

# Information Literacy and IT Competency in the Information Age: A Critical Overview of Corporate IT Education Sourcing

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## Abstract

Many companies desiring or compelled to join the information revolution are wondering whether they possess the wherewithal to accomplish the feat. Beyond the purely technical issues there exists the broader challenge of adapting their organizations to new business and information paradigms. A similar challenge faces firms that have already made the transition, because constant change seems an inescapable fact of life in the information age. This paper briefly examines (from a “macro” perspective) current education and training sources—including degree-based programs, corporate universities, and training vendors—designed to help companies attain (and maintain) this crucial information technology (IT) competency. Our purpose is to assess the relative effectiveness of these alternatives, especially in terms of a core determinant of organizational IT competency at the employee level: *information literacy*. This refers to a mixture of IT knowledge, skills, perceptions and values that determines an individual’s IT perspective. In our scheme it is composed of two fundamental areas, which we call *technical literacy* and *business literacy*. This framework leads us to identify inherent weaknesses (and some strengths) in the various IT education approaches. We also conclude that the IT education and training scene as a whole suffers from fragmentation and inconsistency. Our evaluation argues for a more integrated and cooperative approach involving the major players in the IT education market, one that in fact may just be starting to emerge.

**Keywords:** Business education, corporate universities, information literacy, IT competency, IT education, IT training industry

## 1. INTRODUCTION

The proliferation of “Dotcom,” Internet, and E-commerce references in business headlines and marketing campaigns reflects a deeper phenomenon, a radical reformation of business practices and strategies driven by the emerging power, pervasiveness, and promise of information technology (IT). Steady advances in communications, internetworking,

distributed computing, and related technologies and services, coupled with their enthusiastic adoption by both industry and consumers, have ushered in the information age.

As in most revolutions, however, the excitement is tempered with uncertainty. Many companies, for instance, question whether they possess the competency

to implement and manage the new technologies. This concern is evidenced by growing reports of manpower shortages and skill gaps (*Bridging the Gap* 2000) and by the accelerating trend toward outsourcing all things IT (Lacity et al. undated). The problem goes well beyond a shortage of technical skills; many firms discover that keeping abreast of the complex and fast-changing technology represents just one aspect of the challenge. The larger challenge is in effecting the changes in the way their organizations operate and in the way their employees work so that the full benefit of the technology can be realized (Thorp 1998, p. 6). In this light IT competency becomes much more than a technical issue. It refers to a broader ability to manage all the organizational issues and implications inherent in adopting a fundamentally new approach to information.

This paper introduces a conceptual framework for viewing the question of organizational IT competency, and uses that framework to assess—on a broad overview level—the relative effectiveness of current educational alternatives meant to address it. We use the term competency in reference to organizations because we apply a related but different concept to individuals, one that better illuminates the attitudinal and behavioral factors that play such a crucial role in this issue: *information literacy*. Used together these concepts (further defined below) lend insight into the IT education and training scene; they help expose the inherent weaknesses as well as strengths of the different sources and approaches, and point out fundamental problems with the current system that carry important implications for both industry and educators.

## 2. INFORMATION LITERACY

Information literacy can be defined as an individual's level of facility with information and information technology, as well as his or her perspective of the role and value of information and IT in an organization. It is based on personal experience and educational background, and made up of a combination of knowledge and skills, values and perceptions. Information literacy represents a key component of organizational IT competency at the level of the individual employee. Johnson (1995) has identified a scale of information literacy that roughly parallels the evolution of IT in the last three decades, from the mainframe and PC eras through the subsequent stages of the networking era.

Toward the lower end of this scale stands the mainframe or PC era traditionalist with an "Operational Utility" perspective, who views IT in a strictly utilitarian, business-support sense. Further up the scale resides the "Tactical Integrator" whose perspective corresponds to the data integration stage of the networking era. Higher still is the "Strategic Support" viewpoint arising from the next stage of the networking era, which extended the integration paradigm across an organization's

boundaries to create strategic IT links with partners, suppliers and customers. Johnson's scale culminates in the "Strategic Determinant" view of IT, which represents the current information age paradigm. Thus in this scheme a fully information literate individual considers IT a key asset, a strategy enabler, and views information itself as the basis for developing new products and services.

