INFORMATION ECONOMICS

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There are many elements that contribute to a wise investment decision. Most techniques use cost-benefit analysis (CBA) to measure each proposed project. Economic impact calculations such as return on investment (ROI), internal rate of return (IRR), and/or net present value (NPV) are then applied to compare the value or contribution of each of the alternatives. By this rationale, we would think, the project with the highest economic impact would be funded first, and the project with the smallest economic impact would be funded last. Given that there is always a limit to the amount of funds available for investment, potential projects with low economic impact would rarely, if ever, be funded. But that isn't what happens. The final list of approved-for-funding projects may bear little resemblance to the list of high economic impact projects. Why? Because there are other factors that enter into the overall management investment decision process in addition to the measurable costs and benefits derived through CBA.

DIMENSIONS OF THE INVESTMENT DECISION-MAKING PROCESS

The other factors inherent in the decision-making process (other than cost) are not easily measured, and are expressions of the management strategy for the enterprise. Factors that weigh heavily in the decision-making process may reflect added value, e.g., enhanced economic impact, strategic match, competitive advantage, management information, competitive response, customer satisfaction, and strategic IS architecture. Or they may reflect risk and uncertainty surrounding the project, such as organizational risk, IS infrastructure risk, definitional uncertainty, and technology uncertainty.

Without a systematic approach to assessing these additional factors, investment decisions will be less than optimal. The purpose of Information Economics is to develop this systematic approach to the decision-making process that accurately reflects the strategy of the enterprise. We will define and discuss the most frequently found categories of intangible benefits, risk and uncertainty, and illustrate how to translate the strategy of the enterprise into a weighting, decision-making schema.

COST-BENEFIT ANALYSIS

Information economics goes beyond traditional methods of evaluating information systems projects, which are usually based on a return on investment capital budgeting model. Other non-monetary dimensions, which may be of considerable long-term value to the firm, are usually ignored by the traditional processes. Using information economics, managers can improve the way they select among IS investment possibilities by evaluating each project's perceived contribution to the corporate or line of business goals.

Today's answer is information economics. Information economics works to measure and justify the value of information technology based on business performance. By considering justification separately from technical viability, a more accurate estimate of the economic impact of a project or investment can be determined. The challenge: ensure that proposed information technology applications result in improved business performance.

Previous cost-benefit methods for evaluating investments dealt with discrete projects. These methods depend on a linkage directly to cost avoidance or cost displacement. Management now expects information technology to contribute to the success of a product or product line, or to create a product that will be offered as a service by the line of business. These systems are most closely associated with LOB (and enterprise) success. They link to the bottom-line performance of the LOB, and they contain new elements of risk that are not addressed by the typical IS proposal.

To address this wide range of investment opportunities in an even-handed manner, the justification process must expand to embrace new techniques to quantify the new risks. The information economics structure encompasses three categories of factors: economic impact quantifications, business domain assessments, and technology domain assessments. These

factors combine to portray a true economic value for the project. The innovative revenue-producing or revenue-enhancing applications designed to gain competitive advantage can then be prioritized along with investments in architectures, infrastructure support, and maintenance of current systems.

EMERGENCE OF INFORMATION ECONOMICS REQUIREMENTS

Two concepts have emerged to be used as descriptors by the information systems professional: competitive advantage and backbone architectures. Competitive advantage (Porter, 1985) focuses on the competitive value of computing and information technology to the line of business and enterprise. Current marketplace pressures have led senior business managers to expect their information systems managers to accomplish computer implementations that will gain competitive advantage. At the same time, greater attention has been focused on the backbone systems of the organization.

Emphasis on both these systems types pose difficult choices, particularly when the available resources are limited. How does one balance the maintenance of current systems with the support of new LOB or enterprise infrastructures, or investment in information architectures with the creation of competitive advantage applications for the line of business? How does one address the many associated problems in information technology and business in a cost-justifiable manner?

EVALUATION TOOLS IN THE LINE OF BUSINESS (OR ENTERPRISE) CONTEXT

Financial officers and chief executive officers (CEOs) show little interest in state-of-the-art information technologies unless they can be convinced that financial performance for the LOB or enterprise will benefit. Information technology must either improve performance of the current organization, or improve the outlook for new business opportunities and strategies. Information economics works to achieve cost and benefit quantification through communication and consensus between and among the business and technology domains of the enterprise.

