show considerable dissatisfaction with SISP (Nash 2000, Ward and Peppard, 2002), and there is a call within the SISP literature for improving its methodology (Reich and Benbasat 2003, Orlikowski & Iacono 2001, McBride 1998).

The SISP literature is surprisingly sparse when it comes to describing what constitutes a superior SISP. This normative question is generally avoided and focus is on plan-making methods and processes. The literature explores IT stages of growth, but the lack of SISP maturity definition is evident. In general, the literature has no segregation between SISP maturity and IS/IT departmental maturity (Nolan 1979, Ward & Peppard 2002). SISP maturity depends on IT stages of growth but it is its unique activity that must be expressed in its own terms. SISP in its complexity, apart from technological issues, reflects relationships to organisational structure, decision making, culture, learning, performance, customer relationships, globalisation, etc. thus provoke the importance of knowing the evolution stage or 'maturity' of SISP in an organisation. No existing studies, to our knowledge, have reported a method for establishing the relative and absolute importance of the SISP constructs with capability to synthesize the various measures into a single overall measure of SISP maturity. This paper reports research that aims to pave the way for the adoption of a novel approach to SISP maturity definition as well as to develop a procedure for multi-dimensional assessment and measurement of SISP maturity. SISP maturity assessment is diagnostic in nature, thus it can link knowledge and action (policy) and can enable corrective measures to be taken to prevent or reduce the number of failures or to improve return on IS/IT investments.

RESEARCH STRATEGIES

To provide adequate SISP maturity definitions from an organisational perspective and to bring qualitative insights into the relationships of the criteria/subcriteria influencing SISP, a descriptive or explanatory approach is taken. This research develops a theoretical SISP maturity model and operationalizes it through two frameworks, one being the analytical hierarchy and network process (AHP/ANP) theory and the other through a conventional statistical framework using structural equation modelling (SEM).

As this research is concerned with generalisability, a large quantitative and qualitative sample data (normally exposed to rigorous statistical analysis) from the various secondary sources were used. In addition, the models were refined through intense debate amongst three prominent SISP practitioners. Comparative analysis and normative judgement were used where a narrower focus and set of outcomes were needed. Throughout the conscious use of intuitive judgments as well as logic were used for a mapping out of the interrelations among model constructs.

As this research is seen as complex, it is apparent that it cannot rely on any one single approach. It tries to push the boundaries of qualitative research, and look at a holistic, integrated approach. In particular, Information Engineering is investigated as a popular method for bridging the gap between business requirements and IS systems. We also explored analytic thinking (backed by the AHP/ANP methods) which combines the deductive (focus on the parts) and the inductive approach (focus on a system as a whole). As a result, we define our 'Integral SISP Engineering' approach. This approach is based on a holistic approach in which SISP is defined in engineering terms (input/output) and all the factors and criteria affecting SISP are laid out in a network that allows for dependency and feedback.

The AHP/ANP multi-criteria decision-making theories are based on relative measurements which allow one to compare 'apples and oranges' (for example in the case of apples and oranges we can compare their common properties such as size, shape, taste, colour, juiciness, etc.) (Saaty, 2001b). The pair of elements from the SISP system (or its subsystems) is related through their attributes and the importance of their contribution to the SISP. Most importantly, the AHP transforms a multidimensional scaling problem to a uni-dimensional scale. It also supports conflict resolution in different judgements of importance of SISP constructs. For further details about implementation of this theory we refer readers to references Saaty, 2001a and 2001b.

It is not possible to reduce complexity artificially into a very simple structure and claim that the model is an acceptable representation of the real world. It is possible to organise reasoning and calculations in sophisticated but simple ways to deal with the relative complexity of the model (Saaty 2001a). Following that, we performed an iterative process to limit the number of SISP variables. As a result, a research instrument is obtained to conduct a SISP survey and the benchmark model for assessment of the SISP is defined. To rank each SISP maturity stage we used relative measurement, where the SISP elements are compared in pairs against relevant criteria. The ratings approach is used for evaluating an organisation in SISP maturity terms. This approach is based on the absolute measurement model where we evaluate an organisation against established scales. This framework is depicted in Figure 1. Theoretical findings and correctness of the application of ANP were verified by SEM on data from a survey of 260 Australian companies.

