Planning for information systems resources?

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Increasingly, organizations are looking towards IS planning in an effort to force information technology to live up to its heralded promise. Many of these are finding that their efforts are resulting more in disappointment than in organizational advantage. This article reviews the principles of information systems planning and reports the practices found in organizations. The authors argue that these practices lack the high level direction required to achieve mastery in the area. To rectify this, they propose a four-tier planning framework for information technology, information systems, and information management. This framework provides guidance for an integrated approach to the management of an organization's information and technology resources by promoting the development of a planning platform from which consolidated planning can take place at operational, tactical, and strategic levels.

Introduction

The need for planning in business, as in many other areas, is clear. Apart from providing direction for subsequent decisions, it increases understanding of the business and its direction. As the profile, importance, and cost of information systems increased, they became subject to the planning process (McFarlan, 1971). The initial focus of IS planning was on providing a means of control over a growing expense (McFarlan *et al.*, 1973). Later concerns turned to the acquisition and integration of compatible information technology (McFarlan *et al.*, 1973; Pyburn, 1983), and recently, as information systems gained competitive importance, information systems planning took on a strategic significance (Ives and Learmonth, 1984; Wiseman and Macmillan, 1984; Earl, 1989). Despite awareness of the importance of information systems planning, the distance between interest and mastery in the area remains significant.

This article looks at the evolution of IS planning concepts and reports the findings of recent research in the area. The most striking finding of the study is the absence of a strategic direction to IS planning and the concentration on detailed operational and tactical issues. Organizations, in general, do not seem to be addressing the important area of competitive advantage from information systems and in particular strategic information systems.

The emergence of IS planning

Strategy identification emerged in the early 1900s as a formal business concept. However, it was not until the 1970s that strategic planning emerged as a discipline (Mason, 1983). Today, determining the future direction of an organization is often called by different names, depending upon the organizational level at which the planning exercise takes place. The typical business firm normally engages in three levels of strategy formulation, which in effect form a strategic management hierarchy. They are: corporate strategy at the headquarters level; business strategy at the level of the business unit; and functional area support strategy at the level of the functional departments such as finance, marketing, and information systems (Comerford and Callaghan, 1985; Wheelen and Hunger, 1989).

Leavitt and Whistler (1958) predicted notable changes in the operation of organizations as a result of the existence of information technology, as well as from its application in the form of information systems (Leavitt and Whistler, 1958). As well as adjusting for its presence, organizations began to adjust to take advantage of IT. Although, the formalization of this process was to take some time, information systems planning had begun. Interest in IS planning increased in the 1980s with a number of surveys reporting that IS planning was the major concern of IS managers (Ball and Harris, 1982; Dickson *et al.*, 1983; Hartog and Herbert, 1986; Brancheau and Wetherbe, 1987; Earl, 1989).

The term 'IS planning' has taken on different meanings depending upon how one chooses to define information systems and what is to be included within its boundaries. As a result IS planning has taken on somewhat of an intuitive and ambiguous meaning. For the purpose of this research, IS planning is defined as the broadly-based management activity that provides direction, within an

organizational setting for the development and use of information systems.

