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# Information System Design:

## A Systematic Way to Analyze IT in Your Business

By Erica L. Wagner, Ph.D.,
Gabriele Piccoli, Ph.D.,
and Sharon Louthen

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## A Systematic Way to Analyze IT in Your Business

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## Executive Summary

# IS Design:

# *A Systematic Way to Analyze IT in Your Business*

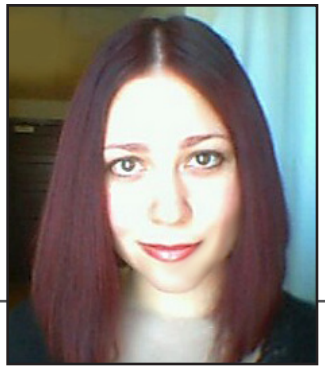
**By Erica L. Wagner, Ph.D., Gabriele Piccoli, Ph.D., and Sharon Louthen**

INFORMATION TECHNOLOGY INVESTMENTS must be thought of in terms of a firm's overall information system. This report explains and illustrates two frameworks that emphasize the role of IT as a fundamental component of organizational information systems, namely, the socio-technical model of information systems (STM of IS) and the information systems cycle. The STM integrates all internal and external factors that bear on the design, implementation, operation, and eventual success of an IT initiative. Using this model requires an analysis of the following factors: the IT hardware and software itself, the people with direct involvement in the information system, the process that those people follow in completing a business activity, and the business's structure, including its organizational design and formal and informal reporting relationships. All of those internal factors and their interactions are cast against the broader context of influences that enable or constrain the business's opportunities. To illustrate the STM, the report examines the case of Nestlé USA's implementation of an enterprise resource planning system. The second framework, the IS cycle, models the business's use of information systems over time, including routine operations and change initiatives. The model's basic concept is that today's information is a valuable asset that, appropriately managed by way of information-system initiatives, can create tomorrow's business opportunities. In illustrating this model the report presents the case of Harrah's Entertainment. By focusing on customers' use of a business intelligence program, Harrah's was first able to determine who were its best customers (surprisingly, not high rollers), and then devise ways to encourage those good customers to become even better customers while increasing the ranks of the profitable customers through an attentive attraction strategy. The concluding insights for management, which are illustrated by hypothetical situations, should help guide the design, development, management, and use of organizational information systems. In particular, it's worth noting that IT initiatives cannot precede organization change (although implementing an IT system will undoubtedly affect the entire business), one does not always need to purchase the "best" or most recent technology, and information systems are constantly evolving as a business changes.

## About the Authors

***Erica L Wagner***, Ph.D., is an assistant professor at the Cornell University School of Hotel Administration (elw32@cornell.edu). She focuses her research on information and communication technologies within organizational contexts, with special attention to issues of strategy, negotiation, power, and transformation of work. Her work is published in *Information and Organization, Journal of Strategic Information Systems,* and *Cornell Hotel and Restaurant Administration Quarterly.*

***Gabriele Piccoli***, Ph.D., is an assistant professor at the School of Hotel Administration (gp45@cornell.edu). Widely published in information systems and information technology journals, his research and teaching expertise is in the strategic application of information technology, electronic commerce, and IT-enabled customer service.



***Sharon Louthen*** is an undergraduate at the Cornell University School of Hotel Administration, with special interests in design, sustainable development, and information science.

# IS Design:

## A Systematic Way to Analyze IT in Your Business

**By Erica L. Wagner, Ph.D., Gabriele Piccoli, Ph.D., and Sharon Louthen**

DESPITE THE WELL-DOCUMENTED CHALLENGES associated with achieving satisfactory return on investments (ROI) in technology, hospitality companies today continue to spend vast amounts of money on information technology (IT) in the constant effort to improve their competitive position. With IT spending on the rise, there is little doubt that being able to wring value out of these investments is of paramount importance. As a step toward this goal, we propose in this report what we believe is a useful perspective for approaching IT investments.

As we explain here, the most effective way to analyze information technology is to focus on the way IT is used to implement your business strategy. In other words, you should focus on information system (IS) design. As we discuss in this report, a firm's objective when introducing and using information systems is to fulfill its information needs, now done almost universally with IT-based information systems. As we show in this report, speaking of IT investments in a vacuum is meaningless until you identify specific information-processing requirements and goals. That is the reason for this report's integrated focus on information systems.[1] Technology can be implemented suc-

[1]For further details of information systems research and its relevance for hospitality practitioners, please see: G. Piccoli and E.L. Wagner "The Value of Academic Research," *Cornell Hotel and Restaurant Administration Quarterly* Vol. 44, No. 2 (April 2003), pp. 29–38.

cessfully only as an integral part of an information system.

In this report we present the following two analytical frameworks: the socio-technical model of information systems (STM)[2] and the IS cycle.[3] We believe that these two frameworks are valuable because of their ability to support systematic and disciplined analysis of software selection, IS design, and system failure. By using these frameworks to guide their thinking, managers can be sure to complete a comprehensive analysis of information-system needs, rather than being tempted to stop after identifying some kind of information technology, even if that IT seems to fit the bill for a competitor. In that regard, working with the models challenges conventional wisdom and management fads and fashions that at times mislead decision makers (e.g., everyone needs customer-relationship-management software), or focuses on only part of the story (e.g., you must train your employees when new software is introduced).

Hospitality leaders have already seen how purchasing IT has influenced their firms' strategic focus. Take, for example, the purchase of check-in kiosks by airlines and hotels. This decision has reinforced the trend toward customer self-service. If such kiosks fit a hotel's or airline's business strategy, they are wise investments, but if they're implemented due to a bandwagon effect, the results are wasted resources. Wide-scale media coverage, vendor pressure, and a lack of solid models to guide managers' independent thinking often create such bandwagon effects where, to use the empty management buzzwords one hears so often, firms "benchmark their performance" to "industry best practices" and then purchase "table stakes in killer apps" and "mission critical" IT. This situation is indicative of a perilous mindset—one that is focused on investing the next innovation without a thorough analysis of the implications that such a purchase will have on company performance. We believe that the frameworks presented here will arm practitioners with tools to enable independent thinking. We are convinced that independent thinking of this kind will lead to effective use of technology in hospitality ventures.

***The two frameworks presented here support systematic and disciplined analysis of software selection—and provide a rational approach for resisting IT-management fads.***

To illustrate the use of the frameworks we analyze two well-known hospitality cases, one in which an IT solution misfired and the other where an information-system approach has been successful. We conclude this report with our insights and suggest implications for practice.