An adaptation of this concept has been proposed by Johnson and Figueroa (2000) as a means of relating the information literacy of individuals in an organization to that organization's IT needs. Those needs vary according to the nature of the enterprise and its industry, of course—many business still function quite comfortably within the "lower" evolutionary IT stages enumerated above. The approach in the current paper is quite different in that the emphasis is not on assessing individuals but on evaluating educational alternatives meant to improve the collective IT competency of an organization—especially one striving to join the information revolution. The assumption here is that the success of thousands of IT initiatives across many industries hinges on achieving this competency. Information literacy represents a critical success factor at the employee level, which includes all IT users and IT professionals in the organization.

Information literacy is crucial not just in terms of knowledge and skills but also the beliefs and behaviors that collectively determine organizational culture. In other words, an essential ingredient is an intimate understanding of the role of information and IT in a business, manifested on the user side as an ability to work in harmony with the technology, and on the IT professional side as the ability to enable and maintain that harmonious relationship. Thus, as we define it here, information literacy consists of two fundamental components:

- 1) A particular IT knowledge-base and skill-set, appropriate to an individual's role within an organization (e.g., IT professional, IT user, IT management, user management, top management), and
- 2) An appreciation for and understanding of information in a business or organizational context—its uses, characteristics, and value—and of the systems and processes used to manage that information.

Though they represent imperfect labels, we will use "Technical Literacy" and "Business Literacy" to describe these two components, respectively. This division is not to suggest that the two areas should be treated or valued independently; ideally they should be thought of as closely intertwined and even interdependent aspects of information literacy. In our view technical skills without business literacy are of little value. And in the information age, business literacy without some role-appropriate base of technical

knowledge seems like an oxymoron. The employee of an IT-competent organization must embody both “kinds” of literacy.

### 3. IT COMPETENCY

We have defined IT competency as the ability of an organization to change its approach to information in response to environmental imperatives brought about by sweeping technological advances. We could perhaps remove the last 15 words and still make the same point, because the essential issue is the ability to change. IT drives and enables change; moreover, IT itself is continuously changing. This contributes to an ever more complex and dynamic business environment, one of frequently shifting business, technology and information paradigms. In such a world continual organizational (and personal) learning and adaptation become imperative for success and perhaps survival (see Senge 1994 and Drucker 1995). This is the emerging reality of our times (captured by seminal concepts such as Drucker’s “knowledge economy” and Senge’s “learning organization”), and it can be a daunting one. In this light achieving and maintaining IT competency presents a tremendous challenge.

Many companies are nevertheless meeting the challenge. They demonstrate IT competency in the utilization of enterprise-wide information systems to reengineer their business processes; in creating new and enhanced relationships, products and services using Internet and Web-based technologies; in leveraging IT relentlessly to refine and reinvent business models, uncover hidden savings and revenue sources, and make their organizations ever more agile and intelligent. Examples abound: Dell Computer, for instance, has transformed itself into the world’s leading Internet vendor. General Motors has created a single online marketplace for streamlining its dealings with its myriad suppliers.

Yet it is equally apparent that successes are more than balanced by struggles and failures. In 1997 Dell abandoned in mid-stream a multimillion dollar implementation of an enterprise resource planning (ERP) system (Baker 1998). Another telling example is reflected in the stumbling forays into online “e-tailing” by otherwise innovative and highly successful retailers, even catalog and mail order businesses which would seem tailor-made for transitioning to the Web (Greenberg 2000).

Clearly, IT competency in the information age can prove both elusive and fleeting, even for the best of companies. Achieving it over the long-term hinges on building and maintaining a highly information-literate workforce and a flexible, agile, change-embracing organization. This requires considerable, ongoing, and effective investment in education and training. We underline effective because our overview of the current IT education and training scene, which follows, calls

into question the corporate return on much of this investment.

### 4. IT EDUCATION

There is no question that corporations are indeed making the investments. Some estimate total expenditure on education and training in the United States at nearly one trillion dollars (Drucker 2000). A significant fraction of this is IT related (Bridging the Gap 2000). Starting salaries and financial incentives for IT professionals and IT-savvy business school graduates continue to escalate (Ibid.). To meet the demand, colleges and universities, technical schools, training companies and major IT vendors are all rushing to develop and expand their programs with the latest in e-commerce, internetworking, and Web technologies instruction.