A number of phases in the evolution of IS planning can be identified (see Figure 1). The first phase of formal IS planning was characterized as demand driven, focusing on the efficient allocation of resources, with return on investment used as a ranking methodology (Dantzig, 1990). The second phase of IS planning began to focus on the effective allocation of the organization's resources to information technology. The IS plan became a response
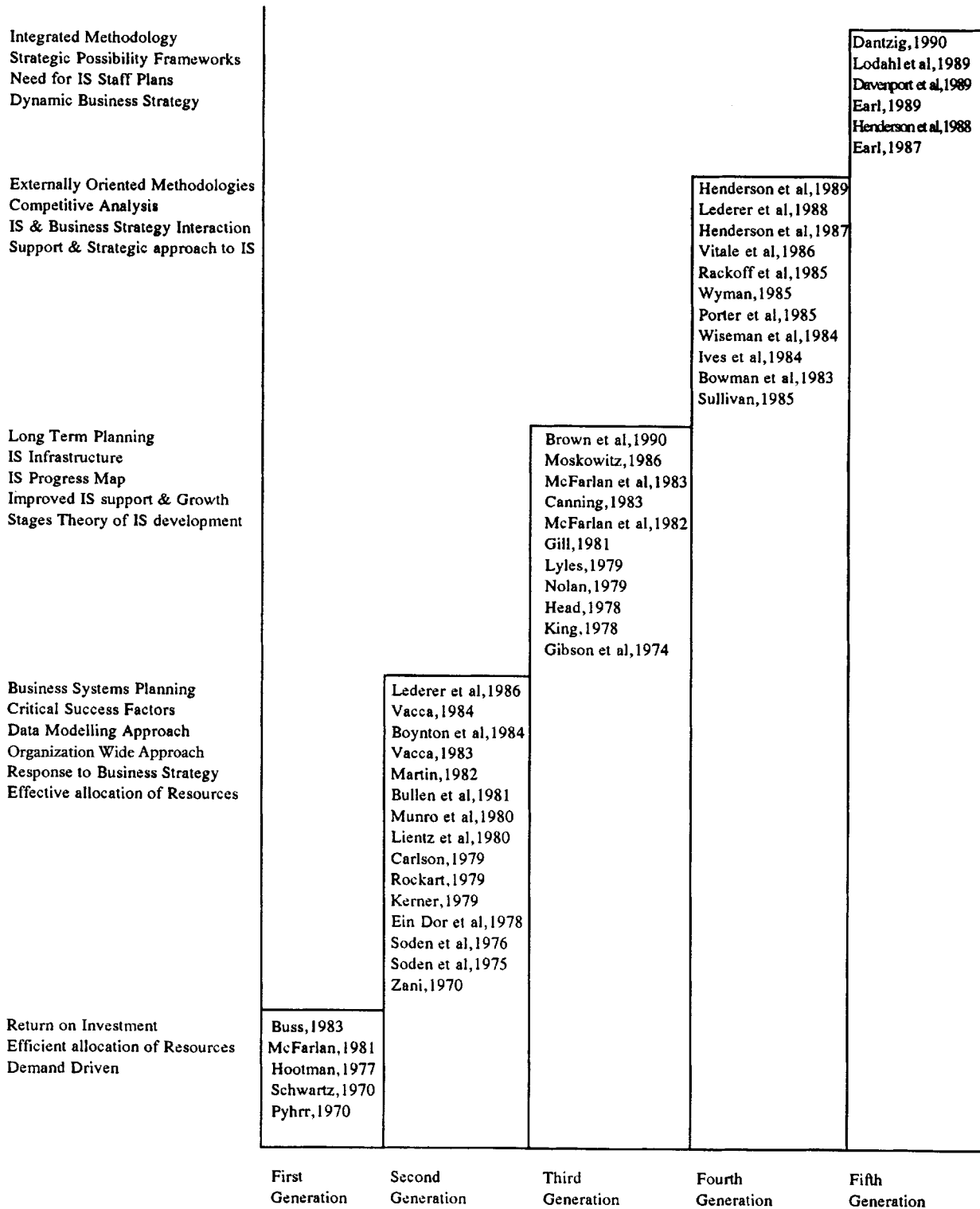

	First Generation	Second Generation	Third Generation	Fourth Generation	Fifth Generation
Integrated Methodology / Strategic Possibility Frameworks / Need for IS Staff Plans / Dynamic Business Strategy					Dantzig,1990 / Lodahl et al,1989 / Davenport et al,1989 / Earl,1989 / Henderson et al,1988 / Earl,1987
Externally Oriented Methodologies / Competitive Analysis / IS & Business Strategy Interaction / Support & Strategic approach to IS				Henderson et al,1989 / Lederer et al,1988 / Henderson et al,1987 / Vitale et al,1986 / Rackoff et al,1985 / Wyman,1985 / Porter et al,1985 / Wiseman et al,1984 / Ives et al,1984 / Bowman et al,1983 / Sullivan,1985	
Long Term Planning / IS Infrastructure / IS Progress Map / Improved IS support & Growth / Stages Theory of IS development			Brown et al,1990 / Moskowitz,1986 / McFarlan et al,1983 / Canning,1983 / McFarlan et al,1982 / Gill,1981 / Lyles,1979 / Nolan,1979 / Head,1978 / King,1978 / Gibson et al,1974		
Business Systems Planning / Critical Success Factors / Data Modelling Approach / Organization Wide Approach / Response to Business Strategy / Effective allocation of Resources		Lederer et al,1986 / Vacca,1984 / Boynton et al,1984 / Vacca,1983 / Martin,1982 / Bullen et al,1981 / Munro et al,1980 / Lientz et al,1980 / Carlson,1979 / Rockart,1979 / Kerner,1979 / Ein Dor et al,1978 / Soden et al,1976 / Soden et al,1975 / Zani,1970			
Return on Investment / Efficient allocation of Resources / Demand Driven	Buss,1983 / McFarlan,1981 / Hootman,1977 / Schwartz,1970 / Pyhrr,1970				

Figure 1 The evolution of IS planning

to business strategy as an organization-wide approach was taken (Henderson and Venkatraman, 1989). This approach is characterized by methodologies such as Critical Success Factors (Rockart, 1979), and Business Systems Planning (IBM, 1981).

