CHOOSING THE BEST EIS IMPLEMENTATION STRATEGY

by

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CHOOSING THE BEST EIS IMPLEMENTATION STRATEGY

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Abstract

EIS is a relatively new acronym used to describe a category of information systems. The first step to understanding EIS is to identify what the "E" represents. Originally defined by the executives who began to demand these systems in the early 1980s, the definition has recently increased in scope to encompass an enterprise as well as executive audience. With this broadened description, some suggest that EIS is now defined as push-button access to information for any decision maker in an organization. This evolution has made EIS more confusing and challenging because the implications for developing a system for a few executives is quite distinct from developing a system for the knowledge workers throughout an organization. Furthermore, there may be different development methodologies that work best, depending on the organizational cultures and structure.

This purpose of this paper is to simplify some of the mystery of developing an EIS by presenting the alternative development methodologies and information requirement definition techniques. In recognition that each organization’s situation is unique, the paper presents a framework of questions developed by an expert panel to help the EIS project manager consider the factors to tailor-make the best approach to fit their organizational needs.
Acknowledgments

When I enrolled in the MBA program in September of 1992, I had already spent a considerable amount of time developing EISs. I had presented my findings at an international conference on EIS. I brought this experience to the Simon Fraser University unsure of how it would fit into an academic framework.

I would like to thank Dr. Mark Wexler for explaining the process and enduring several preliminary drafts during my introductory research course. His passion for teaching was truly inspirational in pushing me on to the next phase of writing the thesis.

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The participation of the expert panelists -- Paul Barber, Mason Brown, Wayne Burkan, David DeLong, Gary Guthrie, Don Kellet, Martin Lee, Bruce Petersmeyers, James Suttie, Dr. Hugh Watson, Doug Wood -- is what really made this paper happen. Their commentary was both interesting, valuable, and relevant. I thank each one for spending the time, in spite of their many other obligations.

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A category of systems labeled EIS emerged in the early eighties with the intent to increase the effectiveness and efficiency of senior managers and executives. Alexander Giacco, president and CEO of Hercules Incorporated summarized some of the early objectives of EISs in the following statement: ¹

Computer technology is allowing us as managers -- I should say forcing us -- to move to new and different organization types so that we can better meet competitive needs. The people who can best harness these new technologies in the future will be the most successful. Information becomes the key to success only with management and information systems that causes information to flow up to top management where we can make decisions ... and where we can effectively communicate back down so our decisions can quickly be put into action.

Today, however, both the definition and purpose for an EIS are changing. Rather than only supporting an organization's elite, EIS is often used as the tool to truly empower knowledge workers by providing push-button access to support decision-making throughout the enterprise. Management gurus are arguing the need for faster decision-making only possible with a lateral rather than vertical chain of command. ² As the role of EIS evolves to meet these changes, the EIS project manager may be confused by conflicting information about the goals of EISs and contradictory strategies on how to best realize these objectives.
The Research Question

Partly because of this rapid evolution, the neophyte project manager may be overwhelmed with the range of different approaches available to develop an EIS. Convincing industry and academic experts present strong arguments to support their positions. Therefore, the project manager embarking on the journey to develop an EIS must plot a path to strategically achieve the desired results. The current literature and the practical experience of the author suggest that developing this strategy is a difficult task. Much of the information presented on the topic is contradictory. Practitioners offer documented cases to support their opposing views. The importance of making the right decision is marked by the possibility of choosing a completely different path that may not be consistent with organizational needs or desired outcomes for the project. Therefore, it is necessary to understand that the selection of the best path is influenced by a variety of factors.

The purpose of this paper is to address some of these factors with the following questions:

1. What does the acronym, EIS, mean to an organization?
2. What type of development methodology will produce the optimal results?
3. How does one determine what type of information to include in the system?

An expert panel was assembled to develop a series of questions that help clarify the answers to these research questions. The goal of this paper is to summarize the alternatives and present a framework that helps the EIS project manager to tailor-make an approach to match these
needs. In terms of priority, #2 is the primary research question, #3 is a sub-component of #2 and the response to #1 is one of the critical influences to selecting the right methodology (the main research question). Answering these questions requires a flexible framework because there is no one right approach for all organizational situations. The following section summarizes some of the key components and issues with each.

**Overview**

Explicitly defining EIS for an organization is the starting point to influence the direction of the implementation strategy. As part of this strategy, this paper will review the current literature on development methodologies and the techniques used for eliciting information from the user (audience) of the system.

A review of development methodologies includes the System Development Life Cycle (SDLC). This paper will illustrate when this frequently maligned formal development methodology is appropriate for an EIS. A description of the iterative technique known as Prototyping will highlight its strengths and weaknesses as they relate generally to systems development and specifically to EIS. A discussion of End-user Application Development will recognize the increased use of this approach and the associated opportunities and potential pitfalls of having end-users develop their own applications. Finally, a methodology specifically targeting EIS that uses a chronology approach will be presented as an alternative to using either SDLC or Prototyping in isolation. Several examples will illustrate where each of these approaches works best.
As a complement to the development methodology, several approaches are available to determine information requirements for the system including Business Systems Planning, Ends/Means Analysis, Critical Success Analysis, and Strategic Business Objectives. These approaches can be applied with techniques such as Joint Application Design or Structured Interviews. This paper will review these alternatives and suggest when to employ the various techniques.

Throughout this review, this paper will draw upon the considerations that influence an organization's situation including:

- the makeup of the system's users (audience)
- the goals of the system -- what is the problem or opportunity?
- the structure, culture, and processes in a company

The differences in these factors will provide the foundation for choosing the best strategy and will illustrate the benefits of evaluating organizational needs before committing to a design.

Next, the paper will explain the research methodology that was used to help resolve some of the tension and problems identified in the literature review. A major part of the methodology is an expert panel's contribution of a framework of practical questions to help prepare the EIS project manager for the EIS journey. The Results section will organize and discuss the findings from the expert panelists. The Discussion and Application section will extend the analysis and suggest areas for practical application of the findings.
Chapter II
Literature Review

A. Definition of EIS

Before proceeding, it is necessary to define the acronym, EIS. First the easy part; "IS" stands for Information System. However, a review of current literature reveals that the "E" can be somewhat ambiguous. Clarification of this ambiguity will go a long way towards understanding the audience for the system and the important influences that the user has on the choice of development methodology and information gathering techniques.

Traditional definitions of EIS date back to the emergence of a variety of support systems for senior managers or executives. As Paller notes:

EIS is not an entirely new phenomenon. Under different guises, true computer terminal-based executive information systems have been available to a select few for two decades [1970 - 1989]. Paper based executive information systems existed even earlier. ... Executive information systems is just the latest, and perhaps not even the best, name for this phenomenon. Decision support systems (DSS) or management information systems (MIS) might be better terms, but these have been usurped by academicians, in one case, and data processing professionals, in the other.

A derivative of the Executive Information System definition is put forward by John Rockart and David DeLong in their pioneering text, Executive Support Systems, The Emergence of Top Management Computer Use. The term "Support Systems" implies functionality beyond information, often including office automation tools such as electronic
mail, calendaring and analytical support tools. However, with both EIS and ESS the common focus is the user -- an executive.

A new definition for the "E" emerged toward the late eighties and was foreshadowed by Rockart in 1988:

While early [EIS] focused on what the technology available at the time could do for an individual, newer systems tend to be broader in scope, being designed for use throughout the executive's organization ... hav[ing] much broader impacts in their organizations than the early [EIS] implementat[ions] ... Such organizational systems also are much more apt to continue in use after the executive moves on. As the concept of [EIS] matures, there is a clear trend away from individual systems towards organizational systems, linking executives to their subordinates and to their peers.

David Friend, chairman of Pilot Executive Software, formally introduced a new definition for the "E" in EIS during a 1988 conference. In his address, he argued for EIS to mean "everyone's information system". Competitive software vendors first perceived this as a marketing ploy; they saw the shift in Pilot's approach from strictly executive to enterprise information systems as a sales initiative to broaden the appeal and marketability of the concept and associated products. However, Friend's prophecy has evolved and now been adopted by the industry as the term enterprise information systems. As Friend argued:

In the 'what is it?' view of EIS, the system becomes a potent weapon in an organization's information technology arsenal. It can be used to address a class of information delivery problems whose characteristics include touch-screen or mouse-driven graphical interfaces and techniques for navigating through databases and the like, without respect to the title or position of the user ... In many respects, the mission of EIS technology is quite similar to the mission of 4 [th Generation Languages] (GLs) a decade ago. The difference is that 4GLs produced paper reports or dumb-terminal screens, where EIS offers a highly interactive on-line environment with navigational and graphical interfaces. The real question facing the EIS industry, however, is can EIS do for on-line data what 4GLs did for paper-based reporting?
One of the main objectives of this thesis is to help the project manager ensure that EIS can surpass the accomplishments of 4GLs by understanding how to tailor-make a development methodology that focuses on achieving business rather than technology based objectives.

Another indicator supporting the evolving definition of EIS is revealed in the renaming of the EIS industry newsletter from *The EIS Conference Report* to *EIS and Information Delivery*. As the editor comments in the May 1992 edition:

Reflecting a massive shift in the EIS marketplace, this newsletter is taking on a new name. By adding the words Information Delivery Systems to our masthead, we affirm the shift from an elitist technology to one that will be used by substantially all knowledge workers. Once we broaden the mandate, however, we become obliged to look beyond the facade of easy-to-use graphical interfaces that have been the only unique characteristic of executive information systems since their inception. And when you, as an information systems professional, take on the broader job of information delivery, you, too, will begin to face tougher challenges involved in delivering information to information workers throughout the organization. These are the challenges top IS executives are facing every day, and with this issue of the newsletter, we confront those challenges head-on.

From the literature review, it seems that the EIS project manager must recognize these challenges and broaden their perspective. It is also useful to understand the forces behind this shift. EIS originally targeted executives because the cost of software, hardware, and development was too expensive to apply throughout the organization. However, significant reductions in these three costs have made these systems affordable for all decision makers. Secondly, knowledge workers need access to the same information as their superiors to respond to their inevitable questions. Thirdly, the middle management layer has been compressed in many organizations. Executives need direct access to detailed information more than before because they do not have the staff to
support their queries and investigations. Furthermore, knowledge workers need information to support their newly found *empowered* decision making authority.

There will still be a need to support an executive with an information system. But as this shift continues, "push-button" access to operational and strategic information will become affordable and available to all decision-makers. When making the transformation, the EIS project manager must recognize that groups of knowledge workers have different needs than individual executives. The process that creates a system for large groups is quite distinct from the process that creates a system for a few individuals.

Burkan notes that a crucial step in achieving lasting value with an EIS is accomplished by removing the ambiguity inherent in the EIS acronym and explicitly recognizing the audience for the system. When an information system is targeting a large group of users rather than a few select individuals, the content of the information is defined by and targeted to that large group. With this type if information flow, they become primary, not merely secondary consumers of information.8

Sponsorship and commitment have often been identified as essential ingredients in the success of an EIS.9 It is important to recognize the source of support (or potential resistance) for the project. Cultivating an executive sponsor is unique from generating enterprise support. Once the nature of your audience and the source of support are clarified, the project manager should explicitly identify what type of system is needed by the users.
Burkan identifies several categories for an EIS that helps to further define the system by delineating the different users and the potential functionality of the system:

- **Operational Executive**: Operational information delivered to a select few executives. These systems are usually control- and/or productivity-oriented and fit the classical view of EIS. Systems that deliver headcount, financial performance, or production statistics to the executive team would fit this category.

- **Operational Management**: Also operational information, but intended for widespread usage. Usually these systems penetrate at least three levels down into the organization.

- **Informational**: Designed to help empower employees by delivering information to large groups. Here the term EIS relates to the delivery of information to persons generally believed to be computer illiterate.

- **Issue-Based**: Designed to satisfy the informational needs surrounding a single, pressing issue. Issue-based systems usually are designed around a single executive, but may penetrate fairly deep into his or her chain of command.

- **Strategic**: Although it usually includes operational information, a strategic EIS is targeted to lead the organization into the future, rather than merely monitor the past.

In the Discussion and Analysis section, this paper will describe how Burkan's identification of user audience and the functional level of information can provide a framework to impact development.

From the literature, it is clear that the evolution from strictly executive to enterprise information systems is here today. For the
purposes of this thesis, the "E" can represent either Enterprise or Executive. However, recognition of which definition applies to an EIS has significant implications that impact the design and formulation of a system. This thesis will explore some of these differences.

**B. Development Methodology**

An EIS is usually not available as a turn-key system because the content is highly customized (unlike, for example general ledger systems). Therefore, this thesis assumes that the EIS project manager will make rather than buy a "finished" solution. Following this assumption, the EIS Project Manager must eventually select an appropriate development methodology to build the system. Therefore it is necessary to be aware of the alternatives with their strengths and weaknesses. This paper reviews the traditional options including Systems Development Life Cycle (SDLC), Prototyping, End-user Application Development, and then explores a hybrid approach -- The EIS Chronology.

1. **Systems Development Life Cycle**

   The Systems Development Life Cycle (SDLC) originated with large operational systems in the 1950s and remains the most common method for developing medium and large mainframe-based systems today. The systems life-cycle is generally recognized at six stages:

   1. **Project Definition:** Investigation into whether a problem actually exists and whether it requires further analysis and research. If so, a formal project to build a new information system or modify an existing system will be initiated.
2. **Systems Study**: Activities during this stage focus on describing and analyzing problems of existing systems, specifying solution objectives, describing potential solutions, and evaluating various solution alternatives. All of the information gathered from studying existing systems and interviewing business specialists will be used to specify information requirements including who needs what information, where, when, and how.

3. **Design**: Logical design specifications are generated. Design and documentation tools such as the data flow diagram, data dictionary, and system flowchart are used. Business and technical analysts review and approve these documents before physical design and programming begins.

4. **Programming**: Detailed design specifications for files, processes, reports, and input transactions are translated into software code for the proposed information system.

5. **Installation**: Software is tested to make sure it performs properly from a technical and functional standpoint. Business and technical specialists are trained to use the system.

6. **Post implementation**: The system is used and evaluated after it is installed to ensure that it meets the original objectives.

   Because of its historic association with large, traditional, mainframe systems projects, the SDLC methodology is not typically recommended for EIS. The argument against SDLC has been that it is not flexible enough to respond to the unstructured or semi-structured tasks often required of an EIS. Furthermore, SDLC is often used with projects that require a longer time frame than is associated with successful EIS development.
This argument may be valid when the "E" stands for executive and the content is strategic or issue based. However, when the "E" stands for enterprise and the content is operational, SDLC may offer many benefits including organization and control that are necessary for mission critical applications.

A good example of the application of this approach is the EIS under development at Burnaby Hospital Systems (BHS). Rather than communicating the current operational information through paper reports, BHS is using the SDLC methodology to develop a module of their financial reporting system that will generate reports electronically. Here, the task is very structured: the information content is pre-defined and is already stored in computer format. Examples of this information include monitoring the number of patient visits, their activity and records, employee productivity, and financial performance (actual versus budget) reporting. The SDLC will help ensure that the project meets milestones and budgetary considerations during the critical inception phase. In the Results section, this thesis will identify questions that help to determine whether SDLC is appropriate for an EIS.

However, when the system is designed to address strategic goals or to enhance the decision processes of managers with unstructured needs, SDLC may be inappropriate. Often, the user is unable to articulate the problem. Responding to the direct problem definition stage of SDLC assumes that there is a real or known problem or opportunity. However, often with an EIS, the situation is not well defined and the problem definition phase may not alleviate these issues.

When the "E" represents Executive, the content is often unique to each user. When the "E" represents Enterprise, Peters argues that
successful companies will be differentiated by their ability to fashion information delivery by retailing it to knowledge workers in a boutique format that is tailored to the individual's needs. Deriving the format and content to meet these needs is a challenging task, especially for the unprepared analyst. Computer programmers and analysts do not typically interact with executives and may not be tuned into the notions of retailing and fashion.

There can also be problems when the executive and the analyst fail to understand each other's limitations. The analyst may not know that actual information requirements are likely to differ from what is stated by the executive. The executive, on the other hand, may assume that the analyst can develop a good system even if information needs are not fully specified. The SDLC methodology is not inherently designed to tackle these issues. In this environment, it is often necessary to alter the traditional SDLC or consider alternative approaches.