## The Socio-technical Model of Information Systems

The socio-technical model of information systems has a long tradition of research and is widely accepted in practice (see Exhibit 1, on the next page).[4] Information systems are operational mechanisms used by business organizations to fulfill specific information needs in an effort to be more efficient or effective when seeking to achieve their strategic

[2]R.P. Bostrom and J.S. Heinen, "MIS Problems and Failures: A Socio-technical Perspective—Part I: The Causes," MIS Quarterly, Vol. 1, No. 3 (1977), pp. 17–32.; and R.P. Bostrom and J.S. Heinen, "MIS Problems and Failures: A Socio-technical Perspective—Part II: The Application of Socio-technical Theory," *MIS Quarterly*, Vol. 1, No. 3 (1977), pp. 11–28.

[3]R. Watson, *Data Management: An Organizational Perspective* (New York: John Wiley & Sons, 2002).

[4]This perspective was first articulated in the 1940s by researchers at the Tavistock Institute in London, England. Based on a study of the use of new technology by coal miners, the researchers found that organizational structures, business processes, and the miners themselves had to reorganize their work life into team-based activities if they were to use the technology. See, for example: E.L. Trist, *Organizational Choice: Capabilities of Groups at the Coal Face under Changing Technologies: The Loss, Rediscovery, and Transformation of a Work Tradition* (London: Tavistock, 1963).

objectives. According to this view, any formal organizational information system has the following four components: information technology, people, process, and structure.

The four components of the system are (or should be) organized to achieve an explicit goal (or a set of goals) defined in terms of specific information processing functionality. Examples of typical IS goals are increased efficiency of reservations transmission from distribution partners, improved customer targeting and valuation, enabled team selling of group business, and the efficient utilization of perishable inventory. Each of these examples represents a situation where the firm establishes some information processing requirements. Note that, while the IS goals should fit with the firm's strategic goals, the IS cannot ensure that the correct business objectives have been chosen. Consequently, an IS is deemed successful when its information processing goals are achieved—even in the face of business failure due to the pursuit of an ineffective strategy.[5]

***An information system comprises four elements: people, process, structure, and (of course) technology.***

## The Four Components of an IS

**IT.** The IT element comprises equipment—hardware, software, and telecommunication equipment. The cornerstone of modern information systems, IT enables and constrains action through rules of operation that stem from its design. For example, if you choose to collect and store data using a spreadsheet tool such as Microsoft Excel rather than using a relational database application such as MS Access, you are limited in your activities by the design of the spreadsheet software. Excel will allow you to analyze your stock portfolio, but it will not allow you to build meaningful, efficient, and robust associations between separate pieces of data. In addition, it is important to remember that software design, still as much an art as a science, is driven in part by choices and opinions of the developers and programmers. As the following comment reminds us, designers' perspectives on how technology "should function" stay with the product long after it leaves their office.

*InfoWorld* columnist Bob Lewis put it well when he said, "Every piece of software is an opinion." This is loosely translated to mean that it represents the developing company's or programmer's viewpoint on how the data should be represented, organized, and manipulated and that's seldom going to be the same as anyone else's.[6]

**People.** When considering the people component of the information system, we are referring to those individuals or groups directly involved in the information system. Those who are involved indirectly through their influence as a customer or a regulatory body are considered part of context (as we discuss later). The starting point for modeling the social component of a socio-technical information system is to recognize that people—whether they are users, managers, or IT professionals—come to the table with their own set of skills, attitudes, preconceptions, and personal agendas. These prejudices influence the ways in which individuals and groups interact with IT. Any useful analysis resulting from the STM of IS requires a genuine understanding of stakeholder groups and how they influence the system and are influenced by it.

**Process.** A business process is the series of steps necessary to complete a business ac-

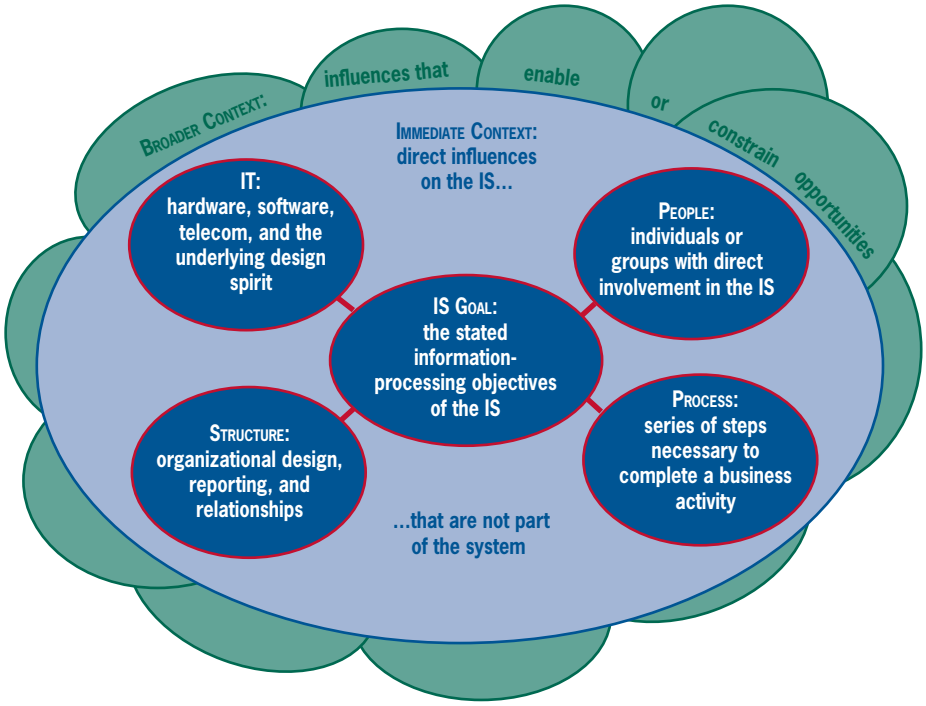
[5] Note that this definition of success and failure is a simplification because it assumes a static view of the firm. In reality, goals change over time and are not universally shared. They may differ by group (e.g., senior management, middle management, front-line employees).

[6] J. Inge, "Islands of Automation: Bridging the Gap Between Disparate Systems," *Hospitality Upgrade*, Summer 2002.

tivity. For example, the process of checking in a guest could be defined by the following steps: (1) guest proceeds to the front desk and provides (or is asked for) his or her name; (2) front-desk agent checks current reservations and assigns an available room; (3) front-desk agent makes the room key and asks for a credit card to imprint; and (4) the guest is directed toward his or her room. Gaps can exist between the official business processes and customer-service protocols that form the basis of training programs and the informal ways in which these processes are actually performed. Whether to model the formal or informal process is a function of how the framework is being used. When designing a new IS, it makes sense to focus on the official business process because one is trying to reengineer the way work is being done and design the new ideal process to be used. For mid-course corrections or when trouble-shooting the causes of IS failure, you should model the actual business process and evaluate any discrepancy with the official business process, as therein may lie the principal failure point. Different stakeholders within a firm often have strong opinions about the optimal way of organizing work. Therefore, regardless of the analytical focus of one's modeling, the process component of the IS should not be cursorily analyzed.