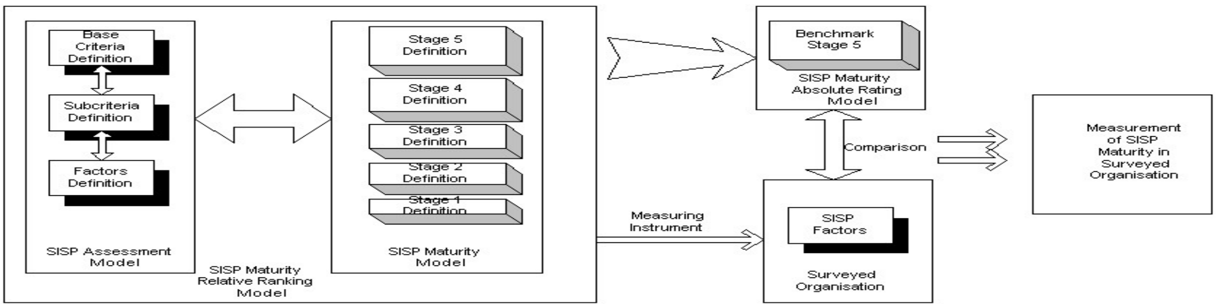

Figure 1 Schematic Representation of the Research Framework

This paper by no means claims that the model is all-encompassing and acknowledges limitations related to the 'robustness' of the model. While every effort was made to ensure the quality of information through mechanisms such as surveying a large number of various sources and cross checking between them, the availability of the data was limited, in some instances, by a lack of information (such as measurement scales). The lack of consistency among reported studies can cause erroneous conclusions regarding the judgement of the importance of the SISP constructs. We found that views on many SISP issues depended on the time when they were assessed (eighties, nineties or recent years); were country dependent, and the type and size of organisation had an impact. Furthermore, the perceptions of some practitioners and theorists may not be accurate, and generally speaking, subjective judgements are not entirely avoidable.

CONCEPTS AND MODELS

Most previous approaches (Kearns & Lederer 2000, Basu et al. 2002) to SISP are characterised by a high level of the SISP abstraction, focusing on a few SISP dimensions at a time. As boundaries between organizations become increasingly fuzzy and the scope of professions crosses borders and boundaries, the objective was to integrate the best of the different approaches (and complement each other's weaknesses) and to transfer analogies from natural and new sciences into theory which enables exploration of new ways of modelling to address the ever increasing demand on SISP effectiveness. If the basic postulates on which to build the research model are defined heuristically, the end result could be surprising with the ability to portray complexity in a natural, simplistic way. In that sense we have explored control and systems engineering, soft system dynamics, organisational cybernetics, decision making theory and business strategy. We have defined SISP as a system from a contemporary perspective. Each system is defined by its structure (static characteristic) and dynamic characteristics named as behaviour and evolution (Simms, 2001). A fundamental difference between living and non-living systems is the ability of the living system to generate information. In that context, the SISP is defined as an instance of integration of interrelated and dependant living and non-living components which is able to produce information (like interaction of people and computers to produce SISP). Information by itself is defined as 'a difference that makes a difference' (Bateson, 1979 as cited by Salthe, 2001), which implicates the change; quantative and qualitative. Salthe (2001) identifies two kinds of information –enformation - information about a system itself (information which characterises it as a system) and intropy – information acquired as a result of a system's experience in the world (historical information). Intropy will cause the system's evolution and as a result, the system's enformation will undergo the change. The natural period of a system's behaviour and its inertia plays an important role in a system's evolution. The more the system finds out about the external environment, the more it disturbs its internal environment (action and reaction) which results in system change (potential growth). In simple terms, information is fixed constraints that prevent the system from achieving equilibrium. Having defined information and system we now define an information system in an organisational environment as a system consisting of personnel and infrastructure for the purpose of generating, storing, processing, and communicating information used within an organisation (Figure 2).

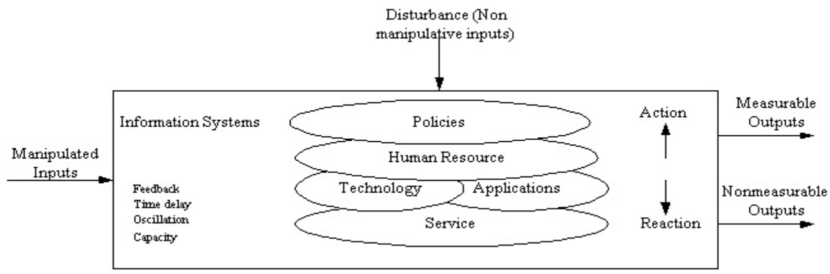

Figure 2 An Overview of an IS System

A plan that is developed, implemented, maintained, and used to explain and guide how an organization can deploy IT elements to work together to effectively accomplish the mission of the organization today and tomorrow is called a SISP plan. SISP is considered as a subsystem of an IS. There are two major processes within an IS: IS Planning and Plan Implementation Process. The third process, Evaluation (feedback) – knowledge of how we are doing - is very often neglected and is one of main reasons for IS/IT failures (if we know what things are going wrong in a timely manner, we can correct them and avoid failures). The importance of system feedback is well recognised (Forrester, 1969 as cited by Sterman, 2000). In this paper we do not discuss attributes of an IS system but just briefly define feedback loops as they are very important from the system control point of view (Figure 3).