2. Prototyping

Senior level executives often lack computer skills and seldom have the time or inclination to acquire this expertise. This can also be true of knowledge workers using an enterprise system. Thus, an EIS that is focused on these groups must address their needs in a manner that requires minimal education and training. This need suggests an approach where experience with the system is gained during the development process.

Furthermore, generating the paperwork and voluminous specifications and sign-off documents for the life cycle methodology is very costly and time-consuming -- ultimately delaying the process. This
can result in project timetables that are unable to maintain the expectations of an impatient executive or enterprise audience. A strategic information system is more dynamic than a transaction processing system and development will be inhibited by this bureaucracy and rigidity. Because it is constantly responding to new user demands, an EIS must be flexible enough to change and expand as its users' corporate needs do.\textsuperscript{16} As a result, the project manager must acknowledge the role of learning in the development methodology.\textsuperscript{17}

An iterative technique referred to as Prototyping can often address the limitations of SDLC and introduce the important concept of learning during development. Prototyping involves building an experimental system or part of a system quickly and relatively inexpensively so that users can evaluate it. The mutual learning process enhances the developers' and users' understanding of needs and limitations. Expectations are set prior to a formal product delivery so that misconceptions are minimized. There is no "curtain unveiling" at the end of the project -- the users are already familiar with the workings of the system since they are intimately involved in the development process.

Prototyping essentially bypasses the life-cycle stage of information requirements definition and allows requirements to evolve as experience is gained.\textsuperscript{18} The steps involved in Prototyping include:\textsuperscript{19}

1. **Identify Preliminary Requirements:** A technical specialist or analyst will work briefly with the business specialist to capture a basic solution model and information needs (sometimes both of these skills are incorporated in one individual). Several steps of solution design are consolidated into one iterative process.
2. **Develop Working Prototype**: A functional prototype will be created rapidly. It may consist of representative screens for the proposed system or an entire system containing partial data.

3. **Use the Prototype**: The end-user works with the prototype to see how well it meets his or her needs. The user is encouraged to make recommendations for improving the prototype.

4. **Revise and Enhance the Prototype**: On the basis of end-user recommendations, the technical specialist or analyst revises the prototype. The cycle then returns to step 2. Steps 2, 3, and 4 are repeated over and over again until the user is completely satisfied. The approved prototype furnishes the final specifications for the information system solution. Often the prototype itself becomes the final version of the system.

   Prototyping combines the four major phases of SDLC (analysis, design, construction, and implementation) into a single step that is repeated. A key criterion associated with Prototyping is the short intervals between iterations. Regular, active user involvement is critical with this process. If the users are not available to actively participate, the likelihood of failure increases dramatically.

   There are several key objectives behind active participation. The first is to solicit constructive feedback that enables the developer to tailor the system processes and content. The second is so that the dialogue between user and developer can be captured in a tangible tool, thereby closing the communication loop and ensuring that both parties are consistent in their direction and expectations. Thirdly, it moves the prototype towards "user ownership". As the user of the system shapes
the prototype, he/she will be more likely to adopt the system as his/her own.

Paller notes that a good barometer for commitment includes the number of times the EIS developer met with the sponsoring executive, number of specific suggestions the users contributed, number of times the user's hands ran the system during these meetings, and number of times the user employed the first person possessive (my, mine, our) to describe the system. Paller views these comments as leading indicators of the system's longer-term success.

Turban, however, recognizes a potential limitation of Prototyping. As the number of users for a given system increases, the communication links required to operate the iterative design process must become more formal and structured to meet the increased organizational complexity. It may be necessary to establish checkpoints to define the beginning of each usage-evaluation cycle. When a system has many users and is designed for organizational support, it must be integrated into the organization by formalizing some of the steps in the systems development process. In other words, it may become necessary to adopt some of the rigour of the SDLC as the project grows. Often this adaptation is referred to as Front-end Prototyping. In this approach, the user interface is developed using Prototyping but the system is actually developed using the SDLC methodology.

A final consideration deals with the number of applications and corresponding screens that will be required to support the information needs of the users. As the expected perspectives increase, so does the complexity of building the system. Although this is partially addressed by
the technology employed to build the system, the choice of development methodology also impacts the success of the deliverables.

According to Martin Lee -- EIS project manager at BC Hydro -- the application of Iterative Prototyping resulted in some problems for their EIS development team. The prototypes were of very high quality (winning international awards for design and content) with actual data and a full complement of application screens. Many of the users felt the applications were virtually complete. Because so many prototype applications were produced for a variety of users in such a short time frame, the user expectations -- in spite of many qualifications and warnings -- for production applications were unrealistically high. Implementing the production EIS applications which utilized new technology and involved complex PC/Mainframe connectivity was very difficult because there was inadequate technical support at the EIS workstation level, especially at remote locations. This combined with an absence of information technology standards across the company created a situation that was beyond the scope for the small EIS staff to handle.23

Although considerable success was realized in terms of number of applications being used, tangible benefits realized and acclaim received from external sources, the EIS at BC Hydro could not be sustained. Lack of support after the original sponsors left the company, technical support infrastructure deficiencies and an absence of information technology standards were primary reasons for the decline of the EIS at BC Hydro. As a consequence a broad based delivery of EIS became impractical and unrealistic. EIS at BC Hydro now consists of a few applications which are maintained by the EIS staff.
This paper will explore some of the other potential deficiencies of prototyping when it is contrasted to the EIS Chronology approach.

3. *End-User Application Development*

End-user computing is defined as the decentralization of control over computing resources to managers and the empowerment of knowledge workers to use and develop computer applications. In both cases, the participants work outside of the formal information systems departments but may be supported by "consultants" from the IS function. The Information Center (IC) is a formal organizational structure that provides education, assistance, and consulting to end-user computing with centralized support to users in exploiting information technology and systems.

End-user Application Development is the act of building these systems to support an end-user's needs. Knowledge workers can build systems that support single functions that they may need personally or at the other extreme, multi-functional systems that support organizational needs. The introduction of personal computers in the early 1980s and the advent of software that is designed for ease of use has provided the tools that enable knowledge workers to do just that.

The main advantage behind End-user Application Development is that these individuals presumably understand the business problems and do not need to relay the issues to systems professionals for programming. The goal is to remove the inefficiency of communication between business and systems analyst, freeing the latter to concentrate on the mainstream development backlog that typically occurs in IS departments. This can have a complementary impact of reducing the
waiting period for the project startup and reducing the direct cost. As with successful Prototyping, there is no surprise delivery when development is complete since the end-user is actively involved.

Martin et al (1991) note that organizations whose cultures value decentralization find it difficult to conform to the traditional model of centralized development. End-user Application Development fits nicely with the model where managers expect to have control of all the resources necessary to determine their bottom-line results.24

The final advantage offered by end-user developed applications is freedom from the rigid bureaucracy of traditional development such as SDLC. Often, end-user projects do not appear to warrant formal cost justification since they do not introduce any new, external personnel and the software cost -- especially when PC based -- can fall below capital approval thresholds. This flexibility facilitates experimentation since resource constraints are removed and cost benefit analysis is not formally required. This can offer a distinct advantage when many of the benefits are intangible -- such as better information for decision-making -- and difficult to quantify.

However, this same potential benefit can also lead to a potential cost. The freedom from controls can result in the misallocation of resources. Managers must realize the real and opportunity cost of shifting knowledge workers from their current activities to application development. The real cost consists of the salary and benefits for the affected worker(s) as well as the investment in their training. Redirecting this individual's energies may require an additional replacement worker or at least force a reduction in productivity on previously assigned tasks.
The project manager must evaluate whether this is an efficient allocation of the available human resources.

Moreover, end-users often develop applications where the usage is limited to their individual interaction. If the system is needed by others in the organization, it may fail to provide an interface that is intuitive. The same problems may make it difficult for a replacement worker to use. This results in a system that is only understood by the developer. A common example is a spreadsheet application that includes macros to automate the routine functions. The user-developer may think that "alt-p" is intuitive enough for personal recall of the printing function and fail to build a menuing structure to indicate this to other users. When the user-developer changes positions or companies, or worse yet, is "hit by a bus," the organization is left to unravel the mysteries contained in the application. Furthermore, these systems often omit important considerations such as audits, documentation, and backup.

Another major problem area associated with End-user Application Development can be the disregard for organizational standards. Naive end-users are more easily drawn to software that may fit their specific needs but deviates from the corporate norm. This can introduce problems of incompatibility that prevents further sharing of data or potential conflict of applications or hardware platforms. When technical problems arise and support is required, the IS professional may be unable to resolve the problems due to lack of understanding or familiarity with the technology. Obscure conflicts between competing software applications or operating system incompatibilities are generally more frequent when the technology has not been endorsed by IS.
Fortunately, there are techniques to minimize these potential pitfalls. One approach is to draw upon the resources offered by the IC, if available. The personnel in the IC can help steer the development away from some of these problems by offering guidelines for software selection and development approaches that balance structure and control with the appropriate level of flexibility. When no formal IC exists, an IS professional can be loaned to the end-user department on a part-time basis to act as a consulting adviser to the application developer.

The EIS project manager must also acknowledge who the end-users are -- individual executives or enterprise knowledge workers. Although a study conducted by Mittman and Moore indicated that some top executives like to build their own systems (using Lotus 1-2-3, for example), it is unlikely that an organization would want executives to spend valuable time developing systems for either themselves or their subordinates -- at least with current technology.

Of the three types of development methodologies identified so far, Gremillon and Pyburn (1983) suggest that there are two key factors that influence their application:

1. **Impact** - the degree to which the system will affect the company. How important is it to the company? How broad is its impact? What would be the impact if the system fails?

2. **Structure** - how well is the problem and its solution understood?

The flowchart approach in Figure 1 helps to influence which path to choose.
The purpose of discussing End-user Application Development is to acknowledge its increasing use and position its application. It is not a formal development methodology alternative as much as a development philosophy that should be considered. Often, the trial and error approach used by end-user developers resembles a Prototyping methodology.

A review of SDLC and Prototyping presents two solutions that offer opposing philosophies and strategies. This next section acknowledges some of the shortcomings of both SDLC and Prototyping and offers an
alternative approach that attempts to capture some of the strengths of each.

4. The EIS Chronology

While the EIS literature favours Prototyping over SDLC, Burkan explicitly identifies that Prototyping is not a panacea and warns of the potential pitfalls. The first problem he recognizes is that Prototyping is expected to "discover" the real problems as the process unfolds. Unfortunately, the expectation of fast development and delivery often leads the developer to turn to the most readily available information in the organization. By concentrating on delivering the prototype as quickly as possible, the developers often spend insufficient time on determining what should be included. The ensuing "enhancement mentality" results in perfecting the presentation of information that is not necessarily the most valuable available. Often, new categories of information outside of the current paper-based reporting environment are ignored.27

Burkan warns that the most electronically accessible and abundant data in any organization may not offer the value expected of a strategic EIS because its focus is historical and operational. This can result in presenting data such as financial, sales, and other operational indicators rather than offering the potential value (and associated risk) of softer, forward looking information typified by competitor analysis, employee suggestions, and customer feedback. Hard information may meet the needs of the firm's knowledge workers. However, for strategic executive information needs, he asserts that only the users' lowest level expectations are satisfied. They may be impressed with the technology but disappointed by the content.28
To achieve success many argue that the initial prototype must be "low cost." It must fall below the minimum threshold of capital outlays requiring special justification. The development of a prototype may be a risky decision ... because the benefits of an EIS are often intangible, relating to such issues as "improved decision making" or "better understanding," a high initial investment may result in a decision not to proceed.

Burkan cautions against the "start small" or "small is beautiful" slogans for a true executive information system. Burkan does recognize that the small EIS may be the appropriate solution when the needs call for little more than static reporting of information. However, the small pilot project approach has its limitations.

If one were to look at the back of the "Start small, fail small" banner, one would read "Start small, succeed small." A project that is limited in scope and functionality cannot hope to yield a big win.

To overcome these potential pitfalls, Burkan focuses on the preparation prior to actually building an EIS, an adaptation of the first three steps in SDLC. Rather than rushing to deliver a prototype, he insists on spending sufficient effort on cultivating the sponsors. Equally important is determining value-added content, setting objectives and developing a vision for the EIS. He proposes that the key to uncovering these hidden secrets can be found in a properly structured interview process (alternatives for this process are evaluated under the Structured Interview section). Finally, before actually beginning to build, a cohesive proposal must be presented and endorsed by the management team.

Burkan offers a more formalized methodology to deal with the potential traps of Prototyping. He also believes that the EIS project manager must take an active role in shaping the vision for the project.
Finally, he applies a *chronology* approach so that project managers consider the timing of the EIS implementation.

1. **Interview the Users**: The interview is the key to confirm or cultivate a sponsor for the project and identify their information needs. An indirect line of questioning is often the key to a successful interview process (see Appendix A for a sample list of indirect questions).

2. **Establish a Vision**: The EIS vision is designed to translate the objectives and benefits to a framework of an operational system. Furthermore, it identifies the nature of the information delivered and the demographics of the audience.

3. **Review the Functional Requirements**: This review identifies the scope and resource commitments for the project over the first six months during the important launch phase. It then looks beyond to the next three years to focus attention on the development and maintenance of the system.

4. **Create the EIS Proposal**: To secure intellectual, emotional and financial commitment for the project, an EIS proposal is essential. It also ensures that all parties' expectations are consistent and realistic. By sharing the master plan and highlighting the many benefits, much of the resistance to change can be defused.

5. **Derive the Technical Needs**: On the basis of the functional requirements and expected support, prioritize the technical needs. Understand your organization's needs, strengths and weaknesses. Review your short and longer term functional requirements. At all stages, avoid features checklists to rate the alternatives. It is preferable to test the fit of the solution to real problems.
6. **Evaluate the Technology Options:** Focus on the immediate and also plan for longer term needs. Select the development philosophy your organization will employ (i.e., a small prototype with complete data versus large prototype with partial data, etc.). This is critical because most firms implicitly evaluate technologies by Prototyping the solution to selected problems.

7. **Build the System:** Manage executive expectations through controlled, planned growth. Return to the functional requirements to confirm the capabilities. Build according to a set of functional guidelines employing Prototyping techniques where appropriate.

   This approach is much stricter than pure Prototyping because more planning steps occur first and each subsequent step depends on information gathered to date. However, it is not as structured as the SDLC methodology. Burkan stresses the importance of an established vision agreed to by all parties that looks to the short-term (less than six months) and longer-term (up to three years) time frame. A formal EIS proposal is essential in confirming the vision and plan. It is also an essential step to initiate support and close the communication loop between developers and users. In part, he recognizes the virtues of both SDLC and Prototyping and attempts to apply the strengths of each approach to develop a hybrid process.

   Figure 2 compares the three main methodologies. Since there is no theoretical development framework for End-user Application Development, it is omitted. End-user Application Development is more of a philosophy rather than a structured methodology; often the user applies a 'common-sense' approach that usually includes trial and error
technique akin to Prototyping and usually omits the control and rigour of SDLC.

**Figure 2: Comparison of SDLC, Prototyping, and Chronology Methodologies**

<table>
<thead>
<tr>
<th>SDLC</th>
<th>Prototyping</th>
<th>Chronology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Problem Definition</td>
<td>Identify Preliminary Requirements</td>
<td>1. Interview the Users</td>
</tr>
<tr>
<td>2. Systems Study</td>
<td>Develop Working Prototype</td>
<td>2. Establish the Vision</td>
</tr>
<tr>
<td>3. Design</td>
<td>Use Prototype</td>
<td>3. Review the Functional Requirements</td>
</tr>
<tr>
<td></td>
<td>Prototype Acceptable? No</td>
<td>4. Create the EIS Proposal</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>5. Derive the Technical Needs</td>
</tr>
<tr>
<td></td>
<td>Develop Final Prototype</td>
<td>6. Evaluate the Technology Options</td>
</tr>
<tr>
<td></td>
<td>Develop Production Version</td>
<td></td>
</tr>
<tr>
<td>4. Programming</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Installation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Post implementation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Since the Chronology approach demands some of the "up-front" work characterized by SDLC and then hopes to quickly implement the findings with careful application of Prototyping, this approach is more
time-consuming than simply Prototyping alone. The expectation is to yield improved value and overall benefits.