Appleton (1986), who has written extensively on information resource management, proposes an asset-based life cycle model for information systems. He believes that basic changes should occur in the way that information systems are justified and managed. First, information systems should be managed as the assets they are. Second, information systems should be as financially justified as assets in procurement and development. This concept of asset helps define the problem information economics seeks to solve. To achieve an asset perspective on information systems requires basic changes in the way information systems are currently justified.

FINANCIAL JUSTIFICATION TECHNIQUES

Information economics uses several financial justifications techniques to assess potential information technology applications in calculating a return on investment. They include the following: traditional CBA; value linking; value acceleration; value restructuring; and innovation valuation (Parker, Benson, with Trainor, 1988).

Traditional CBA

Traditional CBA fits most easily with the views of financial planners, and supports the traditional views of the business domain of capital investment and consumption. Standard cost-benefit analysis is effective when dealing with cost-displacement or cost-avoidance issues. It is useful for supporting tactical plans. The technology manager can apply his or her enterprise's method of justifying long-term capital investment to the architecure-based and infrastructure-based projects. This is successful if technical management knows business strategy, and has an IS strategy, master plan, and blueprint in place to support the firm.

Enhanced ROI, IRR, or NPV

Value linking and value acceleration analysis are techniques to assess costs that enable benefits to be achieved in departments most often outside of IS. This can happen via a ripple effect (value linking). For example, an automated rating and billing application will reduce the number of billing errors. Labor savings will occur as a result of fewer manual billing adjustments. More accurate billing will reduce the annual loss of income due to undetected billing errors. Benefits may also occur more quickly (value acceleration), accelerating a measurable effect on the bottom-line performance of the line of business or enterprise. Using the same example application of automated rating and billing, a one-time benefit (value acceleration) is created by being able to get the billing out more quickly, thus enabling earlier collections. Both value linking and value acceleration are rooted in economics, rather than business finance.

Value restructuring analysis assumes that because a function that does not directly contribute to an end-product exists within an organization, it has some recognized value. Research and development, legal, and personnel departments are examples of such functions that support the LOB or enterprise. Here, we estimate the effects of modifying an existing job function. By restructuring employee or department efforts from lower-value to higher-value activities, the value of the employee or department contribution increases through improved productivity. This technique is useful when direct linkage to bottom-line performance is obscure or not established.

Innovation valuation is applied when the financial issues change from measuring to evaluating and choosing among new, untried, and unproven alternatives. Innovation valuation is useful for new, unprecedented applications of information technology, since it considers the value and benefit of gaining and sustaining competitive advantage, the risk and cost of being first, and the risk and cost of failure.

SHIFTING FROM BENEFITS TO VALUES

Values beyond the measurable benefits based upon return on investment must also be evaluated and included. The sum of these evaluations then becomes the means of ranking alternative information systems projects.

The source of these values depends on the character of the business itself. They are not commonly definable in strictly fiscal terms. For example, we keep reading about the information economy. Gurus and pundits forecast a new competitive order based on information and information-based services. Information becomes the foundation of competition. Consequently, the basis for planning and justifying information technology projects must reflect the new value of information to the business.

Information economics expands the traditionally limited view of economic benefits; it shifts the focus to value. A company gains value from information technology in diverse ways. The idea of value, the benefits in cost-benefit analysis, originated with cost reduction. We have expanded the idea of value to include the following classes: enhanced views of return on investment, strategic match, competitive advantage, management information, competitive response, service and value, and strategic IS architecture.

Enhanced View of Return on Investment (Economic Impact)

In order to provide enhanced view of return on investment, the commonly used ROI, IRR, or NPV calculations may require special consideration when applied to IS application development projects. The usual difficulties in carrying out this analysis, for example, choosing an appropriate discount rate and correctly evaluating all relevant investment alternatives, apply with special force to the consideration of such projects as, for example, an investment in computer integrated manufacturing. IS projects of this nature typically have a longer useful life than non-IS projects, and provide benefits (better quality, greater flexibility, technological expertise) that can be leveraged into other strategic investments for competitive advantage, which a typical capital justification process does not begin to quantify.

Furthermore, IS application development projects are appearing that can extend the concepts of improved operating efficiency and functional effectiveness beyond the boundaries of a single firm. These inter-organizational systems are a new phenomenon. Using electronic data interchange (EDI) between companies, firms integrate their strategic plans. Information economics can identify opportunities for inter-organizational systems, viewing the object of analysis as two (or more) organizations instead of one.