The third phase of IS planning resulted from a realization that the key to effective IS management was the ability to match IS services with the advancement of information systems within the organization (Gibson and Nolan, 1974; Nolan, 1979). An organizational IS progress map was used to analyse opportunities for improved IS support and growth, as well as the quality of the IS infrastructure (Dantzig, 1990). It was now easier to engage in long-term IS planning. The fourth phase of IS planning reflects a much higher level of interaction between business strategy and IS strategy. IS was no longer considered solely as a support function. IS and business strategies had to explicitly recognize the potential for information technology to shape as well as to support the organization's competitive strategy. Planning methodologies became more externally-oriented in perspective, and directly incorporated techniques such as competitive analysis (Henderson and Venkatraman, 1989). Ives and Learmonth (1984) and Runge and Earl (1988) are among many to present frameworks for realizing the strategic potential of information technology (Earl, 1989; Henderson and Venkatraman, 1989).

Functional and IS management are now recognizing that business and IS strategies cannot be regarded as stable and that there is an imperative need to take account of the dynamic environment in which they operate. Linked to this is the need to explicitly formulate IS staff development plans, as a means of gaining competitive advantage (Earl, 1989) as well as for resourcing reasons (Dantzig, 1990). Based on these realizations, information systems planning is now entering a new phase in its development. This involves the use of integrated methodologies, where planning reflects the joint information systems possibilities of strategy support and strategic weapon. Earlier IS planning methodologies have been merged together with strategic possibility frameworks, to produce an IS plan for both support and strategic roles (Earl, 1989; Dantzig, 1990).

An IS planning framework

Earl (1989) clarified the concepts of information technology (IT), information systems (IS), and information management (IM) by defining each in relation to the others. Accordingly, 'IS strategy is concerned primarily with aligning IS development with business needs and with seeking strategic advantage from IT' (Earl, 1989). To Earl it is 'the long term, directional plan which decided what to do with IT' (Earl, 1989). IT strategy, on the other hand, is primarily concerned with technology policies, tackling issues of architecture, risk, vendor policies, and technical standards. Lastly, IM strategy comprises the policies and procedures for managing IS and IT (Earl, 1989). What is then taken as IS planning, if it is really to be 'planning for information systems', must consist of the formulation of each of the above strategies, dealing with technology, systems, and management.

King and Zmud (1981) classify IS planning within two planning contexts: information resource and information function. The information resource context is an approach to IS planning that addresses the management of a firm's information system using an organization-wide perspective (Boynton and Zmud, 1984; Shank and Boynton, 1985). It is concerned with 'the deployment of information services in support of organizational functioning' (King and Zmud, 1981). An information function approach takes a more traditional technology approach to planning, dealing mainly with the technical aspects of establishing and managing the firm's information systems (Boynton and Zmud, 1984; Shank and Boynton, 1985). It is 'concerned with the processes by which IS products are made available, i.e., the activities associated with identifying, selecting, and implementing IS products' (King and Zmud, 1981).

Figure 2 is a classification of IS planning which considers Earl's classification of information technology and systems resources (Earl, 1989), King and Zmud's planning contexts, and the four levels of IS planning (Head, 1978; King and Zmud, 1981; Boynton and Zmud, 1984; Zviran, 1990). The highest level of IS planning is called policy planning. The purpose of this type of planning is to design a systems, technology, and information management culture. The design of this culture involves the consideration of the norms, values, attitudes, and beliefs that are held, and those that are desirable to be held, by the IS organization (King and Zmud, 1981). This creates a planning framework within which strategic, tactical and operational IS planning can take place. In essence, IS policy planning is planning to plan.