**EXHIBIT 1**

**Socio-technical model of information systems**




**Structure.** The organizational structure comprises organizational design (hierarchy, decentralized, loose coupling), reporting (functional, divisional, matrix), and relationships (communication and reward mechanisms). The business's form influences how a system will be used and, many times, the kind of IT that is purchased to support that system. Organizational structure also influences the appropriateness of certain IT investments. For instance, a loosely coupled organization with a strong culture of independence among its units—Cornell University, for example—may find it difficult to successfully implement highly integrated software, such as enterprise resource planning (ERP). With respect to reward mechanisms, it's important that the software reflect employees' compensation and incentives mechanisms. For instance, it is unlikely that lead-sharing software will foster much teamwork or cooperative selling for a sales force that is paid on commissions, if the commission is credited to the individual who closes the sale. In that instance, the spirit of the technology would clash with the sales force's reward and incentive system.

## Exogenous Influences on the IS

Context defines the environment in which the system is designed, built, used, and managed. As we have indicated, information systems do not exist in a vacuum, but instead are embedded in organizational settings. The issue of scale is important when considering contextual influences, where the immediate context is that which most directly influences the information system but is not part of it, and the broader context is that which indirectly enables and constrains opportunities. For example, the information system used to check in hotel guests might have as the immediate context that of front-desk operations, and the broader context of the hotel brand, property-wide customer-satisfaction initiatives, lodging trends toward commoditization of the product, and brand erosion.

## A Focus on Fit

It should be clear from our discussion of the socio-technical model that this framework is not concerned with optimizing technology itself (i.e., adopting the most innovative technology). Instead, by focusing on how the components of the information system fit together, the STM is concerned with optimizing the IS as a whole (i.e., giving the system the best chance to lead to achievement of its stated goals). While the STM is static in that it captures a snapshot of an organization at a given moment, it is helpful for those involved with (or affected by) the planning, design, development, management, and use of IT. The determination need only to be made on how the model can be best applied at a particular time. Before moving on to the various applications of the STM framework we discuss the IS cycle, which provides a systematic way to follow information over time and analyze how it's being used.

## The IS Cycle

The IS cycle helps one view the various information systems found in an organization in relation to its various information-processing phases. The model is particularly useful for considering business information as a complete cycle, running from routine daily operations through to the change initiatives that are implemented to address any gap that is identified between current operations and desired performance. The model is predicated on the realization that current data and information can support senior management's decision making, which in turn helps an organization prepare for the future.

Typically produced as a byproduct of daily operations and transactions, data have substantial business value when they can be converted into meaningful information. Such data, collected by transaction processing systems (TPSs), should be stored by the firm to create a record that can be analyzed to provide an understanding of the business, often referred to as business intelligence. For example, management information systems aggregate and analyze transaction data from quarterly financial results. This data-analysis stage can be relatively unsophisticated, using tools such as Excel or even a calculator, but more likely is that the enterprise will use dedicated software tools such as decision support systems (DSS), executive information systems (EIS), data warehouses and data marts, and online analytical processing tools. All of the activities conducted during this phase of the cycle should be focused on preparing for the future.

Decisions made in this phase often directly affect the firm's information systems, with the introduction of new systems or the modification of existing systems in an effort to position the firm to achieve its future objectives. The final phase of the cycle is completed when changes to the business inform the ways in which the routine operations are transacted.

It should be clear at this stage that when a firm is designing its IS using the STM, it s managers should also spend some time thinking about the IS cycle so as to make sure that all relevant data are captured and retained in a way amenable to future analysis (e.g., collecting data about the same guest without duplication or inconsistencies so that customer-level

analysis can be performed). We argue that any action in this sphere should be based on data-driven insights and knowledge that have been carefully analyzed. While intuition and experience remain fundamental components of the decision-making process, we find that data-driven analysis is all too often a neglected step. This has been true in part because appropriate data in a useful format often have not been collected, making analysis impossible, too difficult, or too costly. When this situation occurs the relationship of the STM and the IS cycle becomes (unfortunately) apparent.

## Case Studies

In this section, we offer an analysis of two cases. In the first case, we reflect on Nestlé's forward-looking, but challenging attempt to implement an enterprise resource planning program in its U.S. subsidiary. In that case, we point out how a failure to consider the STM model created unnecessary challenges to Nestlé's success in the implementation. In the second case, we examine how Harrah's Entertainment successfully implemented a business-intelligence initiative that culminated in an industry-leading customer-relationship program. Using these examples, we illustrate the use of the models, as well as offer suggestions about when, and for whom, these models are most useful.[7] The Nestlé case exemplifies the value of the socio-technical model of information systems, whereas Harrah's is used to illustrate the IS cycle.

## Nestlé: A Standardization Initiative

> "Nestlé is today the largest food and beverage company. ...We employ 230,000 people and have factories or operations in almost every country in the world."
>
> —*www.Nestlé.com*

In 1997 Nestlé USA chairman and CEO Joe Weller came up with the slogan "One Nestlé" to highlight his effort to integrate the company's formerly decentralized units. As part of that centralization program, the company implemented an ERP-based standardization initiative.

By almost any measure, Swiss-owned Nestlé is successful in its diverse businesses. The food and beverage conglomerate owns approximately 200 companies in 80 different countries. Nestlé USA alone has seven different business divisions and employs over 16,000 people. In addition to its signature Toll House cookies, the firm is responsible for managing such well-known brands as Nesquik, Carnation, Stouffer's, Taster's Choice, and Purina. Due in part to its sizable organizational girth, Nestlé's corporate culture allows considerable autonomy to its divisions. Much of this diversity stems from its acquisition of numerous brands, which had their own headquarters, history, and business practices. There was no standardized way of getting things done, from ordering raw cocoa and vanilla to keeping accounting records. While this decentralization had been an accepted paradigm since a large Nestlé USA umbrella-brand merger in 1991, the resulting inefficiencies required management attention. As an example of the disparate pricing and distribution standards, each factory maintained its own vendor relationships and negotiated a separate price from suppliers. At one point, noted an article in *CIO* magazine (on which this case is based):[8]

***By focusing on how the components of the information system fit together, the socio-technical model is concerned with optimizing the IS as a whole.***

[7] Our analysis is based on previously published accounts of these organizations and their information systems. The Nestlé case is based on our reading of: B. Worthen, "Nestlé's ERP Odyssey" in *CIO*, May 15, 2002, www.cio.com/archive/051502/nestle.html, as viewed July 8, 2004. The Harrah's case derives from our interpretation of: G. Loveman, "Diamonds in the Data Mine," *Harvard Business Review*, May 2003, pp. 109–113.