Strategic Match

Strategic match assesses the degree to which the proposed project responds to established corporate and LOB strategies and goals. This dimension emphasizes the close relationship between IS planning and corporate planning, and it assesses the degree to which a potential project contributes to corporate strategy. For example, a university strategy would be based on the recruitment of students. A system that improves the recruitment of quality students becomes especially valuable.

Projects that form an integral and essential part of the corporate strategy will be assigned a higher strategic matching score than those projects that do not, regardless of the economic impact calculation. Obviously, there are many ways to obtain a favorable economic impact. There is, however, a cumulative effect of obtaining the economic impact and moving toward a broader corporate purpose. This dimension assesses the value of moving toward that long-term goal (and implicitly requires its existence).

Competitive Advantage

Competitive advantage evaluates the degree to which the proposed project provides an advantage in the marketplace, for example, inter-organizational collaboration through electronic data interchange. Porter (1985) identifies three basic goals that a company must achieve if it is to gain competitive advantage:

1. Alter the industry structure: The project must change the degree to which buyers, suppliers, new entrants, and substitutes or rivals influence competition.

2. Improve the organization's position in its existing businesses: In general, this is intended to gauge the extent to which a project can differentiate a company's products or services, or change the competitive scope of its business.

3. Create new business opportunities: Under this heading, there are several ways a project can contribute to competitive advantage, including the sale or use of information as a by-product of the current business and the use of internal information processing capabilities to start a new line of business. Airline reservation systems such as American Airlines' SABRE and United's Apollo are good examples of this kind of value. The competitive advantage dimension requires that a value be placed on a project's contribution to achieving one or more of these objectives.

Management Information

Management information is an assessment of a project's contribution to management's need for information on core activities, e.g., activities directly involved in the realization of the firm's mission, as distinguished from support and accounting activities. Support functions supply resources to the core activities, such as spare parts inventory, truck maintenance, and so forth, for a trucking company. Accounting activities translate the core and support functions into financial terms.

The ability of management to make informed decisions is important to all companies. Assessing a project's contribution to the core activities of the business requires that the company has identified its critical success factors. A firm whose critical success factor is on-time delivery will use a system that reports daily performance on this factor in order to control its business.

Competitive Response

Competitive response evaluates the degree of business risk associated with not undertaking the project. Although similar to the concepts of opportunity cost and competitive advantage, this dimension also includes the risk of losing market share that, once lost, may be difficult or even impossible to recover. For instance, the installation of automatic teller machines at one back forces competing banks to offer the same service. Competitive response looks at the timely implementation of an information systems project as a possible preemptive move to prevent the competition from gaining a foothold.

Service and Value

Measurements of customer satisfaction (service and value) must be made from the customer's viewpoint. This measurement takes into consideration such things as ease of access, credibility, competence, reliability, courtesy, security and responsiveness. It also attempts to measure the degree to which customers "like" to do business with the company.

Strategic IS Architecture

Strategic IS architecture assesses the degree to which the proposed project fits into the overall information systems direction. It assumes the existence of a long-term IS plan, i.e., an architecture or blueprint that provides the top-down structure into which future data and systems must fit. A barcode project in a library may be required to enable a variety of other applications systems. Hence its value is derived from its role in the system's architecture.

Summary of Business Values

We have described each of the value classes in terms appropriate to profit-motivated enterprises. However, similar values are appropriate for non-profit organizations and governmental agencies and entities. Each has an underlying basis for its value to the company (or LOB), and information economics recognizes this value with an appropriate assessment. For example, a truck leasing company obtains new competitive advantage from a system that improves route and service station information provided to its customers. This system neither reduces costs nor creates a new market, yet it has a significant impact on increasing its percentage of repeat rental customers and hence adds value to the company's competitive position.

In combination, the value classes we have suggested provide an appropriate checklist for identifying benefits usually considered as intangible. In traditional cost-benefit analysis (CBA) methods, simple ROI calculations represent an attempt to quantify as much as possible. Nevertheless, the calculations of simple ROI, net present value (NPV), or internal rate of return (IRR), all techniques embraced by CBA, alone cannot represent all of the factors that management must consider in the investment decision-making process.