The next level of IS planning is strategic IS planning. These type of plans focus on linking organizational needs with information resources (Zviran, 1990), by relating the mission, objectives, strategies, and attributes of the organization to an IS strategy set. The creation of an IS master plan with a planning horizon of five years is called tactical planning (Zviran, 1990). It is the linking plan between strategic planning and operational planning. This plan projects future capacity, personnel, and other resource requirements needed to meet the objectives set out in the strategic plan (Head, 1978). Operational planning, which is concerned with developing a short
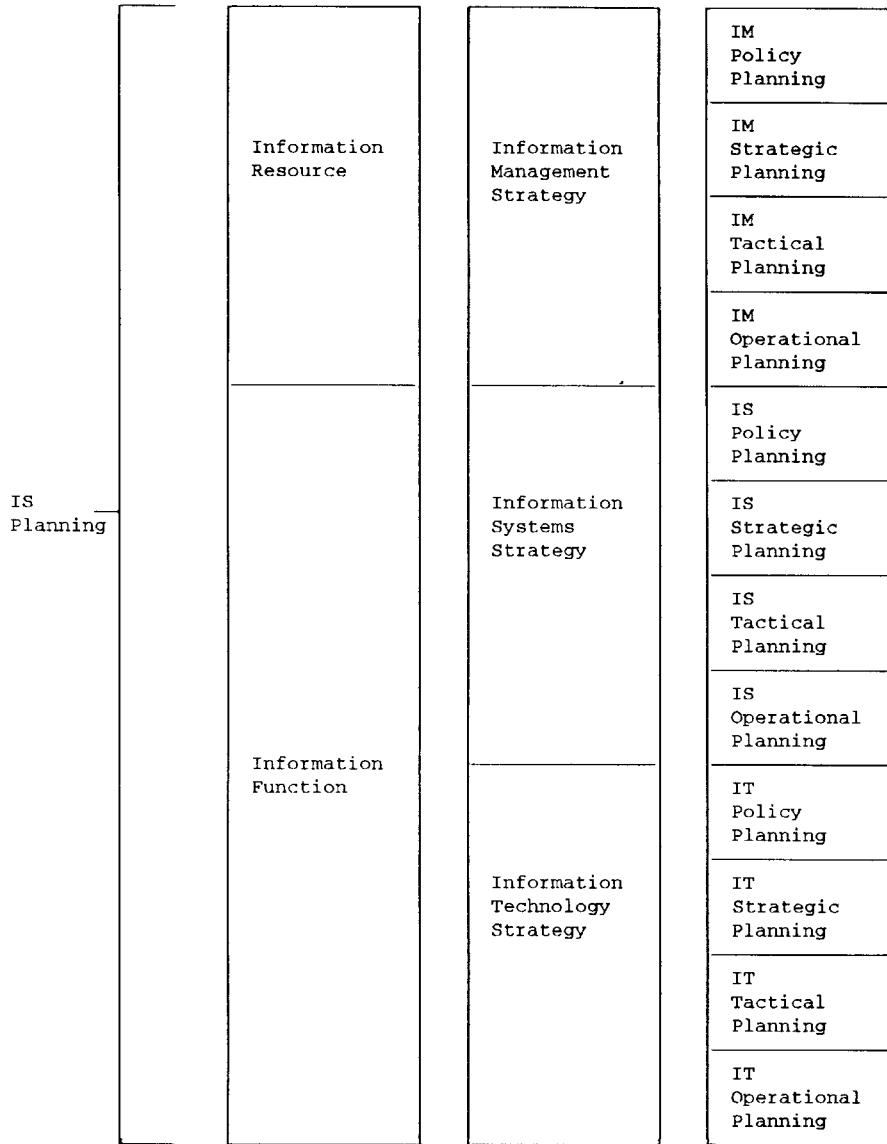
Figure 2 Composition of IS planning

term IS plan is the lowest level of IS planning (Zviran, 1990). This type of planning includes dealing with equipment issues, integration issues, personnel issues, as well as the planning that takes place prior to systems analysis and design (King and Zmud, 1981; Boynton and Zmud, 1984).

Issues in IS planning

The pressures to engage in IS planning have been outlined by a number of writers (McFarlan, 1971; Lientz and Chen, 1980; Pyburn, 1983; Venkatraman, 1985; Murdick and Munson, 1986; Cash *et al.*, 1988), as have the benefits

of IS planning (McLeod, 1979; Cresap *et al.*, 1983; Cash *et al.*, 1988). The type of IS planning that an organization performs falls somewhere on the reactive–proactive planning specrum. At the reactive end, planning is a 'knee-jerk' reaction to the forces that affect the organization, while towards the proactive end, IS management participates fully with senior organizational management in developing organizational strategies that contribute to overall organizational objectives (Reynolds, 1988).

Depending on the definition used, it can be argued that every firm engages in information systems planning. However, successful IS organizations tend to engage in more systematic and formalized planning practices (Lederer and Mendelow, 1986). Nevertheless, there

seems to be little agreement on formal IS planning, except that the process must be linked with top management and corporate planning.

An A.T. Kearney study reported that companies with integrated IS and business plans financially outperformed those without such integration by a factor of six to one (Ball and Harris, 1982; Lederer and Mendelow, 1986). In a 1986 survey of IS managers, aligning MIS with business goals was the second most important issue (Hartog and Herbert, 1986). Also, Menkus stated that the design of information systems must focus on meeting management needs rather than on optimizing the use of computer technology (Menkus, 1990). This involves linking IS strategy formulation to corporate strategy. Other authors have frequently stressed the importance of this link, and its benefits for the organization (McFarlan *et al.*, 1973; Pyburn, 1983). Although fully integrated strategies are not as essential when information systems fill a support, as opposed to a strategic, role, most authors advocate high levels of integration in all IS planning exercises. This is because management objectives are better understood by functional specialists when they are involved in the formulation process, thus making alignment easier (Lederer and Burky, 1988).

Despite the considerable time and money that companies are investing in IS planning, IS planners, executives, and top management are often disappointed and dissatisfied with the outcome (Lederer and Sethi, 1989). However, Soden and Tucker found that the problems that created such dissatisfaction tended to become less relevant over time as the organization gained IS planning experience (Soden and Tucker, 1976).