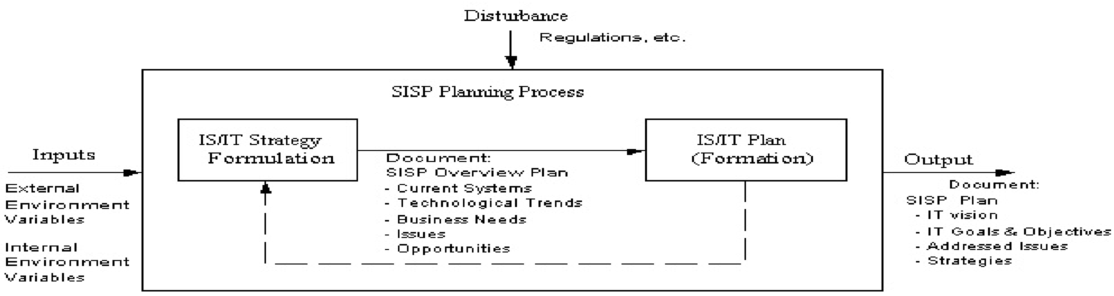

Figure 3 SISP Planning Process - an Engineering Approach

The system feedback loops are positive (feedforward, represent growth, 'reinforcing', non self-balancing nature), negative (feedback, goal seeking, self-regulating, balancing), or negative feedback loops with time delays (oscillations –damped, limit cycles or chaos). By applying Process control engineering we present a conceptual SISP model (Figure 3). This paper concentrates on the SISP planning process (systems are processes and processes are systems of actions). The SISP is a process of IS/IT strategy formulation and IS/IT planning (formation), (Ward and Peppard 2002, Ward and Griffiths 1998). This paper defines the SISP formulation process as a process of analysing external and internal environments for the purpose of positioning IS/IT in relation to the business. SISP formation is defined as generation of a plan itself, which defines all important issues, goals, and related strategies for the deployment of IT across an organisation. The SISP plan ('hard' deliverable) is a baseline (has no technical specifics) from which Operational plans (a prioritized program portfolio) are developed (Figure 3, based on Ward & Peppard, 2002). Soft deliverables of the SISP formation process are related to factors such as awareness, motivation and alertness. We emphasise the importance of feedback loops on the SISP and explore SISP as subsystem within a business system (Figure 4).

Feedback control loop is the simplest control method. Information of the output deviation from its desired value is fed back to generate a force that works towards restoring balance. This implies that there must be deviation hence, perfect control is unobtainable with feedback control. On the contrary, feedforward strategy is based on the state of a disturbance input without reference to the actual system condition. The key variables affecting the process are measured and used to compute the correction to keep output at the required value. In the ideal case compensation is applied in such a manner that the effect of the disturbance is never seen in the process output. However, feedforward control is very difficult to implement. It requires that the process model must be an acceptable approximation of the process (Figure 5). Also, very often disturbances cannot be accurately measured.

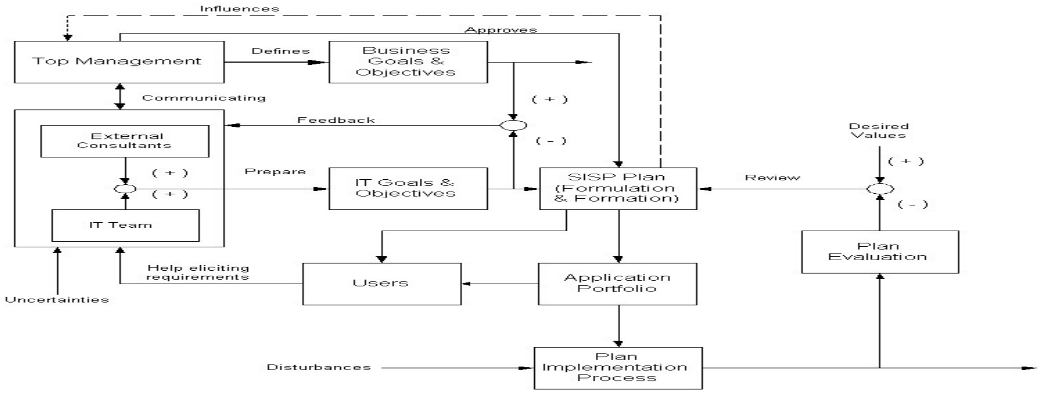

Figure 4 SISP: An Integral Engineering Approach

If some of the input components are ill-defined or the measurement of upsets on process inputs have some degree of error, the control system will induce a measurable offset. If the offset is intolerable, Process control theory suggests use of feedback loop to trim the offset, thus a combination of feedforward and feedback loop (Shinskey, 1988) is often used (Figure 5).

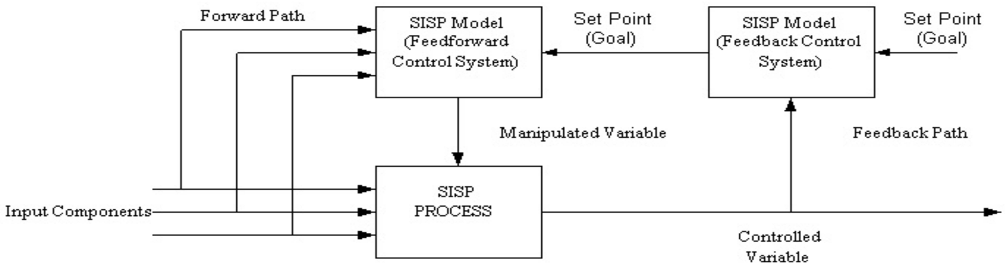

Figure 5 Practical Implementation of the SISP Model (based on Shinskey, 1988:254)

We enhance the engineering approach with a holistic view in which all the factors and criteria affecting SISP are laid out in a network system that allows for dependency and feedback according to ANP/AHP (Figure 6).