[8] Worthen, *loc. cit.*

> Nestlé USA's brands were paying 29 different prices for vanilla—to the same vendor. "Every plant would buy vanilla from the vendor, and the vendor would just get whatever it thought it could get," Dunn [CIO, Nestlé USA] says. "And the reason we couldn't even check is because every division and every factory got to name vanilla whatever they wanted to. So you could call it 1234, and it might have a whole specification behind it, and I might call it 7778. We had no way of comparing."

Rationalizing these conflicting mechanisms made sense. However, the decision to standardize operations around an enterprise resource planning (ERP) package and thereby create "one Nestlé" would require a major organizational redesign. The identification of potential difficulties in the upcoming ERP implementation are evident in the mapping of the proposed system using the STM. The gap between a decentralized organizational structure and the highly centralized rationale underpinning ERP software foreshadows major issues that would need to be resolved.

***Nestlé had the laudable goal of integrating its operating systems, and turned to "best practice" technology to create an enterprise resource planning system.***

Nestlé turned to German software solutions vendor SAP to find a "best practice" technology. As the first step in carrying out this software decision, Nestlé USA began its *Best* (business excellence through systems technology) initiative in 1997. Jeri Dunn, CIO of Nestlé USA, was responsible for implementation of the *Best* initiative. She tried to warn CEO Weller and the key stakeholders of the firm about the potential difficulties in the proposed transition:

> "I took eight or nine autonomous divisions and said we are going to use common processes, systems, and organization structures," says Dunn. "[Nestlé SA is] looking at 80 autonomous countries and saying the same thing. They're just taking it up a notch. If they go in with an attitude that there's not going to be resistance and pain, they're going to be disappointed."

Having highlighted these challenges Dunn moved forward with the project. In 2000 the system went live, but it soon encountered problems. *CIO* reported the following:

> By the beginning of 2000, the rollout had collapsed into chaos. Not only did workers not understand how to use the new system, they didn't even understand the new processes. The divisional executives, who were just as confused as their employees—and even angrier—didn't go out of their way to help. Dunn says her help-desk calls reached 300 a day. "We were really naïve in the respect that these changes had to be managed," she admits now.

*CIO*'s report continued:

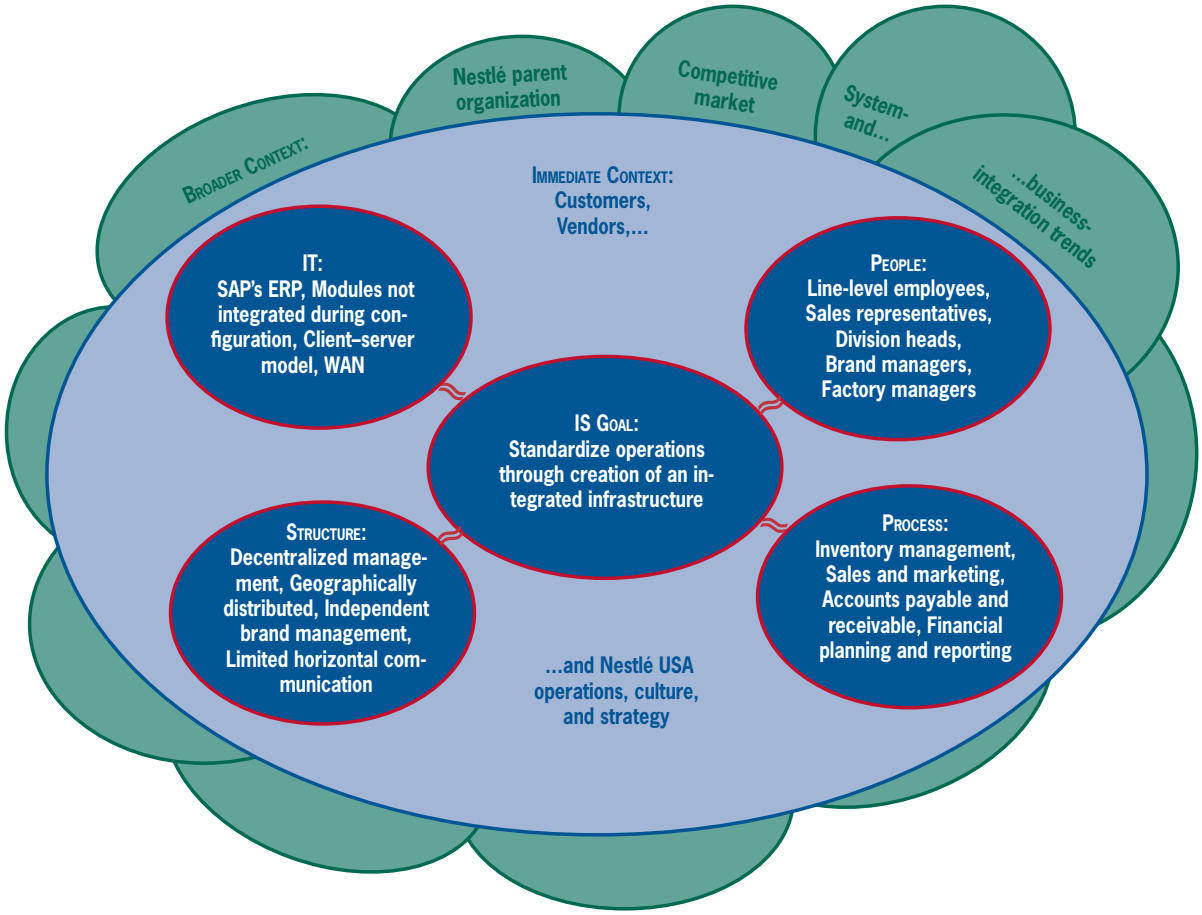
> Nobody wanted to learn the new way of doing things. Morale tumbled. Turnover among the employees who forecast demand for Nestlé products reached 77 percent."[9]

Looking at this quote from the standpoint of the STM, the people affected by the organizational change of which the IT was the bellwether were not ready for it. Practically speaking, with so much technology to upgrade and so little time for training, no one was quite sure whether they were using the new system correctly. Lack of understanding and expertise for this software, which operated in a manner foreign to past processes, caused tensions to rise. As we explain in a moment, it was later determined that although new standardized software modules had been implemented in several divisions, the modules were not integrated with each other, so there was still a lack of real-time inter-divisional communication.

[9] *Ibid.*

**EXHIBIT 2**

**STM analysis of BEST initiative**




## Analyzing BEST Using STM

When the actual *BEST* initiative is mapped using the STM (see Exhibit 2), the complexity of the problem comes into focus. In its rush for standardization, Nestlé failed to align its organizational structure, IT, and people with the integrated business processes that were being introduced during the project. The failure of those three elements is depicted in the model by squiggly lines connecting them to the IS goal. We discuss each in turn.