Data gathering

The nature and extent of IS planning in organizations was the subject of a postal survey carried out in the top 300 companies in Ireland, during June and July 1991. The response rate was 42.67% to a detailed questionnaire which looked at IS and organizational characteristics as well as IS planning details. A test for non-response bias, using the late returns technique recommended by Wallace and Mellor (1988) and Oppenheim (1966), proved to be negative indicating that non-response did not affect the generalizability of the results. The relationship between the findings were then analysed using chi-square contingency analysis, and where a statistically significant relationship was found to exist at alpha = 0.10, the variables are reported as being related.

The primary purpose of the study was to investigate the nature of IS planning undertaken by these firms in an attempt to explain the disappointment and dissatisfaction with IS planning as reported by other researchers. It was believed that a comparison of IS planning practices in

Table 1 Breakdown of respondents by industry

Industry	Number	Percentage
Other manufacturing	22	21.0
Agriculture/food	16	15.2
Chemicals/petroleum	14	13.3
Wholesale/retail	11	10.5
Computers/components	10	9.5
Banking/finance	9	8.6
Other	8	7.6
Leisure/travel	6	5.7
Construction/mining	5	4.8
Service/government	4	3.8
Total	105	100.0

these organizations with the recommendations for successful IS planning proposed in the literature would reveal the source of such dissatisfaction. A breakdown of the respondents by industry is shown in Table 1.

Findings

An analysis of the role that information systems played within the organizations studied is shown in Table 2. These figures indicate that while information systems are very important for the organizations studied, they are being used in traditional support, rather than strategic, areas. The size of the annual information systems budget is shown in Table 3. Although the range of figures here is large, almost 92% of respondents have an annual budget of less than £2m. The size of the IS budget was found to be related to the role that information systems play in the organization. The information systems functions of the

Table 2 The role of information systems in organizations

Role	Percentage of organizations
The organization is critically dependent on smoothly functioning information systems	50.5
Information systems are an integral part of products and services	26.7
Information systems provide operational support	14.3
Information systems have not been of vital importance in the past but they will be in the future	7.6
The organization could function without information systems, but less efficiently	1.0

Table 3 Size of information systems budget

Size of IS budget (£IR)	Percentage of organizations
<£0.25m	44.3
£0.25–£2m	47.4
£2–£5m	3.1
£5–£7.5m	1.0
£7.5–£10m	2.1
>£10m	2.1

Table 4 Components included in the IS plan

	Percentage
Statement of objectives	75.2
Projection of possible future MIS environment	65.7
Projection of possible future user environment	58.1
Equipment plans	87.6
Software plans	87.6
System development plans	74.2
Database plans	55.2
Telecommunications/networking plans	67.6
Personnel development plans	40.0
Expenditure plans	84.8
Facilities plan	49.5
Organization/function plan	53.3
Alternative technology plans	30.0
Implementation timetable	83.8
Alternative IS strategy definition/evaluation	30.0
Evaluation of past performance versus plan	34.2
Summary of strengths and weaknesses of IS staff/function	31.4
Disaster recovery plans	67.6

organizations studied employ an average of 21 people. However, 61.8% reported that they employed ten people or less. The small numbers that are employed in IS roles combines with the small IS budgets shown in Table 3 to present a picture of IS functions that are less important than their nominal organization position would suggest.

IS planning practice

IS Planning was found to be a relatively recent phenomenon for the majority of the organizations studied, with over 82% of those studied having less than ten year's experience in the area. The vast majority of organizations plan their information systems activities, but the detail of these plans varies. This process was found to be more formal in larger organizations, those with formal business planning processes, and those with relatively decentralized IS functions. A permanent IS planning group was found to exist in only 43.6% of organizations. Such a group is more likely to be found in larger organizations and where there are close links between business and IS planning. The relationships between these factors and others examined in this study are shown in Appendix 1.

As can be seen from Table 4, traditional components, such as equipment plans, software plans, system development plans, expenditure plans, and an implementation timetable, all feature well in the IS plans of the majority of organizations. The relatively new area of disaster recovery planning also features prominently in the IS plans of the organizations studied. Components such as personnel development plans, alternative technology plans, evaluations of past performance versus the plan, and summaries of the strengths and weaknesses of the IS function and staff, which tend to be regarded as elements of progressive IS planning, are generally missing from the IS plans of the top Irish companies.

No significant relationships were found to exist between the items included in the IS plan, and the problems experienced or the benefits enjoyed as a result of IS planning. The items included were also found to be independent of the IS planning methodology used. From these results it is difficult to ascertain why organizations include certain components in their IS plans. However, it does suggest that the benefits of IS planning are related more to process elements of IS planning than to the operational details.

IS planning methodologies used

The methodologies that the organizations studied are using are presented in Figure 3. As can be seen, Business Systems Planning is clearly the most popular, followed by Critical Success Factors and Information Engineering. The category marked 'other' mainly consisted of in-house methodologies and those developed by consulting firms for organizations. The most striking feature of these findings must be the fact that so many organizations either did not use a methodology or did not know which one that they were using. The explanation for this could be that some respondents were in fact using a methodology, without recognizing it as being an IS planning methodology.

