

# Identifying the Critical Information Technology Skills, Functions and Business Intelligence Parameters Assessed by Regional Corporate Community

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## ABSTRACT

*This paper surveys professional corporate practitioners who are involved in the management aspects of the Information Technology field. A survey was conducted with these individuals in order to determine what specific technological skills, functions and business intelligence competencies in Information Technology they consider to be critical and relevant to the current corporate workforce. A questionnaire was administered to selected corporate members of the Association of Information Technology Professionals (AITP) and the Pittsburgh Technology Council (PTC). A matrix was constructed that identifies the key technological skills considered essential to higher education curricular offerings in Information Technology.*

## OVERVIEW

This rapid expansion of information skills and services in Information Technology is a challenging and ongoing undertaking for educators in higher education in relation to developing courses and programs. University programs are often criticized by the Information Technology community for not relating course content to the actual requirements of the field (Paytas et al., 2001). Students are also frequently critical of university programs in that these programs do not met the needs of graduates when they leave the academic setting and attempt to obtain positions in Information Technology.

In order to meet the challenge confronting each institution of higher education that prepares Information Technology professionals, data must be continually collected and analyzed to determine the relevancy and the adequacy of its programs and courses (Modzelewski, 2001). While the universities have the primary responsibility of evaluating each program, personnel employed by Information Technology departments can provide valuable feedback concerning skills, functions and business intelligence demanded of employees. These skills and functions can then be identified as valid entities that must be integrated into the Information Systems programs of colleges and universities.

Information Technology (IT) has rapidly become one of the largest and most important segments of the U.S. economy. In Southwestern Pennsylvania, the IT cluster contains more than 1,400 firms that employ more than 39,000 workers, and accounts for 15% of all the region's job growth over the past decade (Paytas et al., 2001). Within the same time frame, a convergence toward technology has blurred the distinctions between "old line" manufacturing entities, service industries and state-of-the-art technology-driven business enterprises.

While IT is one of the key drivers for success in the global economy, it alone does not create business value. The synergy of corporate and

academic partnerships permits coordinated development of a technology-related workforce through regional initiatives that are designed to meet employer-defined needs. The ensuing skills development process ensures that the emerging workforce is in sync with the technology-driven sector.

Universities and corporations are sometimes at opposite ends of a spectrum, with conflicting cultures and values. Technological consortiums act as a liaison that permits a "fusion" of priorities and goals in a sustainable partnership. As an example, the rapid changes in the occupational competencies required by the job market will generate a redefinition of necessary technological skills that must be woven into the fabric of corporate business management.

Thus, this paper relates to, and captures, the expertise of professionals who are involved in the Information Technology field. The purpose is to collect data from these individuals to determine what information skills, services, functions and business intelligence resources in Information Technology they believe to be relevant. The gathering and evaluation of such information could be of value to the following institutions and individuals.

1. Information Technology departments in colleges and universities as a means of providing reliable information upon which educators can base decisions regarding modifications in curriculum and programs
2. Information Technology departments in business, industry, and education as an aid in determining standards for the selection and education of their personnel.
3. Students enrolled in Information Technology programs.
4. Individuals employed in Information Technology who can benefit from an analysis of areas of study in IT with the possibility of being motivated toward self-improvement and preparation for advancement.

## PROBLEM DEFINITION

The challenge is to improve the linkages between industry and higher education in order to create a workforce system that is more customized, flexible and responsive to the needs of employers. How can we, as an academic institution, add more reliable, just-in-time services, technological skills, and business intelligence to the sector, much as businesses have had to do with their products.

Two associations in the Southwestern area of Pennsylvania actively engage the academic community in developing the regional economy. The Pittsburgh Technology Council (PTC) and the Asso-

ciation of Information Technology Professionals (AITP), in partnership with four Pittsburgh Universities (Robert Morris University, Carnegie Mellon University, University of Pittsburgh, Duquesne University), in allegiance with 1,400 Pittsburgh corporations share in the development of the region's economy.

A survey was conducted capturing data from a significant representation of the Southwestern Pennsylvania regional technological corporate community to determine which skills, functions and business intelligence resources are needed to meet the rapidly changing workforce environment. Twenty specific skills of a technological nature, as well as general areas of computer-related functional competencies, such as networks and databases, are derived. Corporations are placed in categories of size, service, government, health-care, and not-for-profit entries. A matrix is constructed that displays the technological skills considered most necessary to continued strategic workforce advantage. Within that framework, an analysis of which functions are most often outsourced and which are performed in-house, complete the survey. As a corollary to the survey questionnaire, IT directors were asked to disclose which technical areas or skills were most likely to become of growing strategic value to their respective companies, starting in the present time frame and continuing into the next 5-year period.

This study is predicated upon the following assumptions:

1. The Information Technology professionals surveyed are currently using or have used the information skills and business intelligence in their functional role.
2. Those individuals surveyed are a representative sample of Information Technology practitioners nationally.
3. The individuals surveyed can identify their needs in relation to Information Technology.
4. A survey of Information Technology professionals is essential to the revision or development of higher education programs if such programs are to service the needs of students and working professionals.