Following the business-plus-technical literacy formula, most of these programs tend to focus at least as much on the business aspects as on the technical skills. Degree programs in information systems, for instance, strive to integrate business education into their technical curriculums. Some MBA programs are also becoming more “technical.” A recent survey (Fryer 1999) concluded that programs that focus heavily on real-world application of IT have the most success in turning out techno-savvy MBA graduates. Business internships, mentoring, and business projects are emphasized. Graduates of such programs reportedly benefit from hands-on experience and “understand the strategic, business application of technology.”

The top-rated Northeastern University College of Business, for example, designed its High Technology MBA program (<http://www.cba.neu.edu/htmba>) for “fast-track managers in high tech product and services industries.” It strongly encourages students to take elective courses at the university’s computer science college. The two colleges also team up to offer working professionals a graduate certificate in “Information Resource Management,” consisting of a six-course sequence that includes Fundamentals of Information Science; Information Analysis and System Design; Information Policy; Computer Communication Networks; Database Systems; and User Interface Design.

Some business schools are directly targeting specific corporations via highly customized offerings. One example is an alliance between Indiana University’s Kelley School of Business and several corporations to offer a tailored, online “Consortium MBA” program (<http://bus.iupui.edu/cmba/index.html>). Other schools, such as Pepperdine University (<http://bschool.pepperdine.edu/>), are expanding non-degree, corporate and industry-specific offerings.

Yet the fact remains that for most traditional universities, the literacy equation still presents

significant problems. While technical knowledge and skills can generally be imparted via a variety of methods, the business side increasingly calls for a “real world,” team-oriented, hands-on approach. The innovative programs mentioned above still appear to be the exceptions rather than the rule. Most traditional business and IT degree programs still seem to lack either the resources or the resolve to provide realistic business laboratories, or meaningful collaborative arrangements with industry. Such omissions generally stem from realities surrounding higher education (such as fundamental institutional conservatism, faculty autonomy, tendency toward bureaucratic inertia, and conflicting constituencies—see Kerr 1994) that tend to make it rather resistant and ill-suited to such programs.

Hence traditional IT/business education is generally criticized by many within industry (with some merit, in our opinion) as being chronically out of date and out of touch with the real business world. As one consequence of this view, corporations have increasingly turned to alternative education sources.

## 5. CORPORATE UNIVERSITIES

In defense of traditional schools, the literacy formula is a deceptively difficult and complex one. This perhaps becomes more evident when the technical and business sides are contrasted according to some fundamental characteristics, as shown in Table 1.

**Table 1**

	<b>Technical Literacy</b>	<b>Business Literacy</b>
<i>Scope</i>	Generally narrow	Generally broad
<i>Specificity</i>	Usually high	Usually low
<i>Applicability</i>	Specific	Situational
<i>Primary Orientation</i>	Task	Goal
<i>Primary expression</i>	Functional	Behavioral
<i>Primary focus</i>	Systems	Relationships
<i>Unit of currency</i>	Datum (bit, byte)	Transaction (Item, \$)
<i>Primary basis of expertise</i>	Knowledge	Experience
<i>Decision making</i>	Usually systematic	Often intuitive
<i>Primary reasoning</i>	Generally deductive	Often inductive
<i>Primary Values</i>	Problem solving / system functionality / enterprise support	Creativity / system productivity / enterprise success
<i>Learning basis</i>	Primarily highly structured, component-based, individualized	Primarily less structured, interdisciplinary, group-based
<i>Degree determined or influenced by organizational culture</i>	Limited	High

One implication of the marked difference between business literacy (BL) and technical literacy (TL) seems to be reflected in the growing phenomenon of so-called corporate universities (which can also be seen as a response to the perceived inadequacies of traditional IT education sources). Most have only emerged within the last decade or so (Cobb et al. 1999). Their impetus seems to stem in part from the fact that business literacy tends to be enterprise-specific (in contrast to technical literacy which tends to be *function*-specific and more applicable across industries)—it tends to be closely tied to a particular enterprise’s business niche, industry, and culture. Additionally, unlike TL which will vary greatly in content according to the skill-sets and knowledge required, basic BL should be fairly consistent across an enterprise. Thus a corporation is probably in the best position to determine just what BL education should consist of, and to deliver it efficiently through its own education programs and facilities—if it has them.