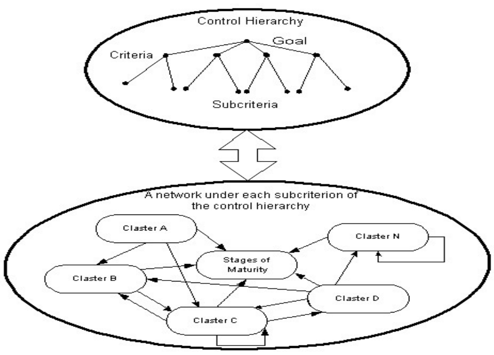

Figure 6 A General SISP Feedback Network Structure

The AHP explores the relationships of the goal, objectives (criteria), sub-objectives (subcriteria) and alternatives to enable decision-makers in selecting the best alternative. The different relationships between the factors are studied through the different hierarchical levels, all in the light of belonging to the SISP as a whole entity. Thus, we consider the SISP as a system consisting of subsystems. We decompose subsystems into components (clusters in ANP/AHP terms), and elements (the nodes within a cluster) where the sum of the elements, due to synergy, may not be equal (larger or smaller) to the whole system. Components/elements where influence on SISP is insignificant were eliminated. At the end of the iterative process, we have a limited number of components where the elements in each component interact and/or have an influence on all or some elements of another component with respect to the criteria. Based on the above concepts we provide the SISP maturity definition and propose the five-stage SISP maturity model. The five stages of SISP maturity are organised as a node of alternatives against which are all construct/attributes judged with respect to the over all goal of successful SISP planning.

SISP Maturity Definition

We define maturity as the degree to which the SISP formulation and formation processes are defined, measured, and controlled. The maturity levels are distinct and well defined stages aimed towards achieving a successful SISP. For the purpose of this research, the following generalised definition of the highest stage of SISP maturity is established: *an organisation achieves the highest stage of strategic information system planning if it possesses an IT/IS strategic plan, fully aligned with business goals, which accurately references, at any point in time, current or target IT themes which provide data of high quality, accuracy, availability and shareability for informed decisions that will give the organisation a competitive advantage*.

This definition does not imply excessive planning efforts but an efficient and effective way of planning and monitoring. It also combines the general planning dimension with alignment, competitive and dynamic dimensions of SISP. The highest level of SISP maturity is recognised as the Adaptable Planning level, where the SISP achieves cohesive relationships among involved processes (a call for data integration enterprise-wide to turn data challenges into business opportunities is contemporary demand, Laney, 2004). Cohesion applies not only to vertical integration mechanisms within organisations but also applies to IT horizontal integration for managing interdependence between organisations (Grandori and Soda, 1995).

SISP Maturity Assessment Criteria and Subcriteria

To be fast, flexible and focused are the main imperatives of every SISP plan. Strategic planning should be judged by these attributes. To be focused or to have content of good quality may require thorough and extensive planning. If the planning process takes too long, the plan can be outdated even before its implementation. Even if one has a high quality content plan, finished on time, it may not be of any benefit if left to sit on the shelf to collect dust. The plan must be a 'live', beneficial document. Needless to say that plan content has an influence on plan usefulness. But what makes a plan 'live'? Is it the process of how the plan is handled, communicated, and implemented? Surely that will help plan 'activation,' but how is it kept 'live', current, relevant, and on top of that strategic? Attributes that define a 'live', useful, relevant plan, with high quality content are characterized through the three main criteria: Efficiency, Effectiveness and Manoeuvrability. This three-dimensional skeleton of the assessment model may imply a simplistic approach to such a complex task as SISP planning. Flawel and Williams (1996) confirmed that high level questions should constantly be asked of any strategy maker about the Efficiency and Effectiveness of the strategic plan. We added the third dimension, Manoeuvrability, to reflect the contemporary demand on SISP dynamics. These three dimensions are higher order factors which governess SISP success.

The multidimensional research framework is depicted in Figure 8. This figure shows the main criteria (dimensions of SISP behaviour): Efficiency, Effectiveness and Manoeuvrability); subcriteria (dimension of SISP structure): Content, Collaboration, Policies, Stakeholders' Designation, Knowledge Bank, Technology, Time Horizon, and Viability, and the evaluating factors (shown as 'Subnet' - a network of inter-correlated SISP factors) used for the assessment of SISP maturity. There are about 400 of these factors in all subnets, which are not shown in this paper. These factors are selected through intensive search of the SISP literature (Hartono et al. 2003, Palvia & Palvia 2003, Galliers & Sutherland, 2003, Ward & Peppard 2002, McBride 1998, Doherty et al 1999, Earl (2000, 1993), Wexelblat & Srinivasan (1999), Cerpa & Verner (1998), Ward & Griffiths (1998), Segars & Grover 1998, etc) and levels of their importance are analysed. SISP maturity is also assessed in terms of overall benefit, cost, opportunities and risk (BCOR).