A relevant Harvard Business School case study chronicles Frito-Lay Inc.'s "Information Revolution". Senior management’s vision necessitated providing access to critical decision making information to all key personnel. This started with the "top 200" decision makers as the first phase in 1988. However, the development and management team had planned for expansion to support a concept that they termed "directed decentralization"; workers were empowered with the information and authority to make decisions and management directed this process by remote monitoring of actions. Today, over 600 decision makers and more than 10,000 route salespeople have access to the corporate database of information on which to base their decisions.\(^{34}\)

This was accomplished successfully because the development team employed techniques akin to the Chronology approach. Prototyping alone would not have provided the foresight, organization and structure to support this massive undertaking. A strict SDLC approach would have difficulty determining the information requirements and the bureaucracy would have delayed the project implementation.

**C. Development Methodology and Project Life Cycle**

In 1974 Gibson and Nolan proposed their stages of growth framework for viewing the progress of data processing within a company. Much like any product, the application of IT evolves through a life cycle with the following broad stages:\(^{35}\)
1. **Initiation** - the new technology is introduced and a few pilot applications are tested. If deemed successful, use of the technology is encouraged.

2. **Contagion** - use of the technology explodes, often without prudent evaluation of the costs and benefits.

3. **Control** - senior management recognizes the explosive growth and accompanying costs. Procedures are implemented to control development, often stifling innovation.

4. **Maturity** - managers and users understand the capabilities of the technology and apply cost-benefit analysis where possible.

   Awareness of this life cycle may be valuable for the EIS project manager for two reasons. Firstly, it may assist in avoiding the negative repercussions identified in stages 2 & 3. Uncontrolled explosion can ultimately damage the long-term success of a project. Reaction to cost overruns can lead to control measures that can inhibit long-term success. Secondly, it may provide relevance to recognize that EIS development is "a journey rather than a destination" that might require adopting different techniques (or fine tuning of common methodologies) to recognize the different phases of the process.

**D. Determining the Information Requirements**

The traditional SDLC methodology involves the fundamental assumption that the information requirements of a system can be predetermined. Information requirements definition (IRD) is a formalized component of SDLC. Traditionally, IRD is determined by combining logical analysis with investigations of user information processing behavior.\(^{36}\)
Where the requirements cannot be predetermined it may be useful to separate the development methodology from the IRD technique. In this flexible approach, the benefits of the development methodology can be combined with the features of the selected IRD technique for the problem(s) to be addressed.

Wetherbe separates several solutions to determining information requirements for an EIS that help formulate the best choice of technique. In addition to acknowledging the role of Prototyping, he argues the need for joint application design (JAD), structured interviews, and cross-functionally designed systems. This section will review four IRD methodologies and position the roles of structured interviews and JAD within these alternatives.

Table 1 summarizes the four methodologies.

**Table 1: Information Requirements Definition Methodologies**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Details</th>
<th>Developers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Systems Planning</td>
<td>Specify problems and decisions</td>
<td>IBM</td>
</tr>
<tr>
<td>Ends/Means Analysis</td>
<td>Specify effectiveness criteria for outputs and efficiency criteria for processes used to generate outputs</td>
<td>Wetherbe and Davis</td>
</tr>
<tr>
<td>Critical Success Analysis</td>
<td>Specify critical factors</td>
<td>Rockart</td>
</tr>
<tr>
<td>Strategic Business Objectives</td>
<td>Support organization's strategic business objectives</td>
<td>Volonino and Watson</td>
</tr>
</tbody>
</table>


A brief description of each methodology and its application follows.

The goals of the Business Systems Planning (BSP) process are designed to answer the following questions:38

i. What are the major problems encountered in accomplishing the purposes of the organizational unit you manage?

ii. What are good solutions to those problems?

iii. How can information play a role in any of those solutions?

iv. What are the major decisions associated with your management responsibilities?

v. What improvements in information could result in better decisions?

BSP is a method of information requirements determination that assumes business processes are the basis for information systems support.39 Business processes are groups of decisions required to manage organizational resources. Therefore, this suggests that this technique targets the information required to satisfy the problems and decisions of individuals or managers of business units, generally dealing with operational rather than strategic issues.

2. Ends/Means Analysis (Source: Wetherbe, 1988)

The goals of Ends/Means (E/M) Analysis are characterized by the following questions:40

i. What is the end or good or service provided by the business process?

ii. What makes these goods or services effective to recipients or customers?

iii. What information is needed to evaluate that effectiveness?
iv. What are the key means of processes used to generate or provide goods or services?

v. What constitutes efficiency in the providing of these goods or services?

vi. What information is needed to evaluate that efficiency?

E/M Analysis is another process based analysis technique. Recognizing the steps to achieve the final deliverable focuses attention on improving overall efficiency and productivity. This technique best serves a group of users who are related through one or more specific processes that they share in an organization. As such, it can target the individual managers of value activities in the chain and the entire value chain (and organization). Again, this technique generally deals with operational rather than strategic issues.

3. Critical Success Analysis (Source: Rockart, 1979)

Critical Success Analysis (CSA) attempts to answer the following direct questions with more innovative indirect questions (refer to Appendix A for examples):[41]

i. What are the critical success factors of the organizational unit you manage?

ii. What information [key performance indicators] is needed to ensure that critical success factors are under control?

CSA involves utilization of significant decisions to derive information requirements. The Critical Success Factors (CSF) approach derives information requirements by asking users to identify the factors that are critical to the success of performing their jobs or achieving organizational success.[42] CSA can be applied to meet individual and organizational needs by adjusting the focus of the CSFs to:[43]
1. **Industry Level:** Relevant to any company within a particular industry and are determined by the characteristics of the industry itself (e.g., total industry sales).

2. **Company Level:** Important to the firm's ability to compete within its industry (e.g., company market share).

3. **Work Unit Level:** Relate to a given business unit with the organization. The business unit can be a division, department, or smaller group (e.g., minimize production costs).

4. **Individual Level:** Important to individuals in carrying out job responsibilities (e.g., completing a project on-time and on-budget).

   By focusing on answering the question of "What must go right for the business to flourish," critical success analysis can cover both operational and strategic issues for individuals and organizations.

   With all four approaches, an indirect line of questioning can be more effective at determining the user's needs. The examples in Appendix A apply to CSA, but a similar approach can be applied to any of the techniques.

4. **Strategic Business Objectives (Source: Volonino and Watson, 1990)**

   The goals of the Strategic Business Objectives (SBO) method are characterized by the following questions:\(^{44}\)

   i. What are the organization's strategic business objectives?

   ii. What business processes are critical to achieving the strategic business objectives?

   iii. What are the priorities of the strategic business objectives?

   iv. What is the information necessary to support the critical business processes supporting the strategic business objectives?
v. What are the linkages among the business processes identified?

The SBO approach is based on strategy set formulation. This is a method by which information requirements are developed using the strategic objectives of the organization.\(^{45}\) This approach supports the structuring of information to meet the information needs of the organization rather than an individual. As the title SBO implies, it focuses on strategic issues, although operational process may be recognized as a sub-component necessary to achieve a desired strategy.

The alternative techniques are diagrammed in Figure 3.

**Figure 3: IRD Alternatives**

![Diagram of IRD Alternatives](Diagram)


From the literature, it seems that the selection of the IRD methodology will depend on who the audience is and what the goals
(functionality) of the system are. Depending on whether the system is designed to meet individual's needs or a broader group of users and whether the focus is on procedure or a problem or opportunity will influence which techniques the EIS project manager draws most heavily from.

Once the IRD methodology is selected, the EIS project manager must decide whether to administer the questions as individual structured interviews or as a group design process (JAD). The next section explores the appropriateness of each approach.

The Structured Interview

Determining user information requirements is not as simple as asking "What information do you need from the new system?" Instead, an indirect line of questioning can be much more effective in uncovering the direct objectives of each IRD methodology (see Appendix A for a representative list of indirect questions). The EIS project manager can test various lines of questioning on the EIS development team and surrogates of the interviewee (secretaries, assistants) prior to a structured interview to see which approach fits the audience and system's goals. There is no rule that dictates that the interviewer cannot draw from the different IRD methodologies to meet the overall needs.

Structured interviews require thorough preparation. When the system is designed to capture the needs of a broad group of users, this approach can be time consuming. Since structured interviews are performed individually they tend to focus attention on the needs of single employees rather than groups of employees (i.e., business units, departments, etc.). For larger group systems, most of the information
needed to improve the decision making within a function will come from outside the function. When an organization learns to share information cross-functionally, employees are empowered to make better and more productive decisions for the organization. This supports Peter’s notion of lateral rather than vertical decision making. The fundamental premise is that in order to develop a new information system, it is necessary to be aware of all functions that are touched by the information system and be sensitive to their decision-making requirements. When the audience is a broad group of users or comprised of individuals leading business units that need to interact, the process should consider cross-functional needs.

Joint Application Design

A widely used technique that incorporates cross-functional needs is known as Joint Application Design (JAD). With this technique, users of the system work with developers to design the system. In this process, users are interviewed as a group instead of individually. Individual interviews can place cognitive stresses on a manager that hinders his or her ability to respond adequately. This can result in selective recall where managers mention things they need recently rather than everything they need. To combat this effect, JAD facilitates pooled memory recall thereby reducing the fading effect created by time lapse. JAD can help overcome the differing agendas of the various functional areas of an organization.

With traditional SDLC, JAD can include the Problem Definition, Systems Study, and Design phases. Typically, the developers then take a set of specifications agreed to by the users and program the system. Unfortunately, the finished solution can differ from user expectations.
Another option is to combine Prototyping with JAD so that the users can visualize the finished system at several steps during the process.

JAD is useful when the EIS is targeting enterprise information needs and the users are available to participate in the process. However, as with cross-functional systems, when the goals of the organizational unit are independent of the other functional areas, it may be inappropriate. Certain EISs may be focused on a single issue or an individual executive. Sometimes business units are directed to compete with external suppliers (and potential competitors) for internal business. In this case, sensitivity to cross-functional considerations may not be relevant.

JAD has other drawbacks. JAD can re-introduce some of the problems of group behavior and group-think. Removing anonymity can be problematic, especially when executives are involved with the group. Participants may conform to their superior's ideas, or introduce destructive conflict and miscommunication.

Therefore, cross-functional systems and JAD should not be applied indiscriminately. Instead, they should be considered in the context of the vision developed for the system.
Chapter III
Research Methodology

Given the subjective, qualitative nature of this field of study, it is difficult to conduct a formal experiment. Instead, a panel of experts was assembled that included recognized authorities from the academic community, authors and editors of texts specializing in EIS, experienced practitioners, EIS project managers from several organizations, consultants specializing in EIS development, and finally, executives from some of the leading vendors of EIS technology. A list of participants and their credentials is detailed in the first Results section.

The expert panelists were requested to develop a set of questions to precede the development phase of an EIS. A sample letter introducing the goals and expectations of deliverables is presented in Appendix C. The primary objective of the questions was to help the EIS project manager formulate a strategy to implement a system. Enclosed with this letter was an early draft copy of the thesis and a set of twenty questions and their interpretation formulated by the author. Several of the questions were adapted or extracted from the literature review while others were developed by the author. These questions were approved by the senior supervisor. A listing of the original questions is presented in Appendix D.

During introductory telephone conversations or electronic mail correspondence, the author requested that the expert panelist focus on the preliminary set of questions identified in Appendix D. Emphasis was placed on presenting these questions to elicit discussion designed to address some of the inconsistencies identified in the literature. The expert panelist could remove a question if it was deemed irrelevant, tailor
or alter a question and its interpretation, or add completely new questions and their interpretations. The revised sets of questions are presented in the Results sections of the thesis.

Following this exercise, if time permitted, the expert panelists were invited to comment on the draft contents of the thesis. The draft accompanied the preliminary set of questions in case clarification of one of the questions was required. In the draft, the questions were also inserted throughout the body so that they were aligned with content.

Expert panelists responded by editing the original appendix of questions and the draft thesis, then presenting their findings in writing or during telephone interviews. A summary of the submissions is presented in the Results section.
Chapter IV
Results

This section presents the findings submitted by the expert panelists by dividing their responses into four sections. The first -- The Panelists -- includes a biography of their qualifications in the field of EIS and their perspectives on the topic. Any unique material outside of addressing the three research questions and the original twenty questions presented in Appendix D is also included. The panelists are ordered alphabetically.

The second section -- EIS Definition -- details the comments from the responses to questions relating to the first research question:
*What does the acronym, EIS, mean to an organization?*

The third section -- Selection of Development Methodology -- details the comments from the responses to questions relating to the central research question:
*What type of development methodology will produce the optimal results?*

The final section -- Selection of IRD Methodology -- details the comments from the responses to questions relating to the third research question:
*How does one determine what type of information to include in the system?*
1. The Panelists

Paul Barber

Paul Barber is Executive Vice President of EPS Software Consultants, a Canadian agent for Pilot Software and vendor of consulting services. He obtained an MA in Mathematics from Cambridge University and has worked in the computer industry for over twenty years. Since 1981, Mr. Barber has specialized in Decision Support (DSS) and Executive Information Systems. Within these areas, he has a wide range of experience in the practical development of applications, typically in large corporations and government departments. Mr. Barber is a frequent speaker at conferences and contributes to publications concerning DSS, EIS and industry trends.

Mr. Barber presented ten questions with some interpretation that he uses in organizations considering EIS (please refer to Appendix E). They addressed a variety of issues including whether technology was pushing the project, organizational implications and issues related to data ownership and location.

Mason W. Brown

Mason Brown is the President and Chief Operating Officer of American Information Systems, Inc., vendor and developer of RediMaster, a PC/LAN based EIS. Mr. Brown has been instrumental in fostering much of the growth in Executive Information Systems at AIS and has been very active in managing the product design and development of RediMaster. He was also an early adopter and leading proponent of the
"open" approach to EIS that enables organizations to implement EIS and push-button delivery solutions using most of the hardware and software they already own, and the in-house personnel who know how to use it. Focusing on this approach, Mr. Brown has assisted more than 100 organizations, including the US. Postal Service, Marriott Corporation and the US. Marine Corps, in overcoming the hurdles associated with the implementation of IBM PC and LAN based EIS systems. One of these applications was successfully utilized as an information delivery system by the 2nd Marine Aircraft Wing in their Desert Storm operations.

Mr. Brown received top honors in the management program at Susquehanna University. While there his academic exploits were covered in the Wall Street Journal. He is an effective speaker on EIS related topics and was invited to chair the tutorial instruction session entitled "How to Build an EIS Prototype on an IBM PC" at the National Conference for Executive information Systems. Mr. Brown was also a featured speaker on EIS at COMDEX, Computer Graphics '91, and most recently at FOSE in Washington, DC.

As a vendor and consulting organization in the field of EIS, AIS presents a list of questions for prospective EIS Directors and Designers to think about (please refer to Appendix E). Mr. Brown also sent these observations:

One of the toughest challenges for anyone thinking about implementing an Executive information System (now often called Visual information Systems or information delivery Systems) is just plain getting started. Who do I talk to? Where do I go? What do I need to learn?

While I continue to encourage a very proactive "do it now approach", I do not encourage a leap then look mentality. Experience shows that it usually does not pay to spend months on requirements analysis and executive
Interviews. It's best to use a managed Prototype approach that provides a low risk, high return plan of attack.

Wayne Burkan

Wayne Burkan is President of Alternative Visions, Inc. and has spent the last seven years speaking, writing, and consulting on executive computing. He conducts seminars on EIS for the Technology Transfer Institute in the U.S. and for Frost and Sullivan in Europe. During his career, Mr. Burkan has served as Director of Financial Planning at American Motors, Director of Strategic Business Development at Uniroyal Chemical, and as a consultant in decision support, end-user computing, and executive computing at Comshare Inc. Mr. Burkan is author of Executive Information Systems: From Proposal Through Implementation.

Mr. Burkan believes that the EIS project manager must first establish a vision for the system. This implies a proactive approach where the project manager directs the development of the system rather than passively following the direction of the users. The first question that the vision must answer is "What is the organization trying to accomplish?" This leads to another question, "Where do you [as the project manager] want sponsorship to come from [to support the vision]?