The popularity of Information Engineering and BIAIT can be explained by their use as secondary methodologies as they are used in conjunction with the more popular ones mentioned above. The need to tailor the methodologies used to suit the organization, was illustrated by the fact that over 78% of respondents had the IS planning methodology developed or adapted internally.

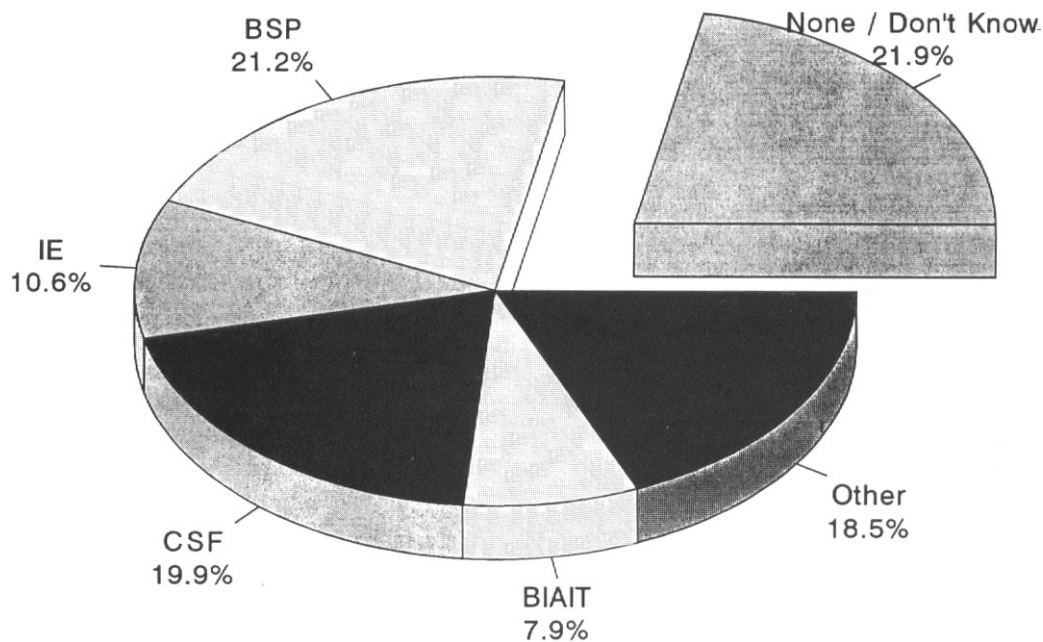An analysis of the responses revealed that a relationship

Figure 3 IS planning methodologies used

existed between the methodology used and the degree and formality of IS planning. The methodology used was also found to be related to whether the organization considered operational, tactical, or strategic plans to be the most important. Finally, a relationship was found to exist between the methodology used and the degree to which the IS planning process was reactive or proactive.

Benefits and problems of IS planning

In order to ascertain the benefits that organizations enjoy as a result of IS planning, those questioned were presented with a modified version of the framework of benefits used by Cresap *et al.* (1983). The results are shown in Table 5. A modified version of the framework of IS related problems, developed by Lederer and Sethi (1988), was used to ascertain the numbers experiencing various problems related to the IS planning process, its output, and the resources required. The results are shown in Table 6 and are similar to the findings of Lederer and Sethi (1988) in the USA.

In the area of resources, many feel that while the process is not very expensive, it does take a long time. Problems are also significant in the areas of plan implementation and

Table 5 Benefits of IS planning

Benefit	This is a benefit we currently enjoy (%)	We would like to achieve this in the future (%)	Benefit not applicable (%)
Major one-time projects can be often justified	71.4	13.3	8.6
A basis for information systems budgeting is provided	70.5	21.9	1.9
Performance of information systems activity can be measured fairly	39.0	50.5	3.8
Strategy for selection of information technology can be set	49.5	35.2	7.6
General management becomes informed and involved concerning information systems activities	61.0	34.3	0.0
Scarce information systems resources can be allocated wisely	55.2	30.5	7.6
Emergency information systems projects are often avoided	29.5	51.4	10.5
Business programs are assured of needed information systems help	52.4	35.2	1.9