Here we briefly define the main criteria: Efficiency is a concept that measures the ratio of the output to the input of SISP (doing things right, avoiding wasted time and effort); Effectiveness is a primary gauge of SISP success, the concept which measures the quality of SISP output (doing the right things, the quality of being able to bring about an effect, ability to influence business strategy); Manoeuvrability is a concept that measure responses to the rate of change of inputs (reflect the quality of being adaptable).

The SISP Maturity Model

The major characteristics of the each SISP maturity stage (SISP evolution) are defined in Table 1. The SISP criteria and subcriteria are organized in a hierarchy and the influencing factors in a network. Every network (shown as 'Subnet' in Figure 8) has the 'Alternatives' cluster whose elements (nodes) are the five stages of SISP maturity. We did not use subnets to evaluate alternatives; instead we used alternatives to evaluate all elements with respect to the overall goal of efficient, effective and manoeuvrable SISP planning. When the model was synthesized, (the 'Super Decision' software tool was used) the alternatives were ranked, using ordinal values which confirmed the validity of our comparative judgement. If an organisation scores between 0-0.036 it is of a Rudimentary level of planning, a score of 0.036 to 0.055 will indicate Ineffectual Planning and scores between 0.055 and 0.116 points to Attainable Planning. To achieve Sustainable Planning, scores should be between 0.116

and 0.46. If an organisation has total weights of more than 0.46, that organisation is on its way to achieving the highest level of SISP maturity (Adaptable Planning).

Table 1 The Definition of the Five Stages of SISP Maturity

Stage	Characteristics
Stage 0 – No SISP	The organisation does not have any form of IT planning.
Stage 1 Rudimentary Planning	The organisation does not have a formal IT plan. Plans are ad hoc, basic, and very often just financial plans to acquire hardware and software. There is no adequate IT planning or IT technical resources. Very often the decision of what to acquire is made by senior management following the advice of external consultants. There is no analysis of the external environment and the impact on business before acquiring IT/IS. Milestones are used in place of goals and objectives. The organisation is concerned about costs and will acquire a cost effective solution for the current situation regardless of future needs.
Stage 2 Ineffectual Planning	SISP is a formal process, but basic. No effective planning is performed. Plans are more tactical than strategic, out of date, and not complete. The IS plan addresses only technical issues. It is usually undertaken as part of the annual budgetary process and is a one-shot activity. Very often IT projects are just embedded in the business plan. IS/IT ad hoc selection criteria are used. Senior management is involved in certain planning activities. IS vision, goals, and objectives are set but they are not aligned with business goals. Information input in the planning process is not a result of a comprehensive environmental analysis. The need for use of formal methodologies and structured techniques is acknowledged but not consistently implemented. Established policies are very often abandoned under the pressure of deadlines and lack of commitment from the managerial structure.
Stage 3 Attainable Planning - causing Federalisation	The organisation adopts a methodological approach for SISP and produces a complete strategic plan which is current to within one year and largely followed. SISP goals are aligned with departmental business goals. Very often IS projects are embedded in the IS plan. Management is involved in SISP formulation, evaluation, and control. The IS department is technically strong and perform planning, development, and control centrally. Implemented systems cover major business areas, but very often they are far from real business needs. At the same time, end users deploy many different computing systems in an uncoordinated manner. They prepare their own IT operational plans in isolation from other IT plans and they are inconsistent in form and content with the other plans. Thus an organisation acts as a federation, having a central IS/IT department who dictates an overall IS strategy but some other departments have miniature IS/IT functions which retain their own controls on IS initiatives.
Stage 4 Sustainable Planning - achieving Adhesion	In this stage emphasis is on integration, coordination, and information sharing. SISP is principally driven by business needs and acts as an agent for adhesion of internal functions. Plans identify synergistic opportunities across internal functions; take into account external factors, organisational culture, and other internal factors. Any planning inconsistencies are overcome through synchronisation by the central IT planning function if established, or coordinated across different business units. SISP review meetings that promote organisational learning and performance feedback mechanisms are in place, but they are event driven and episodic rather than continuous. Assessing and meeting customer needs is the target of the application portfolios. The importance of the IT function is widely recognised. Integrated relations are established throughout the organisation as all areas gain understanding of other areas and work together towards common goals.
Stage 5 Adaptable Planning – achieving Cohesion	SISP is used to guide core business activities and influences organisational goals by using IT opportunities for competitive advantage. Based on feedback, SISP is continuous and emerging rather than episodic, dynamically synchronised with business needs; it is both, structured and informal to promote innovative ideas and act proactively. High quality partnership relations with the business function are established and maintained. Adaptable - multiple scenarios planning that explore interaction of the system with relevant environmental, social, political, technological, and economic factors is in place and strategically increases organisational manoeuvrability. Optimisation, focus on quality, monitoring, and control are continuous processes. The outcome of the SISP is more likely to be policies rather than application definitions. An excellent and distinctive IS capability enables the sophisticated SISP to focus on strategic alliances in the marketplace (horizontal integration), thus achieving cohesion between partner organisations to sustain a competitive advantage, or achieve cohesion between position and capability (vertical integration).