## Source of Failure

According to the *CIO* reporting of this case, IT certainly played a big part in the initial and costly failure of this information system:

In the rush to beat the Y2K deadline, the *BEST* project team had overlooked the integration points between the modules. All the purchasing departments now used common names and systems, and followed a common process, but their system was not integrated with the financial, planning or sales groups. A salesperson, for example, may have given a valuable customer a discount rate and entered it into the new system, but the accounts receivable department wouldn't know about it. So when the customer paid the discounted rate, it would appear to the accounts receivable operative as though the invoice were only partially paid. In its haste to unify the company's separate brands, the project team had es-

sentially replaced divisional silos with process silos."[10]

As the quote above suggests, the ERP software failed to integrate business functions across Nestlé's value chain. Ironically, horizontal integration of this type is a key benefit of ERP software, which enables discrete business units to communicate seamlessly. In the example above, the sales department was not "talking to" the accounts receivable department (in terms of the software). This created the process silos referred to above, where individual processes were being completed, but communication across processes was lacking. This prevented the achievement of an enterprise-wide infrastructure and caused a breakdown (illustrated in the model by a squiggly line between the IT component and the stated goal of the IS). It is important to consider the systemic effects of such a breakdown.

***By collecting behavioral data on guests enrolled in its affinity program, Harrah's was able to develop a profile of its best customers.***

While a cursory reading of the case may lead to the conclusion that the IT failed, we argue that a second point of failure existed. It is said that people do not like change because it is difficult. Yet we have found that it is often the people who are the linchpin of system success or failure. People may not like change, but they handle it and move through the difficult times to "make it work." In the case of Nestlé, people provided a further point of failure (again marked by a squiggly line). This failure was due to the reluctance of people who were expected to work with the system, but whose disengagement made it impossible to achieve the IS goal. Users were not involved in the design and configuration of the system, and when the ERP went live they were confused. In our snapshot of the *Best* system at Nestlé the people are rebelling, and until they are willing to work with the system it would be considered a failure.

In June 2000, Nestlé USA decided to stop the *Best* project to go back and reengineer the implementation process to be more thoughtful, realistic, and accessible to the employees directly affected by the changes. While the technological rollout had been completed, the business goal of creating "one Nestlé" through an enterprise-wide information system had not been realized because it failed to create an integrated organization across Nestlé's US brands. To accomplish this goal, the gap between the organization's historically decentralized structure and the centralized IT design needed to be closed. The company was seeking radical cultural change and this proved difficult. Once again, this is illustrated in the STM using a squiggly line.

Historically Nestlé had a decentralized and loosely coupled structure—one that could not be expected to change simply with the introduction of the ERP. Aligning organizational structure with the other components is difficult because structure is often entrenched and valued as part of the organization's history. Yet, our analysis shows that a lack of fit between organizational structure and the IS goal is only likely to lead to significant difficulties—as *CIO* commented:

> No major software implementation is really about the software. It's about change management. "If you weren't concerned with how the business ran, you could probably [install the ERP software] in 18 to 24 months," [the project champion] says. "Then you would probably be in the unemployment line in 19 to 25 months."
>
> ...Nestlé learned the hard way that an enterprise-wide rollout involves much more than simply installing software. "When you move to SAP, you are changing the way people work," Dunn says. "You are challenging their principles, their beliefs and

[10] *Ibid.*

the way they have done things for many, many years."[11]

It would take much more communication, solicitation of end user perspectives, and an extended time frame not constrained by the millennium bug that had threatened to cripple legacy systems if the changeover to ERP had not occurred by January 1, 2000. Six years in, the final roll-outs of the ERP were due to take place in 2003 and overall Dunn claims that the ERP has ended up saving the company money.

## Applying the IS Cycle: Harrah's CRM Strategy

In 1997 Harrah's Entertainment was beginning to design an intricate information system with the goal of encouraging brand loyalty among its guests. This system would eventually become the envy of the gaming industry. The process that Harrah's used also depicts how the IS cycle operates, with yesterday's business information becoming tomorrow's business strategy. Harrah's rollout was successful, but it's only fair to note that its implementation was evolutionary rather than revolutionary and less far reaching in terms of scope and magnitude than was the Nestlé's initiative.

The initial Harrah's program rollout, called "Total Gold," was a typical reward-card system modeled after airline frequent-flier reward programs. Any customer could sign up and would then be able to use the card in slot machines and any other retail outlets in the casino to earn reward credits. Participating customers could exchange their credits for perks, such as free hotel rooms, food, and gift certificates.

While handing out freebies to loyal customers and fair-weather guests alike was not really the goal for Harrah's, the Total Gold card system did allow Harrah's to begin building customer-activity information in its central data warehouse. Every customer provided initial demographic data as part of enrolling, while every transaction a guest made thereafter generated behavioral data. Harrah's collected all of these marketing data in its 300-gigabyte data warehouse.

Through mining those data, Harrah's analysts could develop profiles of their most valuable customers (in terms of annual spending at the casino). According to Gary Loveman, CEO of Harrah's, the analysis turned up the unexpected finding that the casino's most important customers are low rollers:

> We discovered that 26 percent of the gamblers who visited Harrah's generated 82 percent of our revenues. We were surprised to find out who our best customers really were. They emphatically were not the gold-cuff-linked, limousine-riding high rollers whom we and our competitors had fawned over for many years. Instead, they turned out to be former teachers, doctors, bankers, and machinists—middle-aged and senior adults with discretionary time and income who enjoyed playing slot machines.
>
> ...We also learned that these customers typically did not stay in a hotel but visited a casino on the way home from work or on a weekend night out. At the same time, we found that our target customers often responded better to an offer of $60 in casino chips than to a free room, two steak meals, and $30 worth of chips, because they enjoyed the anticipation and excitement of gambling itself. We were able to develop quantitative models that allowed us to predict, based on an individual's play, his or her "customer worth"—the theoretical amount we could expect the customer to spend not just during one evening but over the long term.[12]