Table 6 IS planning problems

	Not a problem (%)	Insignificant problem (%)	Minor problem (%)	Major problem (%)	Extreme problem (%)
Resources					
The success of the process is greatly dependent on team leader	24.3	15.5	35.0	23.3	1.9
The planning exercise takes very long	19.4	21.4	40.8	16.5	1.9
The planning exercise is very expensive	37.9	22.3	26.2	11.7	1.9
It is difficult to convince top management to approve the process	26.2	18.4	34.0	17.5	3.9
The planning process					
The exercise fails to take into account organizational goals and strategies	42.6	20.8	23.8	8.8	4.0
The process fails to assess the current information systems application portfolio	52.0	25.0	16.0	6.0	1.0
The process fails to assess the external technological environment	35.0	24.0	25.0	14.0	2.0
The process fails to take into account issues related to plan implementation	30.3	22.2	36.4	8.0	3.1
The process requires too much user involvement	37.0	22.0	27.0	13.0	1.0
The output of the planning process					
The plan fails to provide a statement of organizational objectives for the IS department	41.0	26.0	19.0	9.0	5.0
The plan fails to identify specific new projects	49.0	27.0	13.0	10.0	1.0
It fails to determine a uniform basis for prioritizing projects	32.7	25.7	26.7	13.9	1.0
It fails to include an overall personnel and training plan in the information systems department	26.0	18.0	30.0	23.0	3.0
It is difficult to secure top management commitment for implementing the plan	31.0	18.0	36.0	12.0	3.0

with determining a uniform basis for prioritizing projects. In general it seems there are more problems with the output of the process, than there are with either the process itself or the resources required. The most significant problems are in relation to the personnel plan and in securing top management commitment. The study found that the IS plan failed to provide a statement of organizational objectives for the IS department more frequently when the IS planning process was generally informal, reactive, or when a weak link existed between the IS and business planning processes.

IS planning aspirations

In 55.5% of the organizations studied, the IS plan is prepared every year, with a further 23% preparing it every one to five years. In order to judge the type of IS plans that organizations consider important, those studied were presented with three types of plans and were asked to rank them. The types of IS plans were:

(1) short term operational plans that deal with the next six to twelve months;

(2) tactical plans that cover one to five years; and

(3) strategic plans that cover a period greater than five years.

The results show that while operational plans are considered the most important, followed closely by tactical plans, very few of the organizations studied considered strategic plans to be very important. This was evident by the fact that over 90% of those ranked, it considered the strategic plan to be the least important of the three. This is not surprising considering the frequency with which IS plans are prepared. These results combine to show the short-term nature of the IS planning process, despite the need for strategic thinking in the area.

The degree to which IS plans are linked with business plans was determined by a series of scales relating the IS planning process to the business planning process. The IS plan generally refers to the business plan, but the link between business and IS planning as determined by other scales, such as the involvement of line and staff managers in IS planning and the synchronization of planning calenders, tends to be rather nebulous.

In order to obtain an overall picture of the degree to which IS plans were linked with business plans, a

composite scoring system, based on the linkage indicators identified by Cresap *et al.* (1983), was devised. See appendix 2 for details of this system. Figure 4 shows the link between IS and business planning as determined by these indicators, with 63% showing a score of 10 or lower. This is consistent with findings in the UK (Galliers, 1986).

The degree of linkage between IS and business planning was found to be positively related to the degree and formality of IS planning, as well as to how proactive the IS planning process was. Proactive IS planners tended to have a closer link between IS and business planning. However, such a link was unrelated to either the size of the organization or to the number of years of IS planning experience, as well as to the methodology used and the items included in the IS plan. This linkage was also found to be unrelated to how centralized the IS planning process was.

These results are interesting when viewed against the findings that most of the organizations studied regarded themselves as being relatively proactive in their IS planning practices. This may be explained by the fact that reactive and proactive firms were found to use different IS planning methodologies, which may create a perception of

successful proactive IS planning that is not being fulfilled. Contrary to the findings of Soden and Tucker who, from a small survey of MIS executives, found that more experienced IS planners tended to be more proactive (Soden and Tucker, 1976), no significant relationship was found to exist between IS planning experience and the degree to which IS planning was proactive.

The benefits and problems of IS planning experienced by organizations studied were found to be the same as those experienced by organizations studied in the USA. The results of this study also showed that most of the dissatisfaction with IS planning concerned the output of the process. These results when combined with the functionally operational and tactical nature of IS planning undertaken by these firms may point to the reason for this dissatisfaction. IS managers are constantly being exposed to the potential of information systems and technology. The expectation is that IS planning can deliver such benefits. However, as shown in Table 2, information systems are not being used to their full potential. This creates a perception that the IS planning process is not delivering on its promise.

Conclusions

The evolution of information systems planning has coincided with the progressive assimilation of information technology in organizations. The IS planning concept has assumed different contexts within this evolution, aligning itself with organizational needs and assuring an evolution of purpose. The findings of this study indicate that organizations are now engaging in IS planning, more in an effort to improve the standing of information systems, rather than to allocate their scarce IS resources, as this could be done with less formal and detailed procedures.