Questionnaire

A questionnaire measuring the various research variables to find what is the degree of SISP maturity in Australian organizations was pretested and sent directly to CIOs. The sampling frame was a listing from the MIS 100 (2003) and an extensive Australian company database called 'Australia's Business Who's Who'. To make the results of our study generalizable we compiled a list of companies from a wide variety of industries, being small, medium and large in terms of both, the annual turnover and a number of the employees. Also attention was paid to geographic distribution of companies. From a population of 2000 questionaries sent, we received 86 surveys from organisations that do not perform SISP (respondent's and organisation's characteristics supplied) and 260 usable questionnaires representing a 13.7% response rate. This response rate is considered satisfactory for the chosen method of collecting data (Kress, 1988). The reliability of the measuring instrument is confirmed by applying the Reliability Analysis procedure and Principal Components Factor analysis. All scales used in analysis met the cut point of Cronbach's alpha >0.6 for reliability.

As a complement to the AHP/ANP rating model we derived a subset of questionnaire scales to test the model with raw data using traditional statistics methods like SEM (implemented by using SPSS and AMOS 5 software). One of the limitations imposed by the sample size on SEM is the number of measured variables. Taking into account all restrictions and published rules we ended up with 12 variables. Thus we were forced to respecify our model. The criteria for selection of measured (observed) variables are defined based on the following questions: How reliable are the observed variables and are the chosen variables the best ones to represent the construct? Table 2 lists the chosen pairs of measured variables to represents latent factors. The overall reliability of the 12 item scale is .74. Also conducted tests for convergent and discriminant validity were satisfactory. It was decided to use the raw data despite its non-normality and to account for this departure from normality the bootstrapping statistics were used to prove adequacy of the proposed model.

Table 2 Reliability of Subscales Used in SEM

Items	Description	Alpha/Standard Alpha
q20.5 q23.1	The SISP team has strategically thinking capability The SISP team selects and follows adequate planning approach	.6082/.6088
q36.3 q36.4	The IS Plan supports the business strategies The IS Plan selects a portfolio that maximizes total business value	.6874/.6875
q24.4 q26.2	Senior business management support SISP processes CIO is committed toward SISP from start to finish	.7842/.7857
q30.4 q45.7	Learning on technology applications are shared Automation tools for metrics collection and analysis are used	.6450/.6451
q18.5 q44.5	SISP planning is continuous activity Measurement of SISP objectives is continues process	.6029/.6030
q28.1 q28.4	During SISP formulation a predictive study is undertaken Qualitative and quantitative scenario analysis is undertaken to understand the consequences of a wide range of possible changes	.6860/.6864

SEM: SISP Maturity Measurement and Structural Model

SEM is used to confirm theoretical constructs that cannot be observed directly by explaining how the measured (observed) and unobserved (latent) variables are related to one another. In our case, the abstract phenomena termed as SISP Effectiveness, Efficiency and Manoeuvrability is the three second-order latent factors fully explained by the six first-order latent factors. Observed variables are coded responses from SISP survey and they are presumed to represent the first-order latent variables. The SEM is conducted in two steps (Anderson and Gerbing, 1988): establishment and testing of a measurement model which depicts the links between the latent variables and their observed measures; and establishment of a structural model (model as a whole) which depicts the links among the latent variables themselves. If a single-factor model cannot be rejected, then there is little point in evaluating more complex ones (Kline, 1998). Thus we establish several baseline models (Table 3) and confirm that we can reject baseline models in favour of the more parsimonious six-factor SISP model (Figure 7).

Table 3 Goodness of fit statistics summary: - Hypothesis Comparisons

Hypothesized Models	Comparative Model	$\chi2$	df	$\chi2$/df	$\Delta\chi2$	Δdf	p	GFI
H1:SISP as a Single-Factor model	-	351.539	54	6.510	-	-	.000	.814
H2:SISP as a Three-Factor model	H1	244.828	51	4.801	106.711	3	.000	.863
H3:SISP as a Six-Factor model	H2	62.023	39	1.59	182.805	12	.011	.962
Respecified the Six-Factor model	H3	52.428	38	1.38	9.595	1	.060	.967

$\Delta\chi^2$, difference in χ^2 values between models; Δdf, difference in number of degrees of freedom between models;

The goodness of fit and other statistics for the measurement and structural model were exceptionally good and here we briefly discuss only the structural model shown in Figure 7. The likelihood $\chi2$ is 56.157 (df=44, p=.103) and the goodness of fit index (GFI), adjusted goodness-of-fit index (AGFI), normed fit index (NFI) and parsimony adjusted comparative fit index (PCFI) are .965, .924, .937 and .654 respectively. All indexes are greater than the respective cut-off values, and having excellent normed $\chi2$ ($\chi2$/df=1.276) and the Root Mean Square Error of Approximation RMSEA=.033, we conclude that the observed data fit this model well.