The result is a natural decision tree where one branch leads down an executive path while another follows the enterprise route.

Mr. Burkan warns that this is contrary to most vendor initiated EISs where the main goal is to sell system software. He contends that the easiest path to achieve their goal is to offer a low-cost Prototyping methodology. However, this approach may fail to address the important implementation issues that will impact the lasting value of the system.
Mr. DeLong is a Research Fellow at Ernst & Young's Center for Information Technology and Strategy. He is a former Research Associate at Harvard and the MIT Center for Information Systems Research. Mr. DeLong has been involved with extensive research on the implementation and impacts of executive support systems. He is co-author (with John Rockart) on the pioneering text Executive Support Systems - The Emergence of Top Management Computer Use. He is a widely published writer whose work has appeared in industry journals and magazines.

During a telephone conversation, Mr. DeLong shared his thoughts on the importance of each of the questions detailed in Appendix D, tailoring the interpretation to his field of research -- organizational issues and politics. In addition, Mr. DeLong emphasized the importance of data access, especially with respect to the impact that executive sponsors can have on removing potential barriers to data access. Data access was repeated as a long-term key to the success of any EIS.

Mr. DeLong agreed with the majority of the questions presented. He also added a question:

*Is your organization driven by software [technology] or by a user group [and their problems]?

This question is designed to recognize how the company assesses new IT. Does it survey the environment discovering new IT and then look for a problem? Or does it focus on a problem or issue and then survey the environment to apply technology to the solution? He indicated that the latter approach is more effective.
Gary Guthrie

Gary Guthrie is a Partner with Guthrie, Phillips & Associates, a firm specializing in providing EIS consulting services and software to organizations. Prior to forming this business, Mr. Guthrie was a Chartered Accountant with Peat Marwick Stevenson & Kellogg. As an industry consultant and vendor of an EIS software product - BMP Compuscience - Mr. Guthrie is also familiar with many other EIS software tools. Mr. Guthrie has developed and implemented a full function, comprehensive PC-based EIS, working closely with a CEO. In his written response, Mr. Guthrie commented:

I think that it's important [that one] emphasize the difference between Executive and Enterprise systems (I'm using EIS to mean Executive for my comments) because although there is a certain amount of semantics involved here, it's critical the project manager knows exactly what he's/she's dealing with before starting. The development approach can be quite different and [one] might emphasize this by constructing questions to follow two different streams.

The questions that I would ask are similar [to those detailed in Appendix D] ... but maybe with a slightly different focus. Again, I'm coming at this from the executive's point of view and I would want to focus my questions more directly at them. They are the user and must be the force behind the development of the EIS.

EIS is a unique beast, in part because those for whom it is designed [executives] are also unique. Executives are different and their needs are always changing. Many are computer illiterate and most are too busy to stop and really change the way they do things. This is the major problem for EIS developers. There are lots of technologies and powerful tools to solve all sorts of problems but unless the executives are really going to use the stuff, it's of little value. Often it's the unused Executive Information System that becomes the Enterprise Information System.
Mr. Kellet is currently Director for Comshare's Northwest Region (The Pacific Northwest States and Western Canadian Provinces). Mr. Kellett has held a variety of positions in Comshare over the last 20 years from technical support and implementation consulting to marketing, sales and management positions. Prior to joining Comshare in 1973 as a Planning Specialist, his work experience included the Life Insurance and University environments. He has built DSS and management reporting applications for clients such as Xerox Canada and Canada Development Corporation. Mr. Kellett has lectured to MBA and undergraduate classes on EIS and Management Information Delivery at a variety of institutions.

Mr. Kellett presented a written response with the following comments:

In general, I agree with the thesis in terms of its approach and content. ... Comshare has adopted a term to describe our recommended development approach for EIS -- "Proto-cycling". While this is essentially the Prototyping methodology you describe, we feel that the specific term "Proto-cycling" helps to reinforce the concept that an EIS, an Executive Support System, and a Management Support System are evolutionary systems and hence the development cycle should continue -- i.e., one doesn't get to "maintenance mode" but must stay flexible. The main characteristic of a "Proto-cycling" development [methodology] is centred on getting an early prototype in the hands of users and continuing to refresh it and evolve it frequently.

[I refer to] a paper extracted from the ITAC study titled "Building a Knowledge-Based Canada: Lessons from 15 Leaders" that describes the background and development of an EIS at Correctional Services of Canada. This project was developed using this approach and achieved wide penetration very quickly with good success. [The study also ties the development success and its rapid growth] to the decision to make all information available without restrictions -- therefore all the managers and executives needed to access it to know what was being said about their area of control.
The other general comment that I would like to make is that I believe that there is a strong negative correlation between the overall project scope and probability of success. Usually the EISs that start out big in scope or buy-in (e.g., BC Tel and BC Hydro) end up to be the ones that [fade over time] -- usually because of slow delivery and the creation of an "EIS development team". The most successful implementations that I have seen have started small, been very directed at a specific business issue, and grown from there by evolution.

Martin Lee

Martin Lee is a Chartered Accountant who has worked in the Finance & Administration Group of BC Hydro for the past 13 years. Mr. Lee has accumulated considerable financial management and accounting expertise while managing accounting research, budgeting, and corporate financial and management reporting functions for the company. In 1988, he was appointed Manager of Corporate Financial Systems, a department of professional accountants and business analysts with strong information technology skills, to oversee the development of end-user applications and the Executive Information System for BC Hydro.

Corporate Financial Systems was responsible for the development and maintenance of the BC Hydro EIS from 1988 until 1992 when the project's scope was reduced from a company wide system to a localized system.

Mr. Lee responded with comments throughout both the body of the draft thesis and Appendix D. This was supplemented by a 90 minute interview where he clarified his written points. Mr. Lee noted that he had recently finished Tom Peter's latest book -- Liberation Management: Necessary Disorganization for the Nanosecond Nineties -- and that he believed many of the points it contained applied to the field of EIS. In particular, Mr. Lee acknowledged the book's emphasis on flattening
organizational structures and truly empowering knowledge workers with lateral decision-making authority rather than relying on a traditional vertical chain of command. Furthermore, he believed Peter's notion of *fashion* could apply to information delivery. As a result, Mr. Lee now considers EIS to mean tailored information delivered to decision-makers, not Executive or Enterprise information systems.

Mr. Lee also responded to the quotation in the Introduction section of the thesis where Alexander Giacco, president and CEO of Hercules Inc. summarizes some of the issues surrounding EIS. Giacco states:

... Information becomes the key to success only with management and information systems that causes information to flow up to top management where we can make decisions ... and where we can effectively communicate back down so our decisions can quickly be put into action.

Mr. Lee argued:

If decisions depend on information going up and then back down the [competitive] edge is lost [because too much time is spent]. The key is to provide timely and accurate information across the enterprise so that more decisions can be made at the operating level. Therefore, the real need is for tailored information systems, [not generic enterprise information systems].

*Brian Petersmeyer*

Brian Petersmeyer is Manager of Corporate Information Systems at Cominco Mines Inc. During his employment with Cominco since 1966, he has held a wide variety of line and staff positions, giving him a broad background and business understanding of the company. His earliest involvement with EIS began in 1984 by providing a mainframe reporting and graphics system to a vice-president at a mine location.

In 1989, the current EIS sponsor, vice-president, Finance assisted in the definition of a LAN-based EIS. The original group of 20 corporate
personnel has expanded to 80 and will grow to include virtually all employees in the Vancouver office.

Mr. Petersmeyers added the following two questions to the original list presented in Appendix D:

**How will you measure the success level of your EIS?**

I am often asked how we measure success of the EIS. More specifically I am asked questions such as: "How much time per day does each executive spend on the EIS?"

This type of question is very hard to answer. Some questioners are surprised that we do not have any means to measure the length of time an individual uses the system. I would not entertain measuring this.

**When will you know that the EIS is completed?**

If it is going to be successful it will never be completed. A completed EIS is a dead EIS. It would be very unusual to have conditions that would allow you to say that the EIS is stable and finished. Changing business pressures, changing internal appointments, changing technologies, changing skill levels of employees and changing application breakthroughs by vendors will constantly provide you with opportunities for additions, changes and deletions of applications within your EIS suite.

I believe that it is important to have selected EIS tools and applications that will foster rapid development or change and requires a low level of support effort within your organization.

*James Suttie*

James Suttie is president of J.W. Suttie & Associates. With over twenty years of experience in the Information Systems field, Mr. Suttie has a broad awareness of the business implications of information technology. He has proven skills in achieving goals such as improved productivity, reduced costs, enhanced competitive position and better customer service through the prudent application of technology.
A Graduate of McMaster University in Chemical Engineering, Mr. Suttie has extensive managerial experience in a variety of industries. As Director of Information Services at both Gulf Canada and Noranda Mines Ltd., he introduced a business-driven mandate to information systems. His initial business experience at IBM Canada in marketing and product management provided a solid foundation in business systems.

In his capacity as director of IS, he initiated the development of an information system for the executives at Noranda and Gulf Canada Resources Ltd. He has based his career in IS on a philosophy that stresses the successful introduction of change by balancing four major factors:

- **People** - the individuals in an organization, their background, training and skills
- **Structure** - how a company is organized (e.g., centralized or decentralized)
- **Culture** - the attitudes and values that typify a company
- **Process** - how a company does business; methods, automated systems and business practices

Mr. Suttie believes that many firms focus on the technology (part of process) and neglect the other important issues of structure, people and culture. He believes that the development of an EIS must take a balanced approach to achieve a productive result.

Mr. Suttie added the following questions:

*What value will the EIS bring to the organization?*

The EIS project manager should develop a business case -- to justify the project. -- as if he/she were the major shareholder.
What organizational, structural and cultural changes will the EIS, if successful, cause?

If the answer is none, it is likely that the EIS will not be successful.

Dr. Hugh Watson

Dr. Hugh Watson holds the C. Herman and Mary Virginia Terry Chair of Business Administrations and is Director of MIS Programs at The University of Georgia. His lecturing, research, and consulting focus on the use of computers to support decision making. Dr. Watson has addressed a variety of professional groups and university-sponsored executive development programs and consulted with leading Fortune 500 companies. Dr. Watson is the author of 19 books, including Executive Information Systems, and over 100 articles in journals. He is currently serving on the editorial boards of five journals. His description of the executive information system at Lockheed-Georgia was an award winner in the SIM application competition in 1986 and he is widely recognized as a leading EIS expert. Dr. Watson is on the faculty of the EIS Institute. He is the Consulting editor for John Wiley & Sons' Computing and Information Processing series.

Dr. Watson commented in his written response:

I have a hard time seeing End-user Application Development as being viable with EIS. True, a user might use an EIS tool as an interface to an application, but that is not an EIS, even with a loose definition of EIS.

Your description of the relationship of the stages of growth framework to EIS development is a little off base. There may be appropriate states that describe the evolution of an EIS over many years but your description seems to apply it to the initial version of the systems, which is not appropriate.
Doug Wood

Doug Wood is Senior Consultant, The Alexandra Projects. Mr. Wood has been involved in many EIS and related DSS projects for over 11 years. He led the feasibility, planning, design and implementation phases of a multi-year EIS at the B.C. Telephone Group of Companies and participated at various levels with EIS management and development at Nova Corporation, the Insurance Commission of B.C. and B.C. Hydro. Mr. Wood also conducted an EIS technology assessment study for Supply and Services Canada in Ottawa. The study examined six EIS vendors and provided an assessment of short and medium term EIS industry directions.

Mr. Wood developed a two day EIS course, encompassing all phases of EIS, management, technical, and cultural issues. He has delivered numerous seminars and presentations on EIS including lecturing at the University of B.C., Simon Fraser University, and the B.C. Institute of Technology.

Mr. Wood provided the following comments:

In general, I am biased towards the chronology approach to EIS. I feel that the traditional SDLC methodology is becoming more and more obsolete throughout application development circles, not just EIS, because:

- Its long cycle
- Users having to sign off on a 'paper' design, which is a poor communication vehicle at best
- The cost of correcting errors discovered in user acceptance testing (the first time they are exposed to the 'real' interface)

On the other hand, Prototyping is not an effective methodology either. This is because it is not supposed to be a system development approach in itself. It is merely another
(more effective) tool with which to determine user requirements.

The Chronology approach seems to recognize that Prototyping must be done in a broader system development context, and that an overall scope, architecture, and vision are needed to manage expectations and growth.

It seems to me that the build step (Step 7 of the Chronology approach) is likely to be executed in parallel for several different areas of the EIS, depending on how 'big' it is. This is to say, that you would prototype individual pieces of the EIS separately. I also feel that steps 3 and 4 (review functional requirements and create EIS proposal) would be done iteratively, as your EIS grows and changes. It is very important to ensure that your methodology supports continuous growth and enhancement, both in the traditional EISs for executives and the enterprise information systems. This is because the business environment and drivers change. The development methodology must address this ongoing change aspect.

Summary of the Panelists

From the panelists submissions, it is apparent that there are two camps. The majority suggested that the scale of the first phase be minimized to reduce the risk of failure. This same group recognize Prototyping as a criterion for success. A second camp, including Burkan, Suttie, and Wood, endorsed a more thorough review up front with an established vision. This approach necessitates a larger resource commitment in the earlier phases of the project.

Many panelists agreed that it is important that the EIS focus on solving a problem or identifying an opportunity and not be technology-driven. Furthermore, many noted that EIS is an ongoing process -- "a journey rather than a destination" -- that will never be completed. This differentiates EIS from other systems.
2. EIS Definition

The information associated with the first research question:

*What does the acronym, EIS, mean to an organization?*

relates to questions 1, 2, and 3 from Appendix D and additional comments supplied by the expert panel.

1. *Evaluate your audience -- is it comprised of individual executives or the enterprise?*

2. *Do you anticipate that "sponsorship" from the senior executives will drive the project (top-down) or will it come from grassroots support (bottom-up).*

3. *What vision do you have for the EIS?*

Table 2 summarizes some of the key comments from the panelists.

**Table 2: Panelist Summary of EIS Definition**

<table>
<thead>
<tr>
<th>Panelist</th>
<th>Comment</th>
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<tbody>
<tr>
<td>Brown</td>
<td>Have users define EIS in their own words.</td>
</tr>
<tr>
<td>Burkan</td>
<td>What vision does the EIS project manager have for the system? Proactively select the audience and functional requirements to match the vision.</td>
</tr>
<tr>
<td>DeLong</td>
<td>Recognize that the vision will evolve over time.</td>
</tr>
<tr>
<td>DeLong</td>
<td>Clarifying the definition of EIS can help the EIS project manager anticipate political ramifications, especially potential resistance.</td>
</tr>
<tr>
<td>Guthrie</td>
<td>Develop a clear focus on defining the users and their needs.</td>
</tr>
<tr>
<td>Kellett</td>
<td>Regardless of the user definition, make all information available without restrictions.</td>
</tr>
<tr>
<td>Lee</td>
<td>Define EIS by where the support originates and determine whether this is a &quot;pull&quot; or &quot;push&quot; group.</td>
</tr>
<tr>
<td>Wood</td>
<td>Acknowledge the type of sponsor (e.g., leader, technophile, political) to help define the system.</td>
</tr>
</tbody>
</table>
Mr. Barber wanted to know whether the users actually need an EIS or simply a query tool; this differentiation may define the true role of EIS. Later, this distinction has significant implications on the selection of technology and development approach. With a query tool, a structured development methodology is suggested.

Mr. Brown suggests that both the developers and users actually define EIS in their own words. Then the EIS project manager should evaluate whether there are any discrepancies and alter his or her approach to meet the user's needs. Prototyping would be a useful technique to visualize the definition. He also suggests that the EIS project manager explicitly identify who the intended end-users of the system are.

Mr. Burkan takes a different approach on defining the "what" in the definition of EIS. He stresses that the first question that the EIS project manager should ask is "What vision do you [the EIS project manager] have for the EIS?" This implies that the project manager must proactively shape the project, including goals and audience. From the active identification of goals for the system, the EIS project manager can direct attention towards cultivating executive or enterprise based support to realize the objectives.

Mr. DeLong rephrased the introductory question from the enterprise to a broader group of people? He considered this to be a critical question, but more for organizational and political ramifications than for the impact on development methodology.

He left question 2 intact and acknowledged it as important because of the dynamics of developing an EIS.