As shown in Figure 2, the IS planning process must formulate policy, strategic, tactical, and operational plans for information systems, technology, and management. The organizations studied as part of this research are dealing mostly with tactical and operational issues within an information function context. It is this partial approach to IS planning that prevents information systems and technology from reaching its potential, thus creating dissatisfaction with IS planning. Such functionally-based operational and tactical planning reflects the resource allocation and control orientation of third generation planning approaches. These approaches fail to recognize the importance of externally-oriented and integrated methodologies which Henderson *et al.* (1989), Earl (1989) and Dantzig (1990) identified as crucial for successful IS planning in the dynamic business environments currently faced by organizations. In many cases these organizations are applying 1970s approaches to the 1990s business environment. This lack of direction in the approach to

Percentage of Respondents

Degree of Linkage (Score)
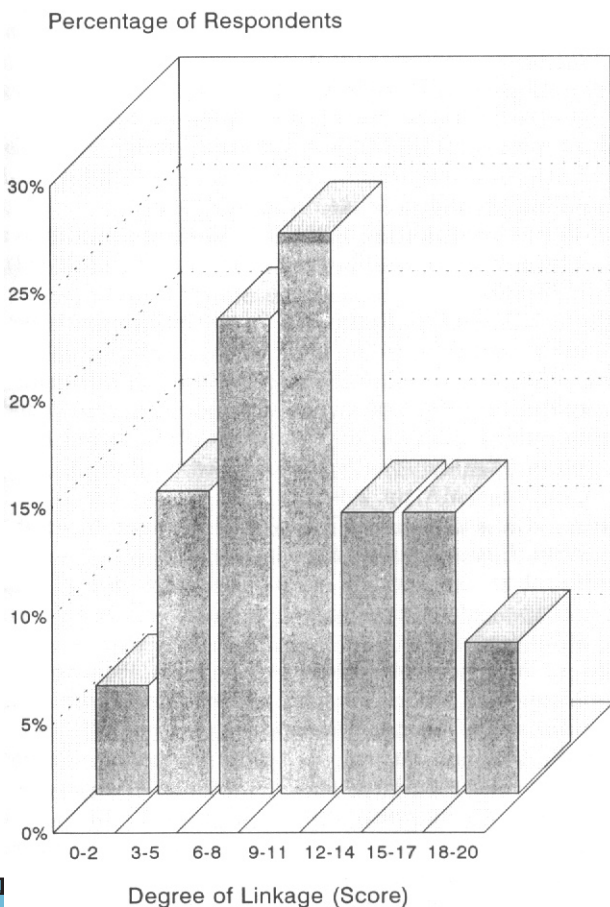
managing information systems and technology inevitably leads to dissatisfaction with information systems planning.

Organizations are now faced with an opportunity to improve their utilization of information systems technology by improving the effectiveness of their IS planning efforts. The first step here is to refocus IS planning by engaging in policy planning within the information function and resource contexts. The goal is to design a systems, technology and information management culture, thus creating a framework within which strategic, tactical and operational planning can take place. In essence, organizations have to replace their narrow allocation mentalities with a broad perspective of the organizational information resource.

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Appendix 1   Relationships between variables (alpha values)

	Degree of IS planning	Formality of IS planning	Existence of planning group
Role of information systems	0.10*	0.05*	0.50
Organization of IS function	0.05*	0.05*	–
Number in IS function	0.10*	0.01*	–
Industry	0.05*	–	–
IS planning experience	0.20	0.50	0.50
Position of IS function	0.20	0.01*	0.30
Formality of business planning	–	0.01*	–
Size of IS budget	0.70	0.70	–
Turnover of company	0.90	0.20	0.05
Formality of IS planning	–	–	0.05*
Link between IS and business planning	0.02*	0.05*	0.10*
Organization of IS planning	0.01*	0.70*	0.90
RE/Proactive planning	–	0.05*	0.30
Methodology used	0.05*	0.05*	–
Number in organization	0.30	0.50	–

*Denotes a statistically significant relationship

Appendix 2   IS and business planning composite scoring system

The scoring system rated organizations in relation to five indicators measuring the degree to which IS and business plans are linked. In relation to each of these indicators, organizations were rated on a five point Likert scale ranging from 'not at all' to 'exactly'. A rating of 'not at all' received a value of zero and 'exactly' a value of four, with points two, three and four receiving a value of one, two, and three respectively. A composite score (max 20) was then calculated for each organization as the sum of $\times 1$, $\times 2$, $\times 3$, $\times 4$, and $\times 5$, where:

$\times 1$ rated the degree to which the information systems plan referred to the business plan;

$\times 2$ rated the degree to which line and staff managers participated actively in IS planning;

$\times 3$ rated the degree to which business planning calendars and IS planning calendars were carefully synchronized;

$\times 4$ rated the degree to which IS plans were closely checked against business plans; and

$\times 5$ rated the degree to which the business plan stated information systems needs.

Although this scoring method assumes that all scales are of equal interval, a point that was intended by the researchers but which may not have been realized by some respondents, the resulting graph (Figure 4) probably still represents the linkage with reasonable accuracy.