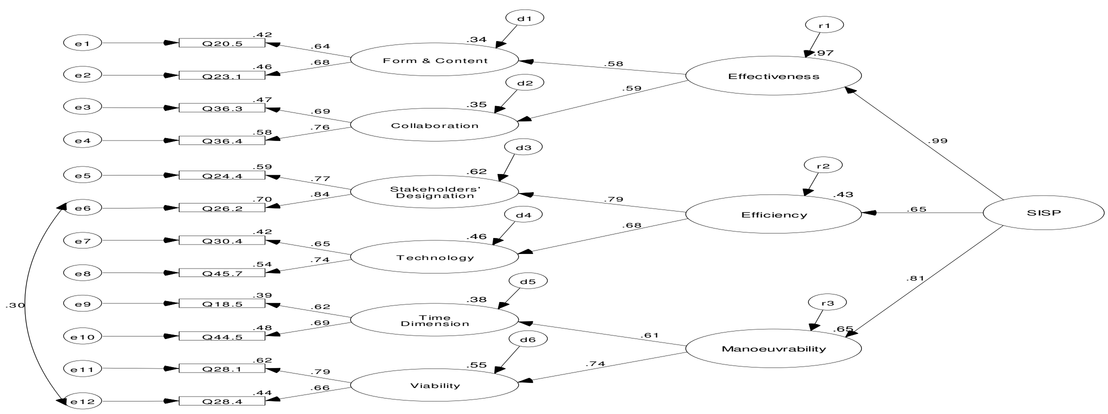

Figure 7 Hypothesized Model of SISP Maturity: Measurement and Structural Components

All factor loadings are significant, ranging from .583 to .986. All other parameter estimates are statistically significant (CR>±1.96) therefore no factors that need to be dropped from the model. The squared multiple correlations are in range from .375 to .972. We found no significant MI values to be considered and the residual matrix contains no values significantly different from zero. Excellent p value (p=.253), when tested that the model is correct using Bollen-Stine bootstrap gives us additional credibility not to reject the proposed model.

As shown in Figure 7, relative contribution of the main criteria to the SISP is comparable with ranking received using ANP/AHP. Factor loadings confirm stronger relationships between SISP and Effectiveness than between SISP and Efficiency or Manoeuvrability. Also, the importance of Manoeuvrability is more favourable than, Efficiency, thus empirically confirming adequacy of the underlying theory. Even though there are no published SEM details to compare the results of this study, these findings have a comparable ground with the findings of the previous works in regard to the Efficiency and Effectiveness constructs. Also, the study empirically confirms the existence of the third dimension, Manoeuvrability that captures dynamics of the SISP.

FINDINGS AND ANALYSIS

The model synthesis provides the weights of the SISP maturity levels in logical order of importance, as per expectations. The difference in scores between level 4 and 5 is the highest difference in ranking. This finding is in accordance with the literature that reports that the highest level is very hard to achieve (Sutherland and Galliers, 1989). When we fed the AHP/ANP assessment model with raw data, the sampled population showed that the majority (50.6%) of Australian organizations that attempted SISP are on SISP maturity level 4. The Attainable planning is present in 44.8% of organisations and 4.6% of organisations reached level 5. The results are also compiled for organisations that claimed performing regular SISP. For those organisations percentage of achieving Level 5 is significantly higher, it is 17.65%. While theoretical ground supports a 5 stage SISP maturity categorization, empirical data supports only the three levels of SISP maturity. This outcome could be due to wide information sharing and availability of knowledgeable resources. Thus the initial model is re-specified to Attainable Planning, Sustainable Planning, and Adaptable Planning.

The following figure shows the significance of the criteria for the “Adaptable Planning” level of SISP. The major findings of this research are summarised in Table 4. The descending order of the weights shows the importance of the subcriteria of SISP in different stages of maturity. Level five organizations have established sound IT infrastructure, and have gained experience in producing efficient and effective plans. The focus of their SISP efforts are neither ‘Form and Contents’ nor Technology but the ways of optimizing SISP and keeping it strategic.