ADDRESSING THE PROBLEM OF RISK AND UNCERTAINTY

It is not sufficient to fully define value in order to make the best choices among IS projects. We also need to consider the full dimensions of cost. Just as information economics looks beyond benefits to value, it looks beyond simple costs to risk and uncertainty. Information economics includes the following classes of risk and uncertainty for profit-motivated enterprises: strategic uncertainty, organizational risk, IS infrastructure risk, definitional uncertainty, and technological uncertainty. They also apply with a slightly different interpretation, or definition, in the non-profit sector.

Strategic Uncertainty

Strategic uncertainty is an assessment of the degree to which the business strategy is likely to succeed. That is, information technology projects associated with a risky business strategy are also at risk, a fact to consider in assessing a project's viability. Robotics and flexible manufacturing may reduce costs. Whether a strategy of reduced cost will produce additional business is another question. If the uncertainty will have a primary impact on the measurable benefits, it can be addressed as part of the economic impact calculations. If, however, the uncertainties are associated with the intangible benefits, it should be addressed as a separate factor.

Organizational Risk

Organizational risk is an assessment of the degree to which an information systems project depends on new or untested non-IS corporate or LOB skills, management capabilities, or experience. For example, a business unit that installs on-line terminals to interface to its customers runs the risk of lack of acceptance.

While a project may look attractive and the technical skills may be available, an unacceptable level of risk may still be associated with the project if other required skills are missing. This category also focuses on the extent to which the organization is capable of carrying out the changes required by the project, that is, the user/business requirements. This does not include the technical organization, which will be measured under the category of infrastructure.

IS Infrastructure Risk

The assessment of IS infrastructure risk is essentially an environmental assessment, involving such factors as data administration, communications, distributed systems, etc. It assesses the degree to which the entire IS organization is both required to support the project, e.g., the degree of non-project technical support investment necessary, and the degree to which it is prepared to do so. A project that requires the support of several functional areas is inherently more complex and difficult to supervise, and it depends on factors that may not be under the direct control of the IS project manager.

The employment of a relational database as part of the IS strategy to improve performance is an example of investment in the IS architecture. Relational databases are not risky in and of

themselves. However, the first applications system developed within an enterprise that depends on this database may represent significant risk, due to the requirement for the application of new skills, training, and software.

Definitional Uncertainty

Generally, definitional uncertainty assesses the specificity of the user's or business' objectives that are communicated to the IS project personnel. When the user cannot properly describe a problem, the technology department is hard-pressed to supply an answer. Essentially another measure of risk, this dimension relates a project's potential to reach objectives to the degree to which they can be specified.

Technology Uncertainty

Technology uncertainty assesses a project's dependence on new or untried technologies, which may involve a single technology or a combination of new technical skills sets, hardware, or software tools. For example, a main-frame staff designing and building a complex personal computer (PC) application can face major difficulties in implementation. A project may be inherently risky if it requires the introduction of an untried technology.

A DECISION-MAKING PROCESS

How do managers successfully choose between alternative investments? The problem is complicated. Some investments improve the infrastructure: for example, a main-frame computer, personal or departmental computers, a communications network, and database and systems development software. These investments create the environment for many individual application projects, just as a factory and its utility and heating systems provide infrastructure for the production company's product lines. Other investment decisions concern individual projects. Should a company install an order entry system or a marketing intelligence system? Both infrastructure and application project decisions are ultimately priority decisions. Which of the many possibilities are the best and therefore deserve support?

We have talked about traditional CBA and economic impact calculations at the beginning of this chapter. And we talked about added values due to increased productivity caused by job restructuring (value restructuring); the ripple effects within an enterprise due to technology improvements (value linking and value acceleration); and values created through innovation. Management concensus will converge around an economic impact estimate for an IS project with any of these characteristics because a non-IS management is familiar with making investments in plant, equipment, and engineering using similar criteria.

What is uncomfortable for IS and non-IS management alike is having to make investment decisions based largely on assessments of intangible benefits, risk, and uncertainty in an equitable way that assures the long-term health of the enterprise, takes advantage of short-term windows of opportunity, and supports organizational responsiveness to change.