The largest and perhaps best known of the corporate university exists at Motorola. “MU” (<http://mu.motorola.com/>) constitutes a \$100 million global enterprise. Its goal is “Educating the entire work force, not just major subsets.” Doing this means

utilizing “An unprecedented array of learning approaches—from desktop training to expert tutoring.”

A different approach to the BL problem is used by Dell University, the almost entirely virtual training arm of the computer maker. Dell’s (<http://www.dell.com>) concept is continual “stealth learning”—making learning an almost invisible part of an employee’s work day. Dell leverages its Web focus to deliver regular, non-linear training “chunks” over its intranet to its workforce, knowledge modules that are often ‘disguised’ as communications, puzzles, and quizzes. For example, a campaign meant to teach employees about the Dell business model started with a brief introduction about the model, prefaced and followed by quizzes. Over time additional material has been added to expand on the topic of Dell’s business strategy, such as a primer on Internet issues (Kenyon 1998).

Whatever their approaches, well-designed and -funded corporate universities seem like nearly ideal mechanisms for instilling enterprise-wide information literacy, especially in terms of BL. Motorola and Dell Universities have networked their organizations for rapid, efficient, effective learning. Both force the

technology itself to carry its own message: highly friendly and connected IT, enabling the free flow of relevant information and knowledge, leads to information-literate users.

## 6. THE TRAINING INDUSTRY

Training vendors represent by far the most common source of ongoing IT education in the corporate world. The reason centers on the cost savings and flexibility of this generally short term, highly focused, just-in-time training model. Demand is so great that innumerable training firms and institutes of all sizes and colors, using a myriad of teaching methodologies and delivery modes, vie for a seemingly ever-growing training budget outlays. An increasing share of these outlays goes to IT vendor-supplied or -sponsored training; examples include Microsoft ([http://www.microsoft.com/train\\_cert/](http://www.microsoft.com/train_cert/)), Oracle (<http://education.oracle.com/>), IBM (<http://www-3.ibm.com/services/learning/>), and Hewlett Packard (<http://education.hp.com/>), among many others. Among the larger independent training companies are Learning Tree (<http://www.learningtree.com/>), Sylvan Learning Systems (<http://www.sylvanlearning.com/>), and Provant (<http://www.provant.com/>), each of which offers a wide range of business and IT related training. Each of these three companies generates revenues in the hundreds of millions of dollars.

The high demand reinforces the conclusion that information literacy is indeed a critical concern in the corporate world—especially the BL component. Witness these blurbs from and about training vendors.

[We] prepare your technical specialists to support your business, not just work on your systems. We help all your people--managers, staff, sales personnel, distributors--understand the technology and use it productively....(*Information Technology Management Institute* 1999)

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Technical proficiency is not enough. When your IT infrastructure is integral to your business, your technical specialists need to have a bigger mindset and bigger skill set.... (Ibid.)

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And so it was that for two weeks...16 IT workers dedicated themselves full-time to learning how Cargill's business works, how to analyze business problems, and how to develop recommendations for solving those problems. (Brandel 1999)

The last quote refers to one of the more telling trends in training, the resurgence of boot camps to teach both business and technical literacy in intensive, sometimes weeks-long immersion programs. Expensive not only in

terms of the cost of the training itself, boot-camping also removes individuals and sometimes whole groups from the workforce for extended periods. This implies not only that information literacy issues are critical, but also that conventional outsourced training approaches are often lacking in depth and effectiveness.

Indeed, from the standpoint of our argument, conventional outsourced IT training (as it is typically practiced) leaves much to be desired. Most of the problems relate to the rushed, piecemeal, multi-sourced, fragmented way in which employees are generally subjected to this kind of training. Our construct leads us to believe that high information literacy requires a systematic integration of technical knowledge and skills with thoughtful, thorough, enterprise-specific business training. This does not happen in the majority of IT training, in our view.