He rephrased question 3 to:
What initial vision do you and the target users have for the EIS?

This question, and the changes to the wording were considered very important because the vision will change over time. If this is not the case, Mr. DeLong asserted that the system in question is not a true EIS but probably something akin to an accounting system; closed and not boundary spanning.

Mr. Guthrie suggested focusing the "audience" questions more clearly by including:

Who is the executive?

What are his/her requirements?

What problem(s) (one maybe two at most to start) do they want to solve?

Mr. Guthrie reiterated that he is coming at this from the executive’s point of view and would want to focus the questions more directly at them. They are the user and must be the force behind the development of the EIS.

Mr. Guthrie acknowledged the debate over whether a grassroots supported system will be easily accepted by executives and he questioned whether a system developed from the bottom up is an EIS or "something else"? Regardless of the origin of support, the vision needs to be that of the users leading to the question:

What do the users want the EIS to be?

Mr. Guthrie states that it is too easy for project managers to make assumptions and then produce something that no one wants. The EIS has to link to the executives' objectives. Typically this means designing a system that addresses the corporate objectives (another reason not to have a grassroots option). It is important to keep the developer focused
on one or two problems at first. If they keep it simple they have a better chance of meeting the executive's expectations.

Mr. Kellett comments that regardless of whether an EIS targets executives or knowledge workers, the probability of success can be increased by making all information available without restrictions. This encourages support throughout the organization since many individuals ultimately need to access it to know what is being said about their area of control. In this way, it becomes an intrinsic component of the organizational process and culture.

Mr. Lee noted that the sponsorship concept identified in question 2 may be confusing because question 1 identifies the users (audience) for the system. A more useful distinction may be derived by determining where the source for the project support originates. The question would be redefined to:

*Where does the support for the EIS originate?*

The system may be demanded (pulled) by one or more executives. Early adopters of EIS were often executive-pull systems. Alternatively, an increasing number are being pushed forward by the MIS department or functional user groups for a variety of reasons. Ideally, EIS has been identified as a solution to an issue or problem within the organization. Perhaps EIS was used successfully at another organization to address similar problems. Unfortunately, some MIS departments have identified EIS as an interesting technology and propose an organization adopt it "to gain competitive advantage" without identifying specific goals and objectives.
Mr. Lee thought that the system could also be defined by the organizational structure. With a flatter organization, decision-making should be lateral, requiring an enterprise information system. Conversely, with a hierarchical organization, decision-making is vertical, best supported by a traditional executive information system.

Mr. Lee stated that even when executives are the target for the system, it will not receive commitment throughout the organization unless lower management gets access to the same data. Furthermore, the project has to be driven by decision makers. Therefore, it is critical to recognize where support may be lacking and bolster this group of users.

Mr. Lee rephrases question 3 to:

What vision does the sponsor have?

Mr. Lee suggests that the definition should be considered in the context of:

How is the EIS going to add value to the corporation?

In response to question 2, Mr. Petersmeyer notes that culture of the company will dictate how to approach this.

Our experience began with a senior executive sponsor. The sponsor is not giving up a great deal of his time to any sponsorship duties, but is well known to be the sponsor. Other executives become sub-sponsors, or sponsors of applications specific to their area of interest, and will drive the requirements for their sub-areas. This is often a case where a senior executive needs information from a remote operational unit in a new format. He or she may want to see data very similar to what has been historically received, but be able to view in a different manner -- a manner which will greatly enhance the value of the data.

In response to question 3, Mr. Petersmeyer notes that he has established a vision for Cominco's EIS.

My vision for the EIS is "to create an information highway" over which data and information can flow from
Originator to appropriate recipients. Originators of data must be responsible for the timely, reliable movement of accurate data from the source to the EIS. They must be able to place new data in the proper location within the EIS, securely, and without intervention at this end. Much of our data come from remote mining properties with poor communications services. These locations must be able to assume complete responsibility for the delivery of their data.

My vision includes rolling out the EIS to all employees at our head office location. Employees are given access only to those applications they need to do their jobs, or which are generic applications (for information only). Access to applications is governed by the owner of the applications. We set up access groups for each application. Each group is given security access to everything required to run that application, or sub-application. As new employees are granted access by the owner we simply add the new employee to the group. Obviously, an individual employee may be a member of many such groups.

Mr. Wood thought that the distinction between 'top down' versus "grass roots" as a bit simplistic. However, he did argue that acknowledging the type of executive sponsor (e.g., Leader, technophile, political, etc.) can be valuable. If it is "grass roots", he thought that there are too many different flavours. He has seen a very different approach coming from MIS versus Finance versus Line of Business sponsored EISs.

Mr. Wood suggested another question:

*What is the organization's leadership style and culture?*

This is a bit more complex than just whether the EIS is "top-down" or "bottom-up". The issues is really how truly effective is your executive team in motivating the organization to change the way that it manages information. He noted that there has not been a lot of discussion regarding organizational resistance (to any change really, but specifically to EIS), and he felt that this can be an enormous factor in the EIS success or failure. He has observed that information provider support is required and that selling the benefits to them is critical.
Summary of EIS Definition

The majority of the panelists suggested that it is essential to develop a vision for the system. Most agreed that the definition of EIS and the vision needs to be determined by the users. However, Burkan argued that EIS project manager should perform this role. Lee suggested that source of support is an important criteria to define the system. Wood noted that the culture of the user(s) can help to define the system. Several panelists acknowledged that the vision will evolve over time.

Mr. Kellett emphasized that regardless of whether the system was defined as Executive or Enterprise, access to information should ultimately be made available to all.

Questions to support the responses by the panelists could include:

1. Do you anticipate that “sponsorship” will originate with the users or will it be pushed out by a functional area (e.g., Finance or MIS).

   Source of support will have a dramatic impact on the process of developing the system. Catering to demands requires tailoring the system to the users needs.

   Pushing a system throughout the organization will require cultivating an executive champion and operating sponsor as well as proactively shaping the vision for the system.

2. What initial vision do the users or the sponsoring functional area have for the EIS?

   The source of support for the vision has been determined by the previous question. Definition of vision incorporates both audience and functionality. Evaluate your audience -- is it comprised of individual executives or a broader group of users? An executive information system implies a different path than an enterprise information system. Secondly, the functionality can target operational issues or a more strategic agenda. It is important to recognize that these extremes imply a different type of system. Thirdly, recognize that the vision may evolve over time.
3. Selection of Development Methodology

The information associated with the central research question: 

What type of development methodology will produce the optimal results?

relates to questions 2 - 18 from Appendix D.

2. Do you anticipate that "sponsorship" from the senior executives will drive the project (top-down) or will it come from grassroots support (bottom-up).

3. What vision do you have for the EIS?

4. How "large" is the system?

5. What length of development time is acceptable to meet the user's expectations and the project's goals?

6. Is the system mission critical?

7. Is the problem well defined?

8. Is the problem being addressed structured, semi-structured, or unstructured?

9. Are the users available to actively participate in the process?

10. How many users will be involved in the first phase?

11. How many perspectives (report views) will be needed at each phase?

12. Is your organization centralized or decentralized?

13. Does management support the notion of employee empowerment?

14. Does the knowledge worker have the aptitude towards systems development? This includes technical, logical, and organizational skills.

15. Is the organization culturally prepared (and committed) to assume the potential risk of user application development?
16. *Is the executive or end-user patient enough to accept the extended time frame and expense of the Chronology approach over stand-alone Prototyping?*

17. *Would you rate the level of information sophistication of your EIS users as high, medium, or low?*

18. *Would you rate the diversity of perspectives (report formats) your EIS will demand as high, medium, or low?*

Table 3 summarizes some of the key comments from the panelists.
Table 3: Panelist Summary of Development Methodologies

<table>
<thead>
<tr>
<th>Panelist</th>
<th>Comment</th>
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<tbody>
<tr>
<td>Barber</td>
<td>Balance the time spent planning the system with the time frame when the sponsors interest starts to wane.</td>
</tr>
<tr>
<td>Burkan</td>
<td>Prototyping is good for generating preliminary interest but may fall short on providing an implementation framework. The resulting lack of long-term vision can be a fatal error resulting in an EIS that fails to deliver lasting value.</td>
</tr>
<tr>
<td>DeLong</td>
<td>For a successful EIS, the development methodology must recognize the importance of data access.</td>
</tr>
<tr>
<td>Guthrie</td>
<td>Successful EIS project managers modify their traditional methodologies in line with the behavioral characteristics of the executives.</td>
</tr>
<tr>
<td>Guthrie</td>
<td>... the reason so many EISs fail is that system development people don’t think like executives (and vice versa) and their rigorously structured development approach is inappropriate for attacking executive problems.</td>
</tr>
<tr>
<td>Guthrie</td>
<td>What techniques will you [the EIS project manager] use to ensure involvement throughout the development phase?</td>
</tr>
<tr>
<td>Kellett</td>
<td>... Prototyping should be evolutionary and not fall into a staid &quot;maintenance-mode&quot;.</td>
</tr>
<tr>
<td>Kellett</td>
<td>... [there is a] strong negative correlation between the overall project scope and probability of success.</td>
</tr>
<tr>
<td>Lee</td>
<td>The development methodology should be able to support lateral decision-making.</td>
</tr>
<tr>
<td>Lee</td>
<td>... the project approval process biases project managers to use a Prototyping methodology because it can be lower-cost.</td>
</tr>
<tr>
<td>Petersmeyer</td>
<td>A decentralized situation adds an order of magnitude of difficulty in the implementation of a head office EIS.</td>
</tr>
<tr>
<td>Suttie</td>
<td>A soft concept can be developed with a structured approach and hard information can be implemented with a Prototyping approach.</td>
</tr>
<tr>
<td>Watson</td>
<td>... an expensive EIS (large developmental budget) is more likely to use a more formalized developmental approach.</td>
</tr>
<tr>
<td>Wood</td>
<td>... [contends] that Prototyping is most beneficial in large application development projects because one of its key roles is to minimize the risk of building the wrong thing.</td>
</tr>
<tr>
<td>Wood</td>
<td>... [cautions] about indiscriminately integrating consultants or IS professionals unless there is an explicit program for knowledge transfer.</td>
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</tbody>
</table>
Mr. Barber acknowledged that in an ideal situation, more time could be spent planning the system. However, he suggested balancing this investment with the time frame when the sponsors interest starts to fade. With a short-term perspective, emphasis should be placed on Prototyping so that immediate results can be seen by the sponsor. He also stressed the practical implications enforced by the size of the budget for the project. With a smaller budget, fewer resources can be spent on up-front planning.

Mr. Burkan thought that questions 2 and 3 implied using a Chronology approach because it stresses the identification of project vision up front. With this approach, the EiS project manager identifies the objectives for the system and then matches the most appropriate sponsor to this goal.

He believes that a more structured approach is necessary to cultivate support. Prototyping may be useful to create preliminary interest. However, he argues that it does not provide an adequate foundation to analyze the information requirements to ensure that the most valuable content can be included. More often, it leads to an enhancement mentality where success is measured by how quickly and inexpensively information is presented rather than by its lasting value.

Mr. Burkan thought that question 4 missed the point. Rather than emphasizing the size of the project, he suggested recognizing the complexity.

A single executive can have a system consisting of several screens. This could be a "small" but enormously complex system because of the varied data relationships.

He also suggested identifying whether the interrelationship with the data and user is one-way (i.e., read only) or interactive. Interactive
data may require a more rigorous development approach to maintain the integrity of the database.

Mr. Burkan suggests that it is difficult to truly respond to question 7. Often, the EIS project manager may think that the problem is well-defined only to discover during the structured interview that it is not. He was more emphatic about the response to question 9; if the users are not available to actively participate in the development process, the project should be stopped.

Mr. Burkan commented that question 10 was reasonable. However, he thought that it is useful to understand where the project was in the cycle. He also suggested that the scope of the first phase is determined more by politics than by technical considerations. It is useful to be aware of the minimum number and identify what number of users is realistic. Continuing with the quantification of perspectives identified in question 11, Mr. Burkan suggested that it would be difficult to determine the number before the structured interview process.

While responding to question 12, Mr. Burkan identified that many organizations are neither wholly centralized nor entirely decentralized. Often, support for the system is centralized making it less technically demanding. Organizations can also be functionally decentralized, implying a political versus technical structure. He also referenced Lynda Applegate's slogan "Centralized control; decentralized decision making" as a contemporary model of organizational structure. He warned of the challenges accessing data when profit centres are decentralized [because of the difficulty accessing information stored in diverse formats and on different hardware platforms].
Mr. Burkan thought that question 14 was too simplistic. He suggested defining what system development means (e.g., screen design, data acquisition, communications etc.). He also noted that the knowledge workers are more difficult to define in a [larger] enterprise system.

Concerning question 16, Mr. Burkan noted that the up-front work involved in the Chronology approach should be no more than three weeks, not several months. He agreed with the Prototyping pundits that success varies inversely with time. Mr. Burkan also clarified that the "sophisticated" users identified in question 17 referred to active users who might query the information database as opposed to passive users who accept information in the static format that it is delivered in.

Mr. DeLong left Question 2 intact and acknowledged as important because of the dynamics of developing an EIS. Specifically, he emphasized the importance of data access, especially with respect to the impact that executive sponsors can have on removing potential barriers to data access. For a successful EIS, the development methodology must recognize the importance of data access.

A question was inserted by Mr. DeLong:

*What is the history of the departments development experience and reputation with the user community?*

Mr. DeLong considers this important because if the department has a history of not delivering on big projects that they had better not declare this a big project employing time-consuming methodologies such as SDLC.

Question 4 was left intact and acknowledged as important but made contingent on early user dynamics. Specifically, one must ask whether the users are patient and willing to accept the extra potential
time associated with SDLC. User dynamics must be considered in context of user needs, especially with respect to expectations of timing of the project deliverables.

Question 5 was left intact. Mr. DeLong sighted the research into the Xerox case to reinforce this question. Paul Allaire, president of Xerox, initially wanted the system operational within six months. When Ken Soha, the operating sponsor of the EIS and a vice president and controller of one of Xerox's operating units argued that this was impossible, Allaire resisted, saying, "I don't want a big IS project." Soha assured him it was just a prototype but that it still would take time. However, Soha notes:

"It was not until Allaire got into the political issues that he started to understand why we needed the time. He saw that at other companies, where they had put the system up too fast, the stuff didn't "stick". In the end, Allaire understood both the technical difficulties and the need to handle organizational resistance, so he extended the installation deadline. Even this deadline would not have been met had Allaire not served as a buffer between the design team and other senior managers, each of whom had his own list of desirable applications.

David DeLong noted the educational process for EIS Project Managers to manage expectations and delivery.

Question 6 was rephrased to:

*Is the information being delivered high impact?*

Mr. DeLong preferred to avoid the term "mission critical" originally used in the question because he considered it to be an over-used and meaningless buzzword in the vernacular of MIS. He identified that the key issue was despite the aspirations of EIS Project Managers, most successful EISs start as tactical systems and may evolve to fulfill
strategic functions. This fact should be reflected in the development methodology.

Mr. DeLong proposed merging questions 7 & 8 to:

*Is the problem well defined, structured, semi-structured, or unstructured?*

Mr. DeLong was unsure of the relationship of knowledge workers to this issue in the interpretation statement -- knowledge workers are the preferred developers since they should understand the business issues better [than IS developers]. Secondly, he challenged that if the problem was structured, it should not be categorized as an EIS solution.

Question 9 was left intact. However, Mr. DeLong was curious as to why they might not be available to actively participate in the Prototyping process. He questioned whether they understood that they could benefit from participating.

Mr. DeLong asked whether question 10 and 11 should not follow under question 4. This suggests that they should be removed or merged.

At this point, another question was inserted:

*How important is it that the first phase [of the project] produce a success?*

Mr. DeLong's response questioned whether there is there any potential to influence the audience's expectations or the actual project itself. It may be important to prioritize users requests if first phase success is important, perhaps at the expense of the overall project and its planning and scheduling.

Question 12 was left intact and acknowledged as very important. Mr. DeLong stated that failure to recognize the structure of the organization could undermine the success of the project.

Complementary questions included:
Where are your developers located?

What about [the location of] IS versus the functional groups?