Strategy is expressed through the planned allocation and expenditure of resources (people, money, material) over a period of time in support of a pre-determined, pre-defined goal. The goal can be a simply stated one, such as 'be the industry leader.' It can be supported by a number of objectives such as 'attain market share of 10%,' or 'achieve return on assets (ROA) of 8%.' Other objectives might be to be first with new products by investments in research and development, low cost leader, or grow earnings by 15% per year. A two-step assessment process is necessary to evaluate investment alternatives. First, we need to systematically define the business (investment) strategy in terms of identifiable tangible and intangible benefits, and risk and uncertainty, to achieve the attainment of the predetermined goals. And, second, we need to measure the investment in each project against the ideal (perfectly strategic) yardstick of maximizing the strategic tangible and intangible benefits, and minimizing the risks and uncertainties. Thus each project is compared to the ideal for each element of the business strategy.

By this process, a project score is developed, so that, for example, an investment in the infrastructure can be compared to an investment in the development of software to provide competitive advantage. The ability to compare unlike investment opportunities in a systematic, equitable way is central to the enterprise's ability to maximize its strategic investment opportunities in IS applications and technology.

UNIQUE INVESTMENT PROFILES

Every enterprise is different, whether in size, structure, or strategy. Therefore, every strategy profile will be uniquely implemented given its current IS application portfolio and investment, its business strategy, and its level of resources available for investment. We can compare the differences between an aggressive company, a regulated public utility, a non-profit service organization, and a private university.

> The aggressive company: The economic impact of the investment for one enterprise represents 50% of the investment profile. The remaining 50% of the values are: 10% for strategic match, 10% for competitive advantage, 10% for management information, 5% for competitive response, and 15% for strategic IS architecture. The risks and uncertainties represent negative decision factors of up to 5% for organizational risk, 10% for definitional uncertainty, 10% for technical uncertainty, and 10% for IS infrastructure risk. This strategy decision profile was used by an aggressive company in a highly competitive market. They were attempting to significantly improve their competitive position by providing quality service rather than compete on price, and at the same time service some remaining long-term debt incurred during an earlier acquisition period.
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> A regulated public utility: The strategy profile of a regulated public utility would be different, since their rates are generally regulated by some form of public utilities commission. Rate (price) changes must be approved by the commission

and must be cost-justified. For example, a public utility might have a strategy of economic impact of 80%, 10% for strategic match, 5% for management information, and 5% for strategic IS architecture. The negative decision factors might be 10% for definitional uncertainty and 5% for technical uncertainty. This allows the focus to be on measurable benefits, and limits a strategic (competitive) investment focus.

A non-profit service organization: The strategy profile of a non-profit service organization would be different, yet again. Here, the focus may be 100% economic impact, e.g., a scholarship fund loaning out 100% of the dollar donations it solicits, where all labor is volunteer. Yet an organization strategy with components of strategic match, competitive advantage, management information, and organizational risk certainly applies to the management and investment of the time of the volunteer labor. So from a value perspective, which includes both the dollar donations and the time donations of the volunteers, the actual investment profile might be more like 50% economic impact, 20% strategic match, 20% competitive advantage, and 10% management information, with 25% organizational risk. The strategy is to increase the number of donors and yield without increasing the numbers and quality of volunteers available. Here, strategic match might be defined in terms of the niche of service provided, e.g., scholarship funds for American Indian students; competitive advantage defined in terms of the American Indian Scholarship Fund competing with the United Negro Scholarship Fund to increase its market share of the total scholarship dollars donated, and management information in terms of identifying foundations and corporations currently giving grants.

Organizational risks for a volunteer organization are always great. Do the skills to write successful requests-for-grants exist in the pool of volunteers? Do the skills exist in the volunteer pool so that fund-raising events such as Buffalo Venison Dinner can be planned, publicized, prepared, and carried out successfully?

A private university: This organization competes for the best students and the best faculty. And it competes for research grants from federal and state governments and from private industry. It does this by maintaining a critical mass in each of the subject areas it is engaged. Competition is generally not based on cost, e.g., tuition. Scholarships and grants in aid are offered if a quality student demonstrates an inability to pay the tuition. Buildings and endowment funds represent little of the real assets of the successful private university. The assets are the students, the faculty, and the graduates. Since the tuition fee rarely covers the cost to the university to educate the student, one would think that the investment strategy of a private university might be maximization of measurable benefits. Generally, it is not. The emphasis is on generating value via ways to continue to attract the best students, faculty, and research grants in a stimulating, thought provoking, and challenging environment. Thus the investment profile of a large private research-oriented university might reflect a small measurable