Outsourced IT user training, for instance, tends to suffer from a narrow focus on application features and functions while neglecting the larger business context. Such training generally fails to impart business literacy, and often falls short on the technical proficiency side as well. This is due to a combination of the following factors:

- Instructors or program designers frequently have little to no knowledge of the particular business or even the industry of their clients—instruction is generally pre-packaged and generic;
- Offsite or public training usually affords no realistic simulation of the highly networked business environment; even onsite training frequently occurs without the classroom computers being connected to the business network;
- With limited time to “cover the material,” context has low priority, and individualized instruction is often lacking.

The picture for outsourced IT professional training is somewhat different, at least in terms of technical literacy. One reason is that vendor-approved training in the form of certification programs is gaining wide recognition and acceptance in the corporate world. This has brought a measure of quality control and standardization to the industry. In terms of business literacy, however, the same criticisms that attach to all third party approaches tend to apply doubly to the outsourced training model, where relevancy and context are typically given short shrift due to resource and time constraints. Moreover, many corporations seem to forget the BL side of the equation entirely in their education and training efforts for IT professionals. The result has been that many IT staffs are technically proficient but business illiterate—insular IT shops “doing their own thing” without much regard or even awareness of how the technology fits into the larger enterprise’s strategy (Brandel 1999).

## 7. THE IT EDUCATION SCENE

In terms of our competency/literacy construction, even this cursory overview of the IT education and training scene raises questions about the effectiveness of current corporate efforts—most markedly in the area of business literacy. The most serious of these attach to the efficacy of the prevailing training industry model, which generally seems poorly equipped to handle the multi-faceted, interdisciplinary, integrated and enterprise-specific nature of BL education. Higher education programs, for their part, still tend to suffer from relevancy questions—many struggle to remain up to date and in touch with current business practices.

Integration of business and technical literacy reigns as the most troubling problem—because there appear few sources that accomplish this. Again, we feel that this should ideally occur via focused, integrated educational efforts; not left to “happen” through the piecemeal accumulation of separate and disconnected BL and TL training certificates. In defense of the current system, however, the issue is complicated by the fact that TL

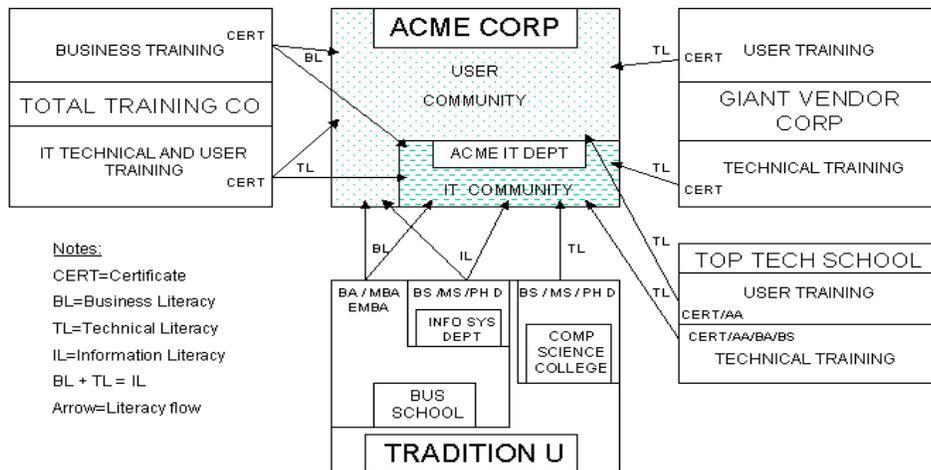
and BL are fundamentally different kinds of literacy, as we have attempted to show. For instance, TL varies greatly in terms of content depending on an individual’s role; BL is multi-faceted with a high organizational culture component and thus generally requires a quite different educational approach. This makes integrating the two difficult. Still, our survey seems to argue strongly for coordinated efforts among all the major stakeholders to bring some focus and integration to the current highly fragmented system.

Figure 1 below represents an attempt at a graphic model of the existing system. It reflects the multiple, highly dispersed sources of education and training a typical corporation may use to try to achieve or maintain IT competency. Two core constituencies—IT users, and IT staff—are represented. The goal is to increase information literacy in these groups. Note that most sources only really provide one or the other components of information literacy, TL or BL. Corporations are thus largely left to try to integrate the two components themselves in a rather haphazard, ad-hoc way.