When the developers are outside of IS, often there can be difficulty or IS resistance accessing the MIS database. Mr. DeLong again reinforced the importance of data access and its impact on the long-term success of the project. Managing the resistance is identified as a goal of the EIS proposal in the Chronology approach.

Mr. DeLong also inserted a "red flag" here:

If the developers are decentralized and non-IS, how will you deal with integration?

Mr. DeLong's research revealed the need to be prepared to adapt and expand the system to ensure its long-term success. He questioned what barriers might prevent this. An example is, "Do you have the ability to access/integrate data to transform delivering it on a weekly basis rather than the current monthly basis?"

Question 13, 14, 15, and 17 were rephrased to:

Does management support the notion of delegated authority and autonomy?

Does the target user have experience with systems development (this includes technical, logical, and organizational skills)?

Is the organization culturally prepared (and committed) to assume the potential risk of user application development and future data problems?

Would you rate the sophistication level of information in your EIS as high, medium, or low?
Mr. DeLong added that it may be valuable to use a method to rate the various levels.

Question 16 was left intact. Mr. DeLong believed this reinforced his earlier comments on tailoring the development methodology to the user's tolerance and patience levels.

Question 18 was left intact but Mr. DeLong again warned that this is only a sub-issue. The overriding influence remained the expected timetable of delivering the system from the user's perspective.

Mr. Guthrie grouped questions 5, 8, and 16 and responded:

I think that once you have the users' vision of what the EIS will ultimately look like and be used for, it's important to get something up and running quickly. Certainly the PC products available today make this possible. Produce something the user wants and get them using it quickly before they change their focus and are onto something else. The project manager has to have a success early on for executive support and patience to last.

I think that the reason so many EISs fail is that system development people don't think like executives (and vice versa) and their rigorously structured development approach is inappropriate for attacking executive problems. The result is sooner or later the executives lose interest.

Rather than to test the sponsor's patience levels, Mr. Guthrie suggests asking how long they will support the project. Time commitment and budget should be approved by the "champion". The project manager needs the time and financial commitment from the sponsor to manage expectations.

Mr. Guthrie is emphatic that if the users are not available to actively participate in the project, it won't work. It is better to rephrase question 9 to:

What techniques will you [the EIS project manager] use to ensure involvement throughout the development phase?
Mr. Guthrie also challenges some of the principles behind the Chronology approach:

With due respect to Mr. Burkan, I think that he sees EIS as not only a computer system but as a means of revolutionizing the way that executives manage. And certainly there is merit in some of his arguments, but you're trying to help project managers produce a successful EIS, not a new way for the executives to do their work. That's probably not an appropriate role for project manager to play, particularly at the beginning of a risky project. They should have a few EIS "wins" before they try this. Therefore, I wonder how practical his ideas are in most circumstances.

In summary, Mr. Guthrie notes that from his readings and experience, the most successful EISs have started with an executive or small group of executives who were the driving force behind the system's development. Committed users are a must. The project manager realized that EIS needs to be "sold", particularly to a group like this. They modified their traditional methodologies in line with the behavioral characteristics of the executives. Most often this meant producing results quickly.

The majority of Mr. Kellett's comments are quoted in The Panelists section. To summarize, he endorses the term "Proto-cycling" to convey the notion that Prototyping should be evolutionary and not fall into a staid "maintenance-mode". He further emphasizes the need to act quickly to deliver information to the users. He also discussed the strong negative correlation between the overall project scope and probability of success.

Mr. Lee reflected on the development situation at BC Hydro and declared that the technical situation of the company, presence of standards, and adequate support staff had the most dramatic impact on their EIS. This implies that if an organization is weak in these areas the development methodology should attempt to compensate. For example, if
standards are absent, it may be worthwhile formalizing the technology to be used in the development approach.

Further to the changes identified in the EIS Definition section, Mr. Lee suggested changing question 2 to:

*Where does the support for the EIS originate?*

When the system is demanded (pulled) by one or more executives, Prototyping is the most responsive technique to confirm their needs. However, he cautions about managing user expectations. Alternatively, with an increasing number of systems being pushed forward by the MIS department or functional user groups, it is better to employ a Chronology approach where a vision is developed by the EIS project manager. Then he or she can select the audience and cultivate a champion best suited to the vision.

Mr. Lee argued in response to question 12 that centralized versus decentralized structure has less impact on development methodology than the difference between lateral or vertical decision-making organizations; lateral structures facilitate empowered decision-making. This is a positive attribute since the cycle for making decisions is reduced. The development methodology should support this where possible.

Mr. Lee suggested grouping questions 4, 10, and 11; 12 - 15 with 18; 5 and 16. In response to the first grouping, Mr. Lee thought that the pace of change in the industry partially dictated the expectations for timeliness and the complexity of the information requirements. He cites the retailing industry as "up to the minute". This environment would not tolerate the time required for traditional SDLC.
Mr. Lee also noted that the project approval process biases project managers to use a Prototyping methodology because it can be lower-cost. Furthermore, when the user's computer literacy is low, a Prototyping approach should be used.

Mr. Petersmeyer added the direct experience gained in developing a successful EIS for Cominco:

In our experience Prototyping has worked best in all cases. We began with a core group of "applications" developed with input from a few key executives. We ran with these applications and received feedback on problems, suggestions, etc. Incorporation of changes was usually done with little fanfare or additional training.

In our experience we have essentially thrown out the SDLC process when approaching EIS applications. When an application sponsor requests something new, or when something new becomes available, we carry out what would have to be called crude Prototyping. We release crude prototypes to a few key executives and work with them to test and modify in a very informal manner. We tend to take far greater chances than some other companies take when approaching the release of EIS applications. It seems that our employees are much more tolerant of this approach than may be the case elsewhere.

In response to question 4, Mr. Petersmeyer said that large can be measured several ways including number of users, applications, or data providers. The EIS project manager must first define the parameters for "large". He goes on to add:

We manage the evolution of the EIS in a very informal manner. We take direction or input from a broad range of executives. If necessary we prioritize to manage our scarce resources (one full-time person supports and enhances our EIS, some new applications are contracted out or purchased from the EIS vendor).

A structured SDLC seems totally inappropriate for Cominco and I would be surprised if it would be much more effective in other organizations.
In response to question 5, Mr. Petersmeyer indicated that the initial project must contain enough meaningful information to "hook" the executives into using and benefiting from the EIS.

To achieve this there must be a short period of time from when the executives become aware that such a project is underway to when the initial prototype is on their desk. In our case we took about eight weeks from decision to proceed to implementation of the prototype.

To achieve success at this initial phase must pass the Faster, Better, Cheaper and Easier rule. If an executive, who may be using a computer for the first time in his/her career, cannot learn to use the EIS in a few minutes he/she will not use it. If the information provided is not faster or better you will find that the executive will revert to whatever means of obtaining the information existed prior to the EIS. If the EIS obtains information at great expense (of internal labour or external fees) then success will be greatly stifled in most organizations.

Once the initial prototype has achieved the above goals we have found that we tend to add something new every two or three months. Simultaneously, we are rolling out the EIS to additional users and may be changing various components of the infrastructure to suit changing conditions.

In response to question 6, Mr. Petersmeyer said that:

We have not implemented any mission critical applications in our EIS. The example of a sales information system is one which might eventually fit this category, but even it may not. Usually we find that the required information is available electronically somewhere in the company. We can usually set up a means to obtain this information into our EIS in an effective manner.

In response to question 7, Mr. Petersmeyer indicated that:

The problem may seem to be well defined, but in our experience we find that once the sponsor sees the first prototype we have our first fresh, meaningful view of what is really required. Once this initial set of changes becomes incorporated in the prototype we may go for months or years without further changes.

Similarly, few of our problems seem to be structured.
Mr. Petersmeyer noted that users are seldom available to actively participate. The development team tend to get a few minutes here and there to get input on requirements and feedback on deliverables.

Mr. Petersmeyer said that rolling out an EIS to a large number of users in the first phase seems problematic. Our experience was to include twenty people (executives, data providers and IS) in the first phase. Subsequently we added secretaries, more data providers and more executives. Our goal is to have all employees at this location on the EIS.

Mr. Petersmeyer was puzzled about the preoccupation with the SDLC methodology relating to EIS.

Our experience suggests that any SDLC methodology will be associated with databases from which data may be extracted for the EIS, but not for the EIS itself. We do not have standardized applications from location to location, thus we define key interchange formats to define how data will look for reporting, statistics, financial consolidations, etc.

As more reports are required we add them. I cannot see, within our culture, being able to define exactly what will be required in a formal SDLC manner. I would be amazed if there were not substantial changes in reports needed by a broad group of executives.

Mr. Petersmeyer thought that a centralized organization with centralized applications, or standardized applications, will have a relatively straight-forward time getting information.

Our organization is very, very decentralized and thus we have dissimilar applications from location to location and also have the idiosyncrasies of dealing with specific individuals at each location. A decentralized situation adds an order of magnitude of difficulty in the implementation of a head office EIS.

Mr. Petersmeyer responded to the question on employee empowerment with comments on structure.
Decentralization of an organizational unit does not necessarily go hand-in-hand with the empowerment of employees at a decentralized location.

Empowerment within your organization may lead to increased difficulty in obtaining the commitment of employees to participate effectively in your EIS project, either in the design phase or in the data provision phase. This may suggest a Chronology approach to cultivate support.

Mr. Suttie challenged the notion that hard information leads to structured development and the soft information is best identified by Prototyping. He argued that a soft concept can be developed with a structured approach and that hard information can be implemented with a Prototyping approach.

Mr. Watson offered his observations regarding development methodology:

EIS involves information requirements that range from the highly structured to the highly unstructured. Consequently, the EIS must always address at least some unstructured information needs.

I also see the cost of the system and whether there is an appropriate computing infrastructure in place as being relevant. For example, an expensive EIS (large developmental budget) is more likely to use a more formalized developmental approach. To me, a couple of questions framed around these factors would be useful.

Mr. Wood challenges the notion that Prototyping is normally associated with fast duration, smaller budget projects. He contends that Prototyping is most beneficial in large application development projects because one of its key roles is to minimize the risk of building the wrong thing. Prototyping should be characterized as a part of the IRD (along with JAD, interviews, analysis, etc.) particularly when requirements are vague or not well understood. Therefore, he agrees with the concept of Front-end Prototyping or the Chronology approach.
Mr. Wood suggests grouping questions 4 and 10; 11, 17, and 18. With the second grouping, he thinks that the perspectives (report views) language is too narrow. It implies that the EIS is primarily a report delivery application (albeit a flexible one). Rather, EIS is an information delivery, analysis, and communication tool. Furthermore, he is unclear what is meant by "information sophistication". It implied to him the level of aptitude the users have to assimilate and effectively use information. (Mr. Burkan defines a sophisticated user as one who would actively query an information database rather than a passive acceptor of static reports.)

Mr. Wood cautions about indiscriminately integrating consultants or IS professionals unless there is an explicit program for knowledge transfer.

Summary of Development Methodologies

None of the panelists identified support for the SDLC methodology. However, several endorsed the concept of Front-end Prototyping. The majority identified Iterative Prototyping as their preferred choice and emphasized the benefits of faster delivery. This same group emphasized keeping the first phase of the project small.

Burkan and Wood did not believe that Prototyping was a methodology at all. Instead, they advocated incorporating this technique following identification of a vision and creation of an EIS proposal. Suttie agreed that establishing a vision is critical to the success of the project.

Mr. Lee indicated that source of support was the major factor to decide between a Prototyping and Chronology methodology. When the system is demanded (pulled) by one or more executives, Prototyping is
the most responsive technique to confirm their needs. Alternatively, with an increasing number of systems being pushed forward by the MIS department or functional user groups, it is better to employ a Chronology approach where a vision is developed by the EIS project manager.

The panelists revised set of questions are:

1. *Do you anticipate that "sponsorship" will originate with the users or will it be pushed out by a functional area (e.g., Finance or MIS).*

When the system is demanded (pulled) by one or more executives, Prototyping is the most responsive technique to confirm their needs. However, the panelists caution about managing user expectations.

Alternatively, with an increasing number of systems being pushed forward by the MIS department or functional user groups, it is better to employ a Chronology approach where a vision is developed by the EIS project manager. Then he or she can select the audience and cultivate a champion best suited to the vision.

2. *What initial vision do the users or the sponsoring functional area have for the EIS?*

When the users are driving the system, Prototyping can be very useful for visualizing the system. However, if the EIS project manager is creating the vision, then a Chronology approach is beneficial in identifying the needs and securing support. This approach can incorporate Prototyping at a later stage.

3. *What is the budget for the project?*

A smaller budget may imply that there is insufficient organizational support. Prototyping may be a cost effective methodology to address this problem. Developing an EIS proposal (as part of the Chronology approach) is an alternative method to gain support for adequate funding.

4. *What is the scope and complexity of the system?*

There are many dimensions that affect the scope including number of users, number of functional areas spanned and volume of information presented. Complexity captures the difficulty in presenting the information. Is it from a variety of databases on different platforms? Is it supporting a standard
consistent view or enabling the user to create dynamic views of the organization?

As scope and complexity increase, so does the need for a proactively managed approach. Front-end Prototyping or the Chronology approach are better suited than Iterative Prototyping to meet the demands on resources that are inevitably created by these systems.

5. *What length of development time is acceptable to meet the user's expectations and the project's goals?*

The response to this question is partially captured by who is driving the system. With an eager executive sponsor, there is a need to prototype something quickly, while managing the expectations for delivery of a production system. If the EIS project manager is driving the system, there may be an opportunity for much needed up-front planning advocated by the Chronology approach.

6. *Is the system mission critical?*

Mission critical systems generally have a high impact throughout the organization. This implies the need for a managed approach such as Front-end Prototyping or the Chronology approach.

7. *Is the problem well-defined; structured, semi-structured, or unstructured?*

When the problem is well-defined and structured, it may be argued that the system is not an "EIS". The SDLC methodology or Front-end Prototyping may be the best solution. Otherwise, Prototyping or an IRD technique may be required to explore what is truly needed (please refer to IRD section).

8. *What techniques will you [the EIS project manager] use to ensure involvement throughout the development phase?*

If users are not available, one response is to abort the project. An alternative is to build support by selling the virtues of the project with a small, inexpensive Prototype. A second option is to cultivate support with an EIS proposal (again, a relatively inexpensive endeavour). Without active participation of the users after these activities suggests a dead project.
9. **What is the structure of your organization?**

There are two dimensions to this question. The first is whether the organization is centralized versus decentralized. Furthermore, "decentralized" organizations often have centralized support for systems, making it less technically demanding. The biggest danger in a fully decentralized organization is gaining access to the many disparate data sources. This environment requires a more rigorous development approach. It may be beneficial to segregate tasks such as screen development from data acquisition, using SDLC for the latter. This concept is captured by the Front-end Prototyping methodology.

The second dimension is whether the structure is flat (lateral decision making) or hierarchical (vertical decision making). The former implies the need for an enterprise system to support the empowered decision making of the knowledge workers whereas the latter suggests the classic executive information system. A Chronology approach can be useful in developing enterprise support. With a hierarchical structure, attention is focused on one or a small group of individuals. This implies concentrating attention using a Prototyping technique to meet the group’s needs.

**4. Selection of IRD Methodology**

The information associated with the third research question:

*How does one determine what type of information to include in the system?*

relates to questions 3, 6 - 8, and 17, 19, and 20 from Appendix D.

3. **What vision do you have for the EIS?**

6. **Is the system mission critical?**

7. **Is the problem well defined?**

8. **Is the problem being addressed structured, semi-structured, or unstructured?**

17. **Would you rate the level of information sophistication of your EIS users as high, medium, or low?**

19. **Is the system targeting the overall corporate welfare or focusing on a specific area, issue, or individual?**
20. *Do you expect a cross-functional group of users?*

Table 4 summarizes some of the key comments from the panelists.