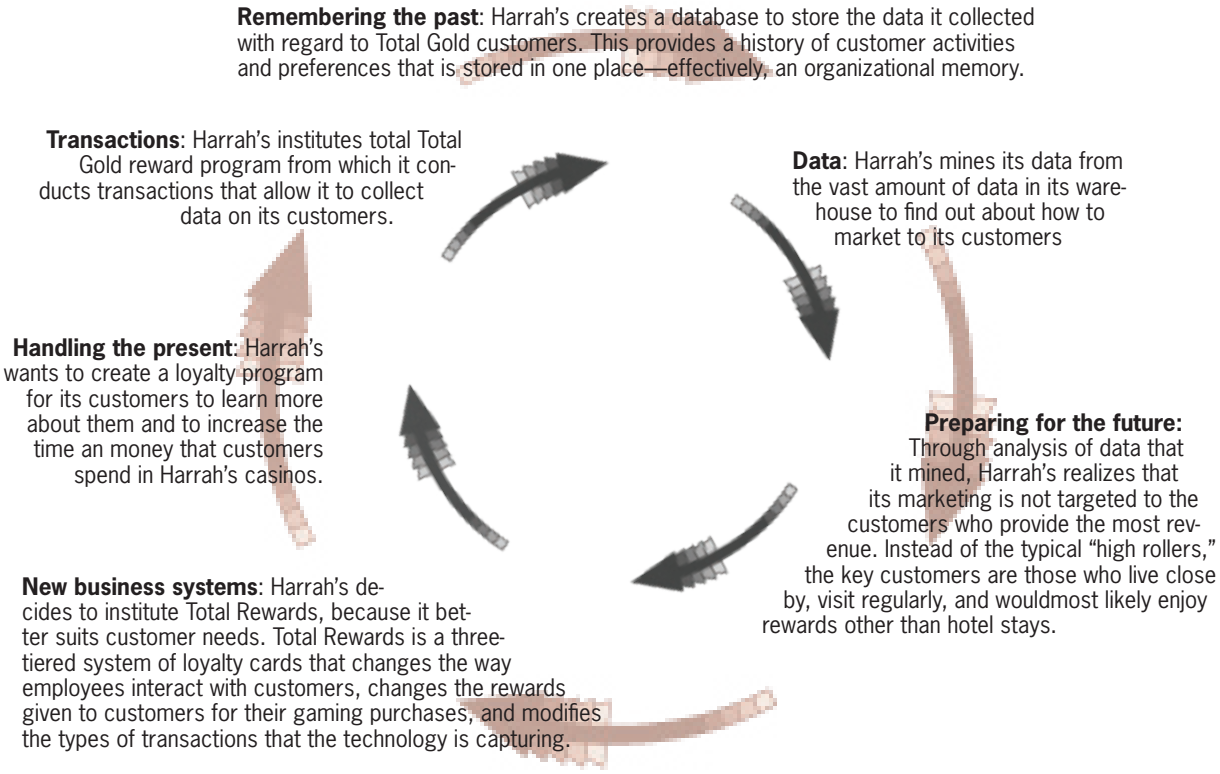
**Turn of the IS cycle.** The knowledge of who constituted its prime customers gave Harrah's the beginning of a competitive advantage in a town where so many operations seemed to be courting high-rolling tourists. As a result of addressing its original concern about how to bring more customers through the door, and then acting on the transaction history that was being stored in a central re-

[11] *Ibid.*

[12] Loveman, pp. 109–113.

**EXHIBIT 3**

**The IS cycle as it applies to Harrah's Rewards initiative**




pository, the company could create meaningful and actionable information to set a strategy and prepare for the future.Through continued data mining and analysis, Harrah's was able to develop a marketing strategy that targeted its most valuable customers directly, while creating more opportunities for market growth by providing tangible reasons for less-loyal customers to "stay and play" more often. This process is illustrated in Exhibit 3.

It was at this point that Harrah's decided to up the ante and the Total Gold program was repositioned and reborn as Total Rewards—a three-tier card system (Gold, Platinum, and Diamond), in which cards were issued to members based on their anticipated annual value to the casino. Visible status reinforcements were implemented wherever possible, such as structural changes in the casino in terms of separate check-in and restaurant waiting lines for each tier. For example, while patrons without cards and Gold members still had to wait in regular lines, Diamond members almost never experienced a wait. The different reward structures gave small spenders direct illustration of the benefits of consolidating their gambling spending with Harrah's and positive reinforcement (e.g., preferred restaurant reservation and seating, members-only access to lounges, priority check in). This clever marketing strategy encouraged guests to spend more to get increasingly preferential treatment.

In the language of the socio-technical model, Harrah's changed its organizational processes and structures in response to its immediate

[12] *Ibid.*

customer context as well as the broader gaming context. As for the IT design, Harrah's decision makers leaned more toward the idea of developing in-house solutions, rather than buy into a pre-packaged system. They had already laid the groundwork for the success of their customer-relationship management system with their Total Gold program and its central database that stored all the customer information. During the growth of its CRM initiative, Harrah's decided to develop and patent its own in-house system of centrally networked software modules. Drawing on Harrah's central data warehouse, these modules were compatible throughout the corporation. This enabled any Harrah's property to "slice and dice" the data, as Loveman puts it, to the "nth degree," as well as allow valuable customers to use their cards (and generate more data) no matter which Harrah's property they visited. The result was a marketing strategy so personalized and effective that many other hospitality companies have tried to emulate it. Loveman elaborates:

> We...set up a series of triggers in the database. For example, if we discovered that a customer who spends $1,000 per month with us hadn't visited us in three months, a letter or telephone call would invite him back. If we learned that he lost money during his last visit, we invited him back for a special event.

By clearly understanding the relationship between business strategy and IS goals, Harrah's designed the components of the system to work in concert.

The IS cycle challenges managers to maximize their information gathering at all stages of business operations. It focuses on the socio-technical model to show the inner workings of the system. Managers can examine the following issues: Are the gears well oiled and running smoothly, or is there a wrench in the works somewhere? What could have been done at each stage of the process to keep it working effectively? What can be done in the future to correct or improve on current processes?

## Insights for Practice

Both of the models and cases that we have discussed here offer valuable insights for hospitality managers. In the following section, we discuss those insights in the context of the common scenarios given on the next page.[13] The models are well suited to address the following three issues. First, when selecting new IT for a firm, one can employ the models to determine which design will best fulfill a firm's information-processing needs. Second, the models are useful for diagnosing problems with failing information systems to determine appropriate corrective action. Third, when planning for or dealing with change, the models provide a vehicle for analyzing the current state of affairs and comparing it to future goals.

*Insight 1:* **Don't put the cart before the horse.**

It should now be clear that technology cannot drive a customer-relationship strategy, as depicted in the first vignette, nor can it precede any other set of IS goals. While it is common for management decisions to be inspired by the functionalities of a powerful software product, the focus must be on IS design if one is to be successful. To do so, a clear IS goal (or set of goals) should be defined. In our CRM vignette (scenario #1), the firm's intention is to improve its marketing efficiencies (i.e., target its best customers). This can be classified as the strategic goal. From this goal the firm should derive a

***By collecting behavioral data on guests enrolled in its affinity program, Harrah's was able to develop a profile of its best customers...and encourage them to spend even more.***

[13] Note that, while seemingly far fetched, both these scenarios are simplifications of real discussions we have had with practicing managers.