Figure 1

### Traditional Corporate IT Education Model

Low Integration of Sources, Theory and Practice



## 8. A NEW IT EDUCATION MODEL?

The most promising alternative for addressing literacy issues appears to be the corporate university concept, where powerful new education technologies and concepts are often used aggressively and quite effectively. Yet relatively few corporations have the resources to develop and invest in such systems, or to supply comprehensive IT training, on the scale they require. Which is why more corporations and corporate

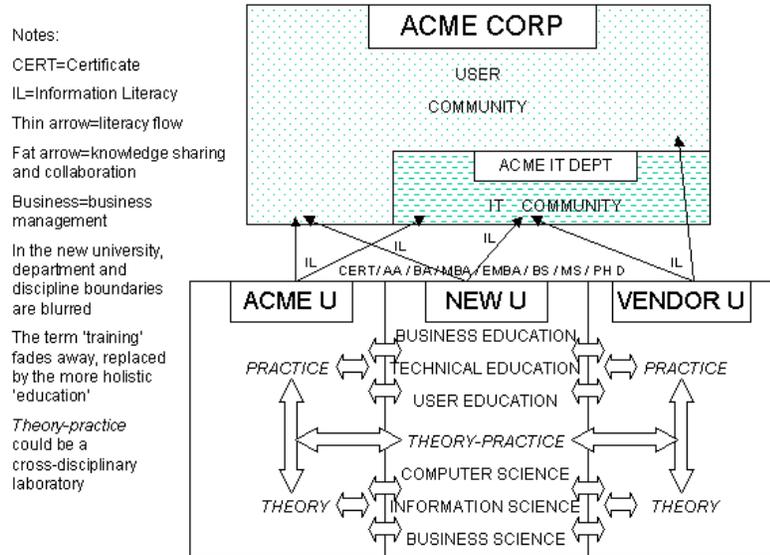
universities are creating alliances with each other and with educational institutions (for an excellent summary of this trend, and links to these alliances, see Cobb et al.). At the same time, more educational institutions are beginning to partner with IT vendors in order to offer product-focused, certification-based technical course sequences alongside their degree program curriculums.

Together these trends point the way to the possibility of a new model for IT education, represented by Figure 2.

Figure 2

## Emerging Corporate IT Education Model?

High Integration of Sources, Theory and Practice



The keys to the new model are integration and collaboration. The corporate university aligns with the traditional university and the vendor university—probably made up of multiple IT and training vendors providing a range of product and function-specific training and research—to create the New University. The corporate university provides leading edge, real world practice and immediate relevance; the traditional university brings established, dedicated resources, structure, scientific rigor, and academic cache. The vendor university supplies the product-focused training and research mentioned above, along with valuable experience in the as-needed, just-in-time training model. Many other synergies could conceivably occur (e.g., whole new career paths and specializations, along with the blurring and merging of many academic and human resource roles—see Cobb et al.). But the main objective of this vision is highly integrated, concentrated, synergistic sourcing of information technology and information technology education. In this scenario, very high information literacy and IT competency become almost a foregone conclusion for all participants.

There are of course major risks with such a model, the gravest being that corporate interests could displace public interest in the missions of educational institutions. Controls would have to be worked out to mitigate that and other risks, such as possible degradation of academic rigor and scientific objectivity. But however risky, this model, or something like it, may very well represent the future.

## 9. CONCLUSION

The changes wrought by the information revolution are causing many companies to question their IT competency, a critical component of which is the information literacy of their employees. Corporate educational practices suggest that business savvy is at least as important in this equation as technical know-how. Yet even a cursory survey of the current corporate education and training market raises serious questions about the effectiveness of current literacy education strategies. Sources are highly disparate and fragmented, and few manage or even attempt to integrate business and technical literacy.

One promising alternative exists in the form of so-called corporate universities, which seem an almost ideal approach to business literacy education. This trend, along with a related one in which universities are beginning to align with corporations and IT vendor training arms, promises a possible new model of IT education based on an integration and pooling of approaches and resources. All stakeholders in the crucial IT competency question, such as educators and government and business leaders, would do well to follow these developments closely—and work together to maximize the benefits and mitigate the risks of such a model. After all, the future of many companies and even entire industries and economies, could ultimately hinge upon its success.

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