**Table 4: Panelist Summary of IRD Methodologies**

<table>
<thead>
<tr>
<th>Panelist</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barber</td>
<td>... information must be viewed as a corporate resource to be shared throughout the organization.</td>
</tr>
<tr>
<td>Burkan</td>
<td>... the IRD methodology is a less important consideration than the development methodology.</td>
</tr>
<tr>
<td>DeLong</td>
<td>... [warned] of not being able to access data beyond the initial phase.</td>
</tr>
<tr>
<td>Lee</td>
<td>... [noted] the importance of the availability of data and the IRD process.</td>
</tr>
<tr>
<td>Lee</td>
<td>... JAD ensures compromise (although this might not be a good result) and results in a less customized system.</td>
</tr>
<tr>
<td>Petersmeyer</td>
<td>... the higher the level of the user, the greater the need for external information such as market pressures, economic conditions, activities by various governments or competitors, stock trading activities etc.</td>
</tr>
<tr>
<td>Wood</td>
<td>... executives who are serious about Business Process Re-engineering must consider cross-functional implications to be effective.</td>
</tr>
</tbody>
</table>

Mr. Barber did not comment on his preferred IRD methodology. However, he did indicate that one of the most important issues related to defining requirements is access to data. He asked:

*Who owns the information?*

*Where does data reside; where should it reside [to be effective]?*

Furthermore, he thought that information must be viewed as a corporate resource to be shared throughout the organization.

Mr. Burkan supports a structured interview approach to elicit information. Although he indicated that the IRD methodology is a less important consideration, he presents a series of questions (see Appendix
A) designed to identify critical success and failure factors suggesting support for the CSA technique.

Mr. Lee noted the importance of the availability of data and the IRD process. This point was captured by Figure 5:

**Figure 4: Availability by Integrity of Information**

**Availability of Information**

<table>
<thead>
<tr>
<th>High Availability</th>
<th>Low Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Integrity</strong></td>
<td><strong>High Integrity</strong></td>
</tr>
</tbody>
</table>

**Integrity of Information**

Mr. Lee noted that the integrity of information available from BC Hydro was high. However, much of the information that was requested was not readily or easily available. IS at BC Hydro was not able to respond to basic questions asked by the CEO including:

*How are we doing [on a project by project basis]?*

*How much have we spent [project to-date and total]?*

Mr. Lee also noted that JAD ensures compromise (although this might not be a good result) and results in a less customized system.

In response to question 3, Mr. Petersmeyer states:

*We have not approached our EIS from a critical support factor point of view. Culture again! We find that*
each executive has a different set of data which needs to be periodically updated for him/her to feel current. We can't always identify which data will be required to achieve a high comfort level, and requirements will change from day to day, determined by changing hot-spots, challenges or problems.

He also notes:

Applications on the EIS have evolved to suit changing corporate and individual needs. Different executives find greater value in different applications. Anticipating this response is very difficult and unpredictable. However, the higher the level of the user, the greater the need for external information such as market pressures, economic conditions, activities by various governments or competitors, stock trading activities etc.

Mr. Petersmeyer states that they did not attempt to have formal JAD sessions or employ a conventional SDLC technique or methodology in the evolution of their EIS:

We have not attempted to get a broad group of executives together for a planning session for the EIS. There are probably several reasons for this. Firstly, it is hard to get the group together on this. Secondly, many of the executives might not feel comfortable in this style of problem definition. Thirdly, if you make suggestions to the group and someone is vocally against it you may lose the opportunity to carry out the suggestion unless another executive is equally vocally in favor of it. Finally, each executive has very different requirements for information and mixing together a broad group and hoping for a consensus on any given EIS application is risky.

Mr. Wood commented in his response to question 1 that a cross-functional group of users may imply the need for a cross-functional EIS team, or likely splitting into separate development streams with a central coordination function.

Summary of IRD Methodologies

Many of the panelists did not explicitly comment on their preferences for IRD methodology. Burkan states that this dimension of the project is less critical than the development methodology.
Petersmeyer notes that his organization did not adhere to any formal IRD methodology and still produced a successful EIS.

The majority of panelists indicated that the most critical aspect of delivering on the information requirements centered around access to the data. Mr. Lee went further to differentiate between the integrity and availability of information. In his organization's case, the integrity of information was high but often the required information was unavailable.

Because of this lack of input, it is difficult to impart any consensus from the expert panelists on the questions that are valuable to assist in determining the best IRD. However, the author refers to the proposed framework of applying the various IRD techniques outlined in Figure 6 of the Discussion and Application section.
Chapter V
Discussion & Application

This section will attempt to resolve some of the tension and contradiction by analyzing and interpreting the expert panels work and some of the material presented in the literature review.

From the literature, it seems that EIS development is complicated by the focus on dynamic, unstructured problem solving. The key is to apply the right methodology for the stage of evolution with precautions to ensure that development does not get "out of control". This implies that the development approach may evolve as the project matures. An example of how this may apply is listed in Table 5.

Table 5: Project Life Cycle and Development Approaches

<table>
<thead>
<tr>
<th>1. Initiation</th>
<th>Iterative or Front-end Prototyping</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chronology approach</td>
</tr>
<tr>
<td></td>
<td>End-user Application Development</td>
</tr>
<tr>
<td>2. Contagion</td>
<td>Iterative or Front-end Prototyping</td>
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<tr>
<td></td>
<td>Chronology approach</td>
</tr>
<tr>
<td></td>
<td>End-user Application Development</td>
</tr>
<tr>
<td>3. Control</td>
<td>Front-end Prototyping</td>
</tr>
<tr>
<td></td>
<td>Chronology approach</td>
</tr>
<tr>
<td></td>
<td>Limited End-user application</td>
</tr>
<tr>
<td></td>
<td>development</td>
</tr>
<tr>
<td></td>
<td>SDLC</td>
</tr>
<tr>
<td>4. Maturity</td>
<td>Front-end Prototyping</td>
</tr>
<tr>
<td></td>
<td>Chronology approach</td>
</tr>
<tr>
<td></td>
<td>SDLC</td>
</tr>
</tbody>
</table>

Although may EISs may never be "finished" due to the endless possibilities to add information, it is valuable to recognize phases within the stages of growth. Recognition of the phases enables post-development evaluation and provides inputs to improve the success of further
development. This approach helps minimize the chance of a colossal failure by segmenting the project into many smaller pieces -- the notion of "Proto-cycling" introduced by Don Kellett. Constant evaluation helps to ensure that all involved learn from past experiences and apply the successes in further development.

From the literature, it seems that the selection of the methodology will depend on who the audience is and the goals (functionality) of the system. Depending on whether the system is designed to meet individual's needs or a broader group of users and whether the focus is operational versus strategic will influence which techniques work best. Furthermore, Lee argues that the source of support is also a major factor; when the support originates from the users, the emphasis should be on Prototyping to quickly respond to their requests and ensure that both users and developers understand the issues. Conversely, when the support originates with the project manager, the Chronology approach is favoured because this approach can clarify the vision and cultivate support. This leads to the formulation of the 3 X 3 X 2 grid illustrated in Figure 5.
**Figure 5: Classification by User, Functionality and Support**

**User Audience**

<table>
<thead>
<tr>
<th>User Audience</th>
<th>Front-end Prototyping</th>
<th>Iterative Prototyping</th>
<th>Iterative Prototyping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior/Middle Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Workers</td>
<td>Front-end Prototyping</td>
<td>Front-end / Iterative Prototyping</td>
<td>Iterative Prototyping</td>
</tr>
<tr>
<td></td>
<td>SDLC</td>
<td>Iterative Prototyping</td>
<td></td>
</tr>
</tbody>
</table>

**Operational** | **Tactical** | **Strategic**

**User Pull**

**Source of Support**

**Project Manager Push**

<table>
<thead>
<tr>
<th>User Audience</th>
<th>Front-end Prototyping</th>
<th>Chronology / Iterative Prototyping</th>
<th>Chronology / Iterative Prototyping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Senior/Middle Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Workers</td>
<td>Front-end Prototyping</td>
<td>Iterative Prototyping / Chronology</td>
<td>Chronology / Iterative Prototyping</td>
</tr>
<tr>
<td></td>
<td>SDLC</td>
<td>Front-end Prototyping</td>
<td>Iterative Prototyping / Chronology</td>
</tr>
</tbody>
</table>

**Operational** | **Tactical** | **Strategic**

**Functional Level**
Recognition of where the organization fits in this grid can direct the development approach to meet the combination of audience, functional level, and source of support.

Although the expert panelists did not refer explicitly to each IRD methodology, Figure 6 positions the focus of each IRD methodology, derived from the literature review.

**Figure 6: Positioning of IRD Alternatives**

<table>
<thead>
<tr>
<th>Individual Executives</th>
<th>Individual CSFs</th>
<th>Individual CSFs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Work Unit CSFs</td>
</tr>
<tr>
<td>Enterprise Knowledge Workers</td>
<td>E/M Analysis</td>
<td>Company CSFs</td>
</tr>
<tr>
<td></td>
<td>BSP</td>
<td>SBO Analysis</td>
</tr>
</tbody>
</table>

As mentioned previously, IRD approaches can be combined, especially when operational and strategic needs are straddled and when the system is serving the needs of both individual executives and enterprise knowledge workers.
Chapter VI
Summary & Conclusions

This thesis began by examining the acronym "EIS" to suggest that the "E" can represent either Executive or Enterprise users. Explicit recognition of the user audience for the system helps to define the best approach to implement an EIS. This approach includes the development methodology and the technique used for determining information requirements for the system.

The paper reviewed the literature on the Systems Development Life Cycle methodology and acknowledged that it may be appropriate for larger EISs with well defined, structured problems and an enterprise audience. However, with poorly defined problems and smaller systems, an iterative learning technique referred to as Prototyping was recommended. Front-end Prototyping may be useful to ensure the applicability of the design before a large scale system is developed. A third approach -- End-user Application Development -- was also acknowledged primarily to recognize the prevalence of development by knowledge workers armed with high productivity development tools. Although it is more distinguished by the "who" rather than the "how" in the development approach, employing knowledge workers rather than IS professionals creates opportunities and potential pitfalls that the EIS project manager should be aware of. A final methodology -- The EIS Chronology -- was outlined. It focuses on preparation prior to actually building an EIS by defining the vision for the system. This vision provides a "road map" for the EIS project manager to follow.
Identifying a vision for the system can help clarify the system's goals. Several EIS types were identified by system functionality. In addition to audience, functionality addressed whether the focus of the system was operational or strategic.

The stages of project life cycle were also reviewed with an explicit recognition that the development process may change as the system matures. Ideally, the project manager sees the need for change before the process is out of control and requires external intervention.

Finally, several different techniques for information requirements determination were identified. Separating the techniques from the development methodology can facilitate a tailor-made solution designed to fit the need. Business Systems Planning and Ends/Means Analysis focus on the existing processes in the organization, thereby emphasizing operational problems for all or part of the organization. Critical Success Analysis can target the strategic needs of individuals or the complete organization. The Strategic Business Objectives technique focuses on the problems or opportunities in an organization as a whole.

From the panelists submissions, it is apparent that there are two camps. The majority suggested that the scale of the first phase of EIS be minimized to reduce the risk of failure. This same group recognize Prototyping as a criterion for success. A second camp, including Burkan, Suttie, and Wood, endorsed a more thorough review up front. This approach necessitates a relatively larger resource commitment in the earlier phases of the project.

Many panelists agreed that it is important that the EIS focus on solving a problem or identifying an opportunity and not be technology-driven. Furthermore, many noted that EIS is an ongoing
process -- "a journey rather than a destination" -- that will never be completed. This differentiates EIS from other systems.

**None of the panelists supported the SDLC methodology.** However, several endorsed the concept of Front-end Prototyping. When identifying Iterative Prototyping as their preferred choice, many emphasized the benefits of faster delivery. This same group preferred keeping the first phase of the project small.

Burkan and Wood did not believe that Prototyping was a methodology at all. Instead, they advocated incorporating this technique following identification of a vision and creation of an EIS proposal. Suttie agreed that establishing a vision is critical to the success of the project.

**The majority of the panelists agreed that it is essential to develop a vision for the system.** Most agreed that the definition of EIS and the vision needs to be determined by the users. However, Burkan argued that this was the role that the EIS project manager should perform. Lee suggested that source of support is an important criteria to define the system. Wood noted that the culture of the user(s) can help to define the system. Several panelists acknowledged that the vision will evolve over time.

The EIS project manager should also be aware of the influence of organizational structure and culture of the organization. Recognizing where support originates dictates a natural decision tree branch. Pull support implies a Prototyping methodology to meet the user demands as quickly as possible. A push strategy from MIS or another functional area may benefit from cultivating the appropriate champion and user group exemplified in the Chronology approach.
The EIS project manager should try to build support where it is lacking. For an executive information system, an effective structured interview can help cultivate an executive sponsor. Joint application design and cross-functional considerations can promote the value of an enterprise information system. For both audiences, an EIS proposal is an effective tool in closing the communication loop and reducing potential resistance to change.

Many of the panelists did not explicitly comment on their preferences for IRD methodology. Burkan states that this dimension of the project is less critical than the development methodology. Petersmeyer notes that his organization did not adhere to any formal IRD methodology and still produced a successful EIS.

The majority of panelists indicated that the most critical aspect of delivering the information requirements centered around access to the data. Mr. Lee went further to differentiate between the integrity and availability of information. In his organization's case, the integrity of information was high but often the required information was unavailable.

Many of the panelists identified a natural decision tree in the questions with several distinct branches. Developing this into a practical framework for the EIS project manager may be useful. This area requires further research.

Another possible area for future research is to explore whether the success of an EIS project is related to the type of methodology that was used to build it. There may be an opportunity to further test the circumstances (e.g., push versus pull support, executive versus enterprise audience) surrounding the project and their impact on the project's success.
None of the panelists discussed the possibility of using computer aided systems engineering (CASE) tools in the development approach. As the sophistication and flexibility of these tools improves, there may be a possibility to employ this technology and the associated development methodology to EIS.

A final area for future research is to discover how dysfunctional behavior labeled group think can be minimized. One avenue may be to apply a group decision support system to the information requirements definition stage.
Footnotes


Source: Personal conversation with Martin Lee, Manager, Corporate Information Systems, BC Hydro, June 1993.


Appendix A - Indirect Questions

1. What information do you currently receive that is important to you?

2. Assume that you have been on vacation for the past few weeks -- away from the phone, the office. When you arrive back on Monday morning, what are the first things that you want to know.

3. If you could enhance the information that you now receive -- improve its value to you -- what would you want to change?

4. Imagine that you pick up a copy of the Harvard Business Review three years from today. You read about our organization, and about yourself in particular. It talks about how well things are going. What does it say?

5. You pick up the same article three years from today. Now it talks about why things are not going well. What does it say?

6. Envision a specific competitor and your counterpart at that organization. Imagine you have ten minutes in his or her office. What kind of information would you most like to collect?

7. What would you least like your competitor to gather about your business?

8. Select an organization that you admire, one that excels in some way. What would you want to know about that organization?

9. Over the past several years, have you ever been surprised?

Appendix B - The Expert Panel Participants

1. Paul Barber
2. Mason Brown
3. Wayne Burkan
4. David DeLong
5. Gary Guthrie
6. Don Kellet
7. Martin Lee
8. Bruce Petersmeyers
9. James Suttie
10. Dr. Hugh Watson
11. Doug Wood
Appendix C - Letter to the Expert Panelists

Dear Expert Panelist:

Thank-you for considering to review my thesis on development approaches for an EIS. The thesis research is focused on helping an EIS Project Manager choose the best implementation strategy from the various development methodologies and information gathering techniques. Recognizing your expertise in this field, I requested your participation on an expert panel to review a framework of potential questions that an EIS Project Manager should consider when developing such a system.

In consideration of your busy schedule, I have separated the preliminary framework of questions into Appendix C although the final version will integrate the panel's input back into the results section of the thesis. I have also sent the latest draft of the thesis for you to review and use as a reference (I would appreciate your input on the thesis, time permitting). In addition to constructive criticism, please eliminate any irrelevant questions in Appendix C and add new questions that you consider to be useful in assisting the EIS Project Manager through this task. Although I have initiated this process with twenty questions and their interpretation, they will be referenced as the expert panel's, not the author's (and the final number is open).

Try to imagine yourself as the neophyte project manager who is responsible for developing an "EIS." He or she has just attended an EIS conference and is overwhelmed with the range of different approaches presented to develop an EIS. Our goal is to present a practical framework of questions that helps the EIS project manager to consider his or her
specific requirements and then tailor-make an approach that matches these needs. I am trying to maximize the practical value of this framework and any input using the questions to develop a decision tree would be very useful.