## Scenario 1:

Your competitors have been "doing CRM" for some time, and your eight-property luxury-resort company is behind the times. The CEO has asked you to work with the COO to design and develop the chain's customer-relationship-management strategy because he feels that CRM software is the key to increasing marketing efficiencies and targeting the best customers. In your first meeting with the COO, he comments: "I've heard about a great software package that will allow us to quickly implement CRM. The vendor said that this software will enable us to have great relationships with our customers." Three things are clear to you when you leave the meeting. First, the COO is close to buying the software and installing it quickly, hoping to catch the competition in the next fiscal year. Second, the broad charge of the CEO is outlined as "increasing marketing efficiencies." Third, exactly how the software fits with that strategic objective is unclear.

## Scenario 2:

Your 12-outlet restaurant chain has embraced the recent integration trends by rolling out an enterprise system (ES) designed to modernize the company's administrative infrastructure. The purchasing module of this ES will enable the consolidation of inventory purchasing across properties and institute automatic reordering when stock falls below predetermined threshold levels. A month after going live with the ES, your suppliers are set for mutiny because they are receiving economically infeasible purchase orders that specify frequent deliveries of small quantities of stock (e.g., an order for a 1/4 crate of tomatillos to be delivered to three different restaurant locations). Your suppliers refuse to operate in such an inefficient manner and complain that in the old system they would speak directly with the restaurant managers who understand supplier work practices and would place orders that they could feasibly deliver. As one of the suppliers put it: "If I filled all these orders, I'd be out of business in a week. This isn't the way we do business." The consulting firm that designed and implemented the system for you says that the application "works just fine. This is an end-user failure, and if they can't deliver you should find more efficient vendors."

precise set of IS goals that specify what information-processing functionalities are needed to achieve this strategy. A suitable IS goal might be articulated as tracking individual guests' behavior and spending over time and across all properties in the chain. Once the goals are set, the design team can then focus on choosing and shaping the appropriate components of the system, of which software is one. In this way, business agendas are the horse drawing the cart of design and use of IS. As we are fond of saying, the benefits of IT stem from its use, not its purchase.

*Insight 2:* **Think of the rock in the pond and plan for systemic effects.**

As in any other system, the components of an IS influence one another.[14] Just as the ripples from a rock thrown into the corner of a pond eventually spread to touch every area of the pond, a change in any component of an IS (e.g., a new technology, new processes, new people) eventually affects every other component of the information system. We can envision this happening in the second vignette (scenario #2) where a change to enterprise software has a domino effect that causes a change in the purchasing process, a structural change in terms of the loss of personal relationships between the vendors and the restaurant managers, and (if not monitored) a change in restaurant personnel who find it difficult to operate in a less personal, computer-mediated environment. In this way, changes to one component reverberate throughout the system. For example, a hotel might purchase kiosks for checking guests into its rooms. This not only changes the business process for those customers who use the kiosks, but it also modifies the role and the skills required of front-desk clerks. Some clerks must be transferred to other departments (because fewer may be needed at the front desk), and those who remain have as part of their job the new assignment of training customers to use the kiosks. As a result, the structure of the or-

[14] Not surprisingly, this "everything affects everything" characteristic of systems goes by the name of systemic effects.

ganization is modified both physically, in terms of front-end operations, and conceptually, in terms of the reporting and reward structure for clerks who are transferred.

In terms of the IS cycle, we can extend this metaphor of rock and pond to consider the ways in which data collected at one stage of the business cycle can affect other business operations. One rapidly growing issue, for instance, is the ethics of data collection. This matter has become increasingly important for hospitality businesses to consider, as hotels are being required to submit customer data to the government on request. Thus, a hotel manager must consider the legal and regulatory issues associated with collecting certain types of data. Further, when deciding on the types of information systems one will operate, it is important to keep the scope broad enough to enable currently unforeseen types of data analysis that may be useful in the future. In this way, the use of IS at one stage of the cycle reverberates into the larger organizational pond.

### *Insight 3:* Distinguish the pond from its environment.

Identifying and correcting problems with an IS are central to the timely delivery of required information-processing functionalities. One should conduct an in-depth analysis of the socio-technical components and how they work together. In addition, the context is crucial in that it might provide the first indication of the failure of the IS to achieve its goals. It is important to note here that when designing an IS it is sometimes difficult to separate the system's components from the context in which the system is embedded. However, this differentiation is crucial because, although context might highlight a problem, that does not take you much further in your diagnosis.

In the second vignette, for instance, an attentive analysis will show that the suppliers are not part of the information system's people component, contrary to the claim by the consultant who blames the purchasing module failure on its users. Rather, the suppliers are part of the IS context, as the recipient of the output of the system—in this case, inventory purchase orders. The suppliers are set for mutiny because they are unable to effectively carry out their function; the output from the restaurant group's ES is not useful to them and even impairs their operations. Note that after this analysis you can conclude that the IS has failed to achieve its goal of streamlining inventory and reordering. Yet, without further analysis, you don't know why the IS has failed, nor do you understand what components are at the root of this failure.

**X marks the spot.** We offer here a test that, while a bit simplified, provides an easy and generally accurate way to separate the components of the IS from its context. Let's call X the object of investigation, with X being a piece of software, a business process, a reward structure, or a set of persons. In the vignette, the object of investigation is the suppliers. The test is articulated as follows: X is a component of the information system if its failure causes the information systems to fail (i.e., not to achieve the stated goal). So, applying this test to the vignette, we see that the suppliers are not a component of the information system for the following reason. Their refusal to deliver inventory to restaurants gives a clear indication that the system has failed, but their frustration has not caused this failure. Further analysis may show that it was the poor design of the software, which does not take into account the realities of F&B supply and delivery, that was at the heart of the information system's inability to achieve its goal. This failure seems to be rooted in the fact that the firm designing the software had no expertise in the business and failed to engage the suppliers (i.e., recipients of information from the system) in the requirements-definition phase of development.

### *Insight 4:* You can never throw a rock into the same pond twice.

In 500 BC, the Greek philosopher Heraclitus gave us the often-repeated aphorism that today we render as "it is impossible to step into the

same river twice." With this apparent contradiction, Heraclitus recognizes that the river—just like the world around us—is constantly changing, even when it looks the same.[15] By the same token, an information system is not designed once and for all, as if it were a static artifact. In scenario #1, it is important to acknowledge the likelihood of needing to redesign the CRM information system. Business strategy evolves—and IS goals and information-processing functionalities must do likewise. In turn, this reevaluation may at times engender the need for changes to the design of an existing IS. Thus, the design and use of an IS should be seen as an iterative process involving the cyclical evaluation of individual IS components and the assessment of how different organizational information systems work together to support the business. The synergy between IS components can be maintained over time only if there is a willingness to modify aspects of this IS configuration as needed. Continuous modification creates and maintains a working system—one that is accepted and used by the intended audience over time.