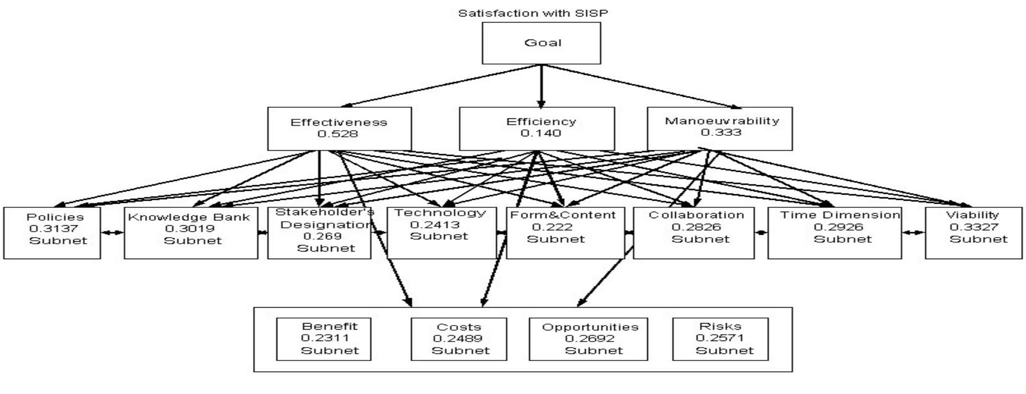

Figure 8 SISP Maturity Stage Five (Adaptable Planning) Hierarchy: Showing Scores

It is not surprising that Viability scores the highest rank as it represents the ability to adapt to environmental changes through scenario planning and continuous feedback for optimisation and control (McBride 1998). High quality partnership relations with the business function guarantee synchronisation with business needs. Alignment is not only related to the business. The influence of relevant social, political, technological, and economic factors on IT function is incorporated in SISP and that is why Opportunities and Risk achieved the highest score. The importance of Opportunities and Risk outweigh the importance of the Costs and Benefit. Established policies are the reflection of knowledge and experience. This is the reason why Policies score a very high rank. The score of the ‘Stakeholders Designation’ subcriteria was not what we expected. This subcriteria represents powerful organisational actors involved and committed to SISP. The surprisingly low value of this score is explained by the fact that knowledge, experience and information sharing made all involved in the SISP process aware of their responsibility to support and make SISP a smooth continuous process. Effectiveness and Efficiency are well recognised constructs of the planning activity and obtained regression weights are consistent with the findings from other researchers. However, Manoeuvrability as a measure of planning dynamics has not been acknowledged in the literature as an equally important planning construct. One of this study’s important findings is conformation on a strong correlation between Manoeuvrability and SISP success. Also we note that underlying data favour the

Stakeholder's Designation and Viability latent factors. This finding implies that the level of SISP maturity in majority Australian organisations is between the Attainable and Adaptable Planning stages. This result is consistent with the result obtained through the assessment model using ANP/AHP and is another conformation of consistency of SEM and AHP/ANP models.

Table 4 SISP Maturity Model - Summary of Subcriteria Contributions

Rudimentary Planning	**Total Priority**	**Ineffectual Planning**	**Total Priority**	**Attainable Planning**	**Total Priority**	**Sustainable planning**	**Total Priority**	**Adaptable planning**	**Total Priority**
Technology	0.0643	Technology	0.0477	Stakeholders Designation	0.0385	Form and Content	0.1558	Viability	0.3327
Stakeholders Designation	0.0069	Form and Content	0.0222	Form and Content	0.037	Stakeholders Designation	0.1429	Policies	0.3137
Form and Content	0.0066	Time Dimension	0.0187	Policies	0.0366	Time Dimension	0.1368	Knowledge Bank	0.3019
Knowledge Bank	0.0051	Stakeholders Designation	0.0145	Time Dimension	0.0366	Collaboration	0.1278	Time Dimension	0.2926
Policies	0.0048	Knowledge Bank	0.0135	Technology	0.0354	Knowledge Bank	0.1255	Collaboration	0.2826
Time Dimension	0.003	Policies	0.0080	Knowledge Bank	0.0344	Policies	0.1207	Stakeholders Designation	0.269
Collaboration	0.0022	Collaboration	0.0058	Viability	0.0292	Viability	0.1158	Technology	0.2413
Viability	0.001	Viability	0.0042	Collaboration	0.0181	Technology	0.1055	Form and Content	0.222
Costs	0.0390	Costs	0.0403	Benefit	0.0674	Benefit	0.1345	Opportunities	0.2692
Benefit	0.0291	Benefit	0.0378	Costs	0.0604	Opportunities	0.1344	Risks	0.2571
Risks	0.0202	Risks	0.0343	Opportunities	0.0567	Risks	0.1333	Costs	0.2489
Opportunities	0.0179	Opportunities	0.0219	Risks	0.0551	Costs	0.1113	Benefit	0.2311

CONCLUSION AND FUTURE RESEARCH

The Integral SISP Engineering approach enables identifying, understanding and assessing the interactions of the SISP system as a whole through its behaviour, structure and evolution. It provides a method for gaining qualitative insights into the relationships of the factors influencing the SISP process and acts as a tool for evaluation of SISP planning efforts. This approach utilises analytic thinking based on natural language, which can be built on top of the intuition, experience and knowledge of experts. The application of ANP/AHP enables both, a comprehensive assessment of individual planning constructs and aggregation of individual assessments into an overall measure of SISP success. This methodology yields promising results as a tool for weighting of SISP attributes to provide timely (feedforward) information for IS planners to make their plans more strategic or providing feedback information for decision-makers to take corrective actions if needed. Application of judgement (needed for ANP/AHP) as a function of time would enhance the dynamic dimension of the model, thus the further investigation in this area would be beneficial.

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