I require your comments prior to June 26 in order to summarize the findings and submit the thesis this semester. I also need a paragraph summarizing your experience in the field of EIS. I will contact you in the first week of June to see whether you require any clarification on the material. I thank you in advance for your time and effort and look forward to your constructive input.

Sincerely,

John H. Phillips

Encl.
Appendix D - Summary of Questions

This appendix presents a list of questions to help the EIS project manager formulate a strategy to implement the system. Following each question a preliminary interpretation of the potential response is offered. These questions and their interpretation are subjective and are presented to initiate constructive criticism including feedback, additions and deletions as the expert panelist sees fit. They will be presented as the expert panel's questions, not as the author's questions.

1. Evaluate your audience -- is it comprised of individual executives or the enterprise?

An individual executive audience suggests using a Prototyping or chronology approach rather than systems development life cycle (SDLC). Furthermore, executives may warrant individual interviews rather than joint application development (JAD) and may be focused on unique issues or strategy that excludes cross-functional considerations. An enterprise audience may need elements from SDLC to coordinate the larger number of participants. JAD and cross-functional considerations can be useful with this group as well.

2. Do you anticipate that "sponsorship" from the senior executives will drive the project (top-down) or will it come from grassroots support (bottom-up).
Top-down directives may tend to support the needs of the individual decision maker (typically executives or senior managers). Again, a Prototyping or chronology approach may work best, supported by the Critical Success Analysis technique (CSA) of information determination. Generally, bottom-up support implies more participants, at a lower average level in the organization’s hierarchy. Coordination of this type of system development may suggest employing some of the rigour associated with SDLC. This does not rule out Prototyping selected phases of the development. JAD works relatively well in this environment and cross-functional considerations should generally be included. A process-oriented information requirements determination (IRD) technique such as Business Systems Planning (BSP), Ends/Means Analysis (E/M Analysis) or Strategic Business Objectives (SBO) may work best to support the needs of the group rather than CSA.
3. **What vision do you have for the EIS?**

   Operational information suggests that the EIS is designed for control and/or productivity gains. This "hard" information lends itself to a more structured development approach. However, when this information has not been determined, flexible techniques such as critical success analysis or strategic business objectives may be required. Support for "softer" information is generally derived from a Prototyping approach since the needs and capabilities may not be known by either the developer or ultimate user of the information.

4. **How "large" is the system**

   Generally, the bigger the system (i.e., relatively more components, more users, more screens, more developers), the more likely that the project can benefit from the control and structured offered by SDLC.

5. **What length of development time is acceptable to meet the user's expectations and the project's goals?**

   Generally, SDLC is used when the expected project life is longer than one year and therefore requires more control, monitoring and coordination. Prototyping is normally associated with fast duration, smaller budget projects. The project may start with Prototyping and move to SDLC as the system becomes more mature and stable.

6. **Is the system mission critical?**

   Mission critical applications (e.g., a sales information system) are those that are deemed to be "high impact" and sometimes find themselves under the banner of EIS. These types of applications generally require the control and organization of a SDLC derivative approach employing cross-functional and JAD techniques. When the system is focused towards operational needs, BSP or E/M Analysis should be used. When the focus is strategic, the CSA or SBO approaches are best.

7. **Is the problem well defined?**

   If the problem is well defined, an IRD technique such as BSP or E/M analysis may be useful in determining the process that supports the problem combined with IS professionals using SDLC. Poorly defined problems may require an indirect line of questioning that is often integral to the CSF or SBO approaches in conjunction with the iterative
leaning process inherent to Prototyping. Knowledge workers are the preferred developers since they should understand the business issues better.

8. *Is the problem being addressed structured, semi-structured, or unstructured?*

Structured problems lend themselves to SDLC in conjunction with BSP or Ends/Means analysis. Semi-structured or unstructured problems require the learning associated with Prototyping and generally utilize the goal focus and monitoring mechanisms associated with the CSF and SBO techniques of information determination.

9. *Are the users available to actively participate in the process?*

Prototyping requires active user participation. This technique will not work without their involvement. When the participants have limited time available, the project manager may consider the chronology or SDLC methodologies because the information requirements section is more formalized and can be delegated to subordinates or user surrogates more easily.

10. *How many users will be involved in the first phase?*

Generally, the more users, the more likely that SDLC should be considered in conjunction with an IRD that targets overall objectives (i.e., not the CSF approach).

11. *How many perspectives (report views) will be needed at each phase?*

The higher the number of views, the more likely that SDLC should be employed at some time during the development cycle to provide the infrastructure for coordination and administration. It may be that the first phase to determine the perspectives involves Prototyping and that SDLC is adopted for a later phase when the volume is known.

12. *Is your organization centralized or decentralized?*

A decentralized organizational structure is more likely to embrace the concept of user application development. Generally, this is combined with a flexible development approach other than SDLC. Ideally, IS professionals will be available for consultation to the development team of end-users.
13. *Does management support the notion of employee empowerment?*

Empowerment usually goes hand in hand with decentralized organizational structure but implies more freedom to dictate the overall approach. This can imply independent user application development. However, independent development will not work without the active involvement and commitment from the users and senior management. Proceeding with this approach without this key support will usually result in disappointing results.

14. *Does the knowledge worker have the aptitude towards systems development? This includes technical, logical, and organizational skills.*

If the knowledge workers in your area do not have the requisite skills, you have two options; either hire consultants or integrate professionals from the IS area onto the development team.

15. *Is the organization culturally prepared (and committed) to assume the potential risk of user application development?*

It is important that the IS project manager recognize some of the risks associated with user application development. These risks are magnified when the management team is not aware of the downside.

16. *Is the executive or end-user patient enough to accept the extended time frame and expense of the Chronology approach over stand-alone Prototyping?*

Recognize that the potential benefits of the Chronology approach are not without additional costs. If the end-users demand deliverables in two weeks, rapid Prototyping is the correct response unless you can convince them that the additional time required up-front by the Chronology approach is worth the investment. The Chronology approach can be a particularly useful structure to provide a more formalized framework and recognizes the importance of timing the various steps necessary to deliver a successful project.
17. **Would you rate the level of information sophistication of your EIS users as high, medium, or low?**

Higher information sophistication will require more flexible techniques such as Prototyping and the CSF approach. Lower information sophistication implies less complex problems that may benefit from SDLC and a process oriented information determination technique such as BSP or E/M Analysis.

18. **Would you rate the diversity of perspectives (report formats) your EIS will demand as high, medium, or low?**

Some organizations want their EIS to support a single, standard view of the business. With this goal, a SDLC approach may be optimal. When the system demands a high diversity of perspectives, the more flexible Prototyping approach may be appropriate.

19. **Is the system targeting the overall corporate welfare or focusing on a specific area, issue, or individual?**

This question is designed to help the EIS project manager choose an IRD technique. Generally, critical success analysis works well with the single area or issue and SBO targets the overall corporate welfare. The other techniques are more process oriented and are slightly biased towards the welfare of a business unit or the organization as a whole.

20. **Do you expect a cross-functional group of users?**

A cross-functional group of users implies a larger user group crossing several business functions. When this is the case, it is appropriate to employ joint application development techniques that involve all of the functional areas.
Appendix E - Additional Panelist Information

Paul Barber

Mr. Barber offered the following questions to consider:

1. Are you promoting a technology or developing an application?

2. Do you need to sell EIS internally and to whom?

3. Consider the next step (i.e., not buying the technology) such as generating executive sponsorship and buy-in from the technical and departmental support areas. This inevitably involves "selling" the concept.

3A. What are the organizational implications of electronic reporting [EIS]?

If it makes middle management redundant is there a plan to manage the personnel changes?

4. Who owns the information?

5. Information must be considered as a corporate resource, available for all to share.

6. How much is the IS budget?

7. How much benefit can EIS give over existing information dissemination?

8. What is the time frame before sponsors interest starts to wane.

9. Where does data currently reside? Where should it logically reside?

10. What skills are available to support EIS development?

11. Does the organization need a true EIS or simply a query tool?
Mr. Brown stated that thinking about and responding to the questions and ideas on the next few pages will give a much better idea of what EIS is all about and where one should go next (if anywhere). They are in no particular order.

1. **What do you think an EIS is? Define it in your own words.**

2. **What do your executives (or other end-users) think an EIS is? Ask them for yourself. You might be surprised.**

3. **What are your expectations about how an EIS will affect your organization?**

4. **Are you managing users expectations? Do you know what their expectations are? If so, what are they?**

5. **What three business objectives will your EIS address or support (i.e., TQM)?**

6. **What operating systems do you plan to use: (a) to produce and store your data, (b) for your user interface (DOS, UNIX, O/S2, Microsoft Windows, Open Look, XWindows)?**

7. **What hardware platforms do you plan to use: a) to produce and store your data, b) for your user interface (PC, Host, Network)?**

8. **Where your choices in 6 and 7 based on what you have now, or what you would use if you could have anything you wanted? What would you use if you could have anything you wanted? Why?**

9. **What kind of Network do you have (if any)?**

10. **Do you have a host system and if so, what kind and how is it connected to your Network or PCs?**

11. **How many users will your system have immediately? In one year?**
12. **Who are the intended end-users of the system (i.e., executives, managers, support personnel)?**

13. **What 3 things are you most concerned about in implementing an EIS for your company?**

14. **What 3 things are you least concerned about in implementing an EIS for your company?**

15. **Studies have shown that some users think the software that creates the data is more important than the EIS software. What kind of software do you have now that you would expect to use to drive your EIS? Do you think you will need more? If so, what?**

16. **What led you to consider building an EIS?**

17. **Have you looked at EIS software systems? If so, which ones?**

18. **What information do you think the system will report?**

19. **How frequently will the data in 18 need to be updated (real-time, daily, monthly)?**

20. **Can you think of any unique requirements for your company that may make implementing an EIS different or more difficult?**

21. **Do you think you will need data from external sources (eMail, Dow Jones) in your EIS? Why or why not?**

22. **How long do you think the initial prototype should take (I'll assume you were going to do a Prototype)?**

23. **What level of technical expertise do you think will be required to implement your EIS? How much help can you get?**

24. **Would you consider consultants to help you implement your EIS?**
David DeLong

Mr. DeLong cited Gillette Company as an example of a tactical (versus strategic) EIS. Darwin Phillips, executive vice president of Gillette North America implemented an ESS that not only transformed the way he processes information personally, but also improves management reporting by executives in the three divisions which report to him. Phillips and his managers primarily use the system for performance monitoring and competitive analysis. (pp. 33-34)

Phillips uses his ESS to get quick status updates on business he oversees. After being out of the office for a few days, Phillips can turn on his systems and note changes in market position and daily sales activity in his three divisions. He also can get updated competitive information, such as new product announcements. (p. 4)

Martin Lee

Mr. Lee believed that twenty questions were inadequate to precede development. He thought that the number of questions could exceed 300, although he commented on the practical reality of this number.

Mr. Lee provided his list of "top-ten" issues to consider before starting development:

1. Availability of Data
   - Timeliness
   - Sophistication of current information systems
   - Level of Availability versus Integrity
2. Technical support must be available - Require proficient corporate and field support staff to deal with technical problems, data access, connectivity of computer platforms.

3. Technology standards must be in place. Furthermore, the EIS project manager must consider:
   - limitations of existing environment; mix of technologies, access tools, missing links
   - directions for future directions
   - existing technologies - application software, operating systems and hardware

4. Type and nature of industry impacts the complexity and timeliness of information required to support decision making process.
   - Certain environments (e.g., retailing versus utilities) may be more volatile and faster paced, requiring flexibility, rapid changes.
   - Increased competitiveness of industry requires external data with third party access technology that must be involved and integrated into project.

5. Computer literacy of users - If low, use Prototyping

6. Organization Structure - fewer decision makers are present in a vertical structure; therefore the distinction between vertical versus horizontal is more meaningful than centralized versus decentralized structures.

7. Degree of support from the information providers.


9. IS budget for the project.
10.  Justification or approval process for a project - SDLC cost more initially and is therefore more difficult to justify

Brian Petersmeyer

Mr. Petersmeyer also included the following comments:

Several senior executives are now coming up with a broad range of internal information or data which should be available within the EIS. Some of this is very general, public information. Some will require limited access.

The desktop technology to deliver the information to the users is DOS based. This environment has suited the task well. Although many users run the EIS under Windows, but this does not enhance the value of the EIS compared to the DOS versions but does allow for complementary desktop technologies such as word processors and spreadsheets.

Cominco's executives have unfailing chosen a simple application over a glitzy one. "Just give us the plain report or data, don't worry about making it look fancy for me."

Most of our operational databases at the business units are relational databases developed in the past few years. This improves our ability to obtain information effectively.

The nature of the mining business deflects much of the need to provide real-time data to the executive desktop. Product pricing is mainly via the London Metal Exchange. The life cycle of mines and mining products tend to very long. Meaningful business decisions are not made based on the current price of a product in the world marketplace.

Most of the time we find that we can respond to relatively simple information requests in a short period of time, often within a day or so. In most cases we find that the length of time to respond to a request is governed primarily by the information providers. It seems to take an inappropriate length of time to get new methods of information reporting to head office established reliably in each reporting location. Many of our locations have high turnover or may have several people trained to carry out each reporting function due to job-rotation programs. Much of the time we have to say to executives "It's not a technical problem" when responding to questions regarding late or missing reporting from business units. Almost always we find that the "technical highway" is working just fine.
How will you measure the success level of your EIS?

I am often asked how we measure success of the EIS. More specifically I am asked questions such as: "How much time per day does each executive spend on the EIS?"

This type of question is very hard to answer. Some questioners are surprised that we do not have any means to measure the length of time an individual uses the system. I would not entertain measuring this. Besides, what is the right answer? If an executive uses the system for two hours per day does that indicate success, failure or a bored executive? Perhaps it takes two hours because the system is awkward to use (of course most executives would abandon the system unless it was the only way to get certain information) and we are impacting executive productivity in a negative manner.

If an executive uses the system for only 15 minutes per day does this mean that the executive is getting high or low value? If it provides the executive with the necessary information in a very efficient, streamlined manner it would be good. If the executive uses it for 15 minutes because it doesn't provide enough information then it would be bad.

Every executive is an individual and uses the system according to their individual needs on a given day. Most executives travel a great deal and will have no access to the system during travel. The system's greatest value may be to provide them with a method of quickly updating themselves on events that have taken place during their absence.

James Suttie

Mr. Suttie added comments to the interpretation to question 2. He cautioned against enticing executive sponsorship with a features based EIS because it may be perceived as nothing more than a toy. Mr. Suttie also cautioned about managers solving business problems that the organization does not have.

Doug Wood

Mr. Wood had the following additional comments:
What is the organization's leadership style and culture?

I think that this is a bit more complex than just whether the EIS is 'top-down' or 'grass roots'. The issues is really how truly effective is your executive team in motivating the organization to change the way it manages information. Organizational resistance is not discussed thoroughly (to any change really, but specifically to EIS), and I feel that this can be an enormous factor in the EIS success or failure. The bringing on side of your information providers and the selling of benefit to them is critical.

Do you need to set up an EIS support infrastructure?

This ties in with question 15 - it is the idea of having a central EIS group to support your information providers to ensure standards (naming, interface, data architecture), and to provide training and technical support. Actually, I think this and point 15 could be combined, along with a number of other issues and surround the aspect of having end users develop. Specifically:

- Risk
- Commitment of resources and buy-in
- 'Non-intrusive' integration of EIS into normal reporting functions (i.e., not 'extra work')
- Central standards and control (i.e., common 'look and feel', data integration and sharing, coordination of similar, perhaps overlapping EIS development efforts, sharing of tips and tricks)

What is the state of the underlying information sources and their capability to 'feed' the EIS?

I feel that it is very important to discuss the issues of data availability, EIS integration to legacy systems, sophistication of the technical infrastructure (e.g., DSS, LANs, etc.) and other such things. This may be outside of the thesis, but it is clearly a very important issue to someone fully implementing an EIS, and often has an impact on the 'EIS Proposal' and the setting of priorities. For example, the EIS will often highlight the need to revamp or even build operational or data collection systems.

On the issue of priority setting in the face of technical obstacles, there is always the danger of going after 'easy to get' data at the expense of an EIS that is truly interesting.
Bibliography