economic impact of 15%, with a heavy emphasis on the values relating to strategic match of 20% (e.g., does this support our current strategies for undergraduate, graduate, and research lines of business?); competitive advantage of 30% (e.g., will this provide the competitive advantage to attract the best students, the best faculty, and the finest research grants?); competitive response of 20% (e.g., will this maintain the current edge enjoyed over competing institutions?); and strategic IS architecture of 15% (e.g., will this provide future facility to respond competitively?). The strategy of the undergraduate line of business is to increase the number of quality students through improved recruitment. The strategy of the research line of business is to increase the number of research projects through more productive faculty and facilities. This may make the university very risk averse in one way, i.e., organizational (business) risk. It cannot afford to drive away current students or faculty. It may be much more inclined to accept risks relating to technology issues of definitional and technical uncertainty. A billing application might be of moderate importance to a commercial enterprise because it represents a more accurate and time-saving approach. Billing is of significant importance to the public utility, as it may be barred form billing retroactive rate increases. The function of billing for the non-profit service organization will most often take the form of personal solicitation by volunteers or through pledge fulfilment. And billing of tuition would become important for the private university only if it adversely affected its image.

At one level, information economics is a simple collection of computational tools to rank benefits and costs of information technology projects. This is the traditional role of CBA. However, information economics looks beyond CBA to deal with projects that previously have been difficult or impossible to assess, such as those that have strategic impact on the company. To this point, these investment decisions have been an act of faith on the part of management, and have been guided more by a project champion or a feeling of supporting the corporate culture rather than specific guidelines or criteria. Information economics looks at supply side investment in the infrastructure, e.g., creating the environment.

At another level, information economics is a new conceptualization of the decision-making process. Every proposed investment in programmers, applications, or hardware, should be justified, but every potential investment has unique characteristics. Resource allocation means choosing between alternative investments. For example, should you install a relational database management system, buy the financial reporting system software package, or hire a PC support professional? The reasons for choosing among alternatives are extremely difficult to determine. Yet managers must regularly make these decisions and live with the consequences. Our purpose is to expand the set of economic tools beyond CBA to embrace competitive advantage and infrastructure, while at the same time providing guidance to the decision-making process itself.

Making the Crucial Distinction

Information economics applies a decision framework that separates the business justification for information technology from the technical viability of the proposed application. Conceptually, this is a crucial distinction. Both are necessary, but the assessments are different and should be determined separately.

From the business perspective, justification is based on the project's value compared with its cost, risks, and uncertainties. This raises two key questions. First, what is the project worth to the business? From the technology viewpoint, viability is based on the resources available compared with the resources needed to provide the services. Second, does the business have the resources to complete the project? The business must be willing to dedicate the level of resources necessary to overcome the identified risks and uncertainties. Separating the two perspectives allows evaluation of the information technology values and priorities for the business as distinct from the infrastructure, staff, and facilities required.

New information economics tools help to define value more completely and, more importantly, help to create a decision process. The process develops a measure of value and an understanding of costs and potential sources of failure or risk. In addition, the process creates consensus among management groups. The evaluation covers both business feasibility (the value to and the effect upon business performance) and technical viability, including risk identification. By ranking feasibility as it is perceived by each of the affected management groups, information economics helps to develop a consensus and helps enhance each group's awareness of others' concerns and evaluations.

Information economics provides a powerful tool for analyzing and allocating resources to support business strategies and performance. Information technology is a fundamental force in reshaping the business world. It is crucial that every manager be able to determine the value of information technology to his or her organization.

Underlying all of this is a current of change. The fundamental impact of information technology is the change it causes in the competitive strength and capability of business. First, we propose that the real benefit of information technology results from a change in the business. Information technology changes products, markets, management styles, and organizational structures. Without change there is no benefit. Second, we propose that the ways in which a company plans and manages its information technology also change, particularity in how decisions are made about priorities and investments in the infrastructure. Finally, we propose that the use of information technology should be directly linked to its impact on business performance. This is the key to information economics, since without a link to business performance information technology is irrelevant. With it, information technology becomes a powerful tool with which management can improve economic performance and thus the overall strength and vitality of the organization for which it is responsible.

SUMMARY

Information economics is a guide to business investment strategies for computing and information systems. It focuses on the competitive advantage of information systems, and methods for evaluating and justifying computer systems for competitive and strategic impact in the business. The result is a comprehensive decision-making approach that a company can apply to best allocate its scarce resources, i.e., financial and information systems resources, for the maximum benefit to the organization. Of the two-part method, this is the first -- the bottom-up approach.

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