***Being driven by a best-practice model of IT investment, where one benchmarks one's organization against the technology used by competitors, is a risky strategy.***

It is through this iterative analysis that one deals with the current state of affairs (the ecology of the pond), decides how to achieve future plans based on the dynamic and emergent context in which they operate (new rocks being added to the pond, along with organic changes), and is best prepared to make fortuitous decisions. For example, any time a significant change occurs, such as a shift in the firm's customer-based information-processing requirements, the IS design must be reevaluated and the system must be once again optimized. Both the STM and the IS models can be used over time. In fact, the IS cycle expressly takes time into account. Socio-technical model analyses frequently compare a planned and actual model or a current state to a desired future performance.

### *Insight 5:* The best IT available may not be best for you.

As mentioned earlier, the goal should always be to optimize the information system (IS) as whole, rather than any of its constituent parts. One should not mistake having best-practice software (either a new CRM package or just-in-time inventory functionality) or highly skilled employees as indicative of an optimized IS. In fact, optimizing the system as a whole often does not require that all components be cutting edge (i.e., they need not be as current as they could be). This fundamental insight is one that is often forgotten when managers get caught up in the IT-investment mentality—the most effective information system need not be composed of all the so-called best parts. We have seen instances where there was no need for the latest and greatest technology to deliver the needed information-processing functionalities. In some cases, the adoption of the most current technology in fact reduced the effectiveness of the IS as a whole, making the achievement of the needed information-processing functionalities more difficult!

## Implications

When considering the purchase of IT, one is really considering the design of that particular technology and how it will interact with the other components of the information system.

**Context.** The case studies and scenarios presented here suggest that being driven by a

[15] Richard Hooker, of Washington State University, translates this fragment of Heraclitus, quoted by Arius Didymus, as: "On those who step in the same river, different and different waters flow." Hooker notes that Heraclitus focused on "paired opposites" in his philosophy. See: www.wsu.edu/~dee/greece/herac.htm, as viewed January 21, 2005.

best-practice model of IT investment, where one benchmarks one's organization against the performance of competitors, is a risky strategy. In fact, the socio-technical model of IS challenges business leaders to analyze how IT that is successfully used by their competitors would fit into their company's context. Does the IT in question suit the individuals, processes, and structures of their firm? If not, one must question whether it is a wise strategy to make changes to the firm's operations and personnel to fit with the IT. For example, American Express is known for having one of the best billing systems worldwide. Does this mean that all companies should benchmark their accounts-receivable practices against those of American Express and then copy them? The answer depends on the extent to which a company's needs and operations relate to AMEX's idiosyncrasies—which are probably widely different from those of, say, a fast-casual restaurant chain. Benchmarking in this case may mean that a company ends up with a Porsche when the firm needs nothing more than a Subaru. Worse yet, the firm could end up with a lemon that doesn't run at all. The key insight here is to trust your internal expertise and don't always look to keep up with the Joneses, because the Joneses might be attempting to achieve something entirely different.

**People, again.** The importance of users in creating a working information system might seem an obvious consideration for the hospitality business. However, one only need look at the experiences of various firms to see that many IT projects fail because the chosen IT was at odds with users' needs (whether customers or employees). The reason that such a seemingly commonsense point creates such problems for business is largely due to the difficulty of matching operational vision with IT design functionality and use. In addition, there is a general feeling that humans should be able to conquer any technology design—that is, to become masters of the computer with proper training. As such, the onus is put on users to adapt or be cast aside as inferior. This mindset does not imply a disdain for one's users, but rather a wholehearted belief that they can overcome any challenge. However, it is faulty nonetheless.

We argue that gaps that may occur between users' needs and IT design are also the result of the belief that users should be made to fit to the technological design—because, after all, the IT represents the best practice. The management trends of business process reengineering (BPR) and "processware," such as ERP, to create an integrated organization, focus heavily on transforming business through the redesign of processes and IT. Perhaps the two most popular and contentious trends of the last 15 years, both BPR and ERP speak to the importance of questioning the notion of best practices by asking: Best for whom? In that regard, what makes the Harrah's case so compelling is that the firm has created a system specific to its needs based on an understanding of the context in which it operates and an informed sense of available IT functionality.

***The importance of considering users when creating a working information technology system for the hospitality business seems to be too often overlooked.***

This matter leads us to question the phrase "best practice," which is used to mean the synthesis of the most successful business practices from leading companies in any given industry. While there are best practices for everything from accounting methods to customer service, critics maintain that there is no one best way to do anything, because the concept of success is defined differently for every firm. As the STM model points out, success is context dependent, while the concept of best practice is context independent.

## Observe How Work Is Done

In conclusion, when working with the models, one should give balanced attention in terms of design, implementation, and use objectives. This report has called for a shift in perspective away from IT investment and toward IS design as a first step toward realizing the power of information technology within business. Too often system-selection considerations focus on system functionality. We argue that just as much time should be spent considering the best way to accomplish those functional goals. Rather than look only at the system's capability, managers should step back and examine how the work should be done. The answer to that question will help a company create working information systems that fit their firm's

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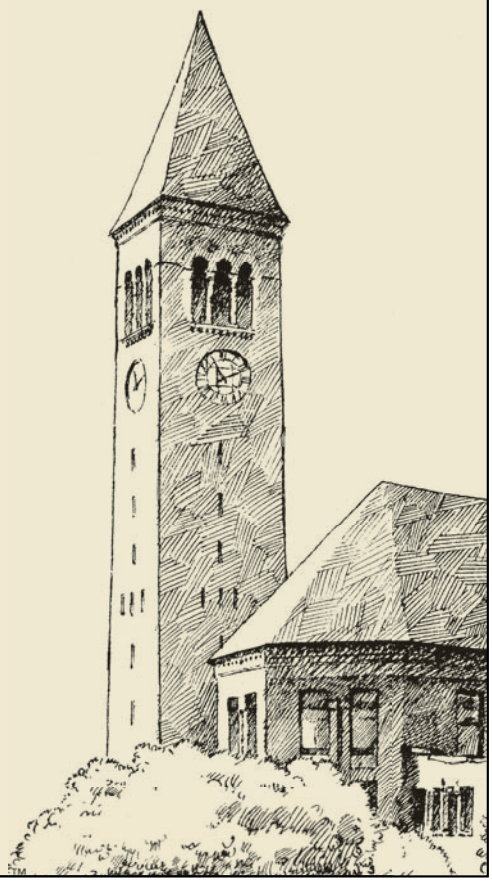


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