## RESEARCH METHOD

In order to meet the objectives of this study, it is necessary to collect, analyze, report, and summarize empirical data concerning skills, functions and business intelligence aspects in Information Technology that professionals require to successfully perform the activities comprising their functional role. Most research directed at obtaining information necessary for this level of analysis falls into the descriptive research category. This type of study is concerned with current conditions or present facts pertaining to the nature of a group of people and involve the procedures of analysis, induction, classification and measurement. In order to carry out a descriptive study, a variety of research tools have been developed to aid in the gathering of data. The most common are the interview and the questionnaire. A combination of each of these tools has been used in this study. Although time-consuming, face-to-face interviews were conducted with each respondent, then recorded on the questionnaire. This resulted in the clarification of items and terms that were subject to interpretation, addition of relevant aspects of IT that may have been overlooked in the initial form, and significant open-ended discussion. For example, the precise scaling of the terms "critical, relevant, useful, marginal and non-applicable" in relation to each skill as used on the questionnaire to categorize the responses of the participant, could be standardized with great precision in a formal personal meeting.

The lengthy 3-page survey instrument codified and captured all relevant information. The time frame of the study encompassed January through October, 2003.

## POPULATION

The population for this study included members of the Association of Information Technology Professionals (AITP) and the Pittsburgh Technology Council (PTC). This population, consisting of a large and diverse sample of corporations and institutions in the Southwestern Pennsylvania area, should provide sample statistics that represent other

urban areas with similar memberships and that can meet the objective of this study.

## FINDINGS

Tables I, II and III depict the major specific Information Technology skills that are integrated into the curriculum of the undergraduate Information Science and Information Systems Management courses at Robert Morris University. The percentage figures indicate the number of corporations that considered the named attribute as a specific critical IT skill, an assessment that weighed heavily in employment decisions.

A large corporation is here defined as one with 500 or more employees. Many are multi-national, multi-division or multi-site in nature.

Table II depicts the same skill set and percentage figures for corporations that have less than 500 employees and are normally single-site and local in nature.

Table III depicts the same skill set and percentage figures for corporations that are health care-oriented, government-organized, or

Table 1: Critical Information Specific Skills

Large Corporate	
HTML	46%
XML	19%
ASP	31%
PERL	15%
Front Page/Dreamweaver	8%
Java	46%
C++	23%
COBOL	15%
Visual Basic	54%
C#	15%
.NET	23%
M	0%
A+	8%
SQL	35%
Oracle	54%
Project Management	42%
Programming Logic	23%
Object-oriented Programming	15%
Technical writing	31%
Information Security	42%

Table 2: Key Information Specific Skills

Small Corporate	
HTML	65%
XML	9%
ASP	30%
PERL	0%
Front Page/Dreamweaver	21%
Java	42%
C++	9%
COBOL	3%
Visual Basic	42%
C#	24%
.NET	27%
M	0%
A+	12%
SQL	21%
Oracle	30%
Project Management	27%
Programming Logic	15%
Object-oriented Programming	0%
Technical writing	36%
Information Security	33%

Table 3: Key Information Specific Skills

Health Care/Government/Not-for-Profit	
HTML	45%
XML	18%
ASP	27%
PERL	0%
Front Page/Dreamweaver	24%
Java	38%
C++	18%
COBOL	15%
Visual Basic	30%
C#	15%
.NET	15%
M	38%
A+	33%
SQL	27%
Oracle	30%
Project Management	38%
Programming Logic	23%
Object-oriented Programming	6%
Technical writing	23%
Information Security	48%

Table 4: Key Information Functional Area Skills

Large Corporate	
Web Design/Hosting	45%
Programming	38%
Tech Support	51%
Database	57%
Data Warehousing	38%
Office Software (Excel, Access, Word)	57%
Systems Design	30%
Operating Systems	23%
Networks	47%
Data Center Operations	36%
Application Development	64%

not-for-profit. Because many of these entities share two or all three characteristics of the category, it is difficult to place them in a single genre. For example, a large federal hospital system falls into all three categories. The number of workers employed in each of these corporations is not a factor in the table.

Tables IV, V, and VI deal with general or functional categories of IT skills. Surveyed corporation executives and administrators considered these areas to be of greater value to a techno-business concern than the preceding specific skill. The rationale, which is compelling, states that technical skills must be combined with general business knowledge over a broad range of corporate activities and integrated services. Thus, the functional areas are more in sync with the overall needs and designs of the contemporary corporation.

The most difficult and elusive skill to categorize is not, according to corporate leaders, a simple or complex single-entity skill at all, but rather a fusion or combination of assets, insights, capabilities and processes. Yet, it was regarded as a coveted, highly desirable asset for any IT employee to possess (Smith et al., 2001). On the questionnaire, it was referred to as business intelligence. Some definitions that employers use are "Logical thought processes", "Integrated IT capabilities", "Techno-business acumen", "Technological business synergy", "Intellectual productivity assets", and "Integrated IT capabilities". The definition used in this study was that it is the ability to fuse corporate business goals and objectives with relevant technological processes. It is difficult to define. It is more difficult to teach, if it can be taught at all. Table VII describes the corporate response by percentage of respondents that considered business intelligence as a critical IT attribute.

Table 5: Key Information Functional Area Skills

Small Corporate	
Web Design	54%
Programming	38%
Tech Support	38%
Database	58%
Data Warehousing	16%
Office Software (Excel, Access, Word)	71%
Systems Design	8%
Operating Systems	17%
Networks	42%
Data Center Operations	13%
Application Development	58%

Table 6: Key Information Functional Area Skills

Health Care/Government/Not-for-Profit	
Web Design	43%
Programming	39%
Tech Support	50%
Database	64%
Data Warehousing	18%
Office Software (Excel, Access, Word)	68%
Systems Design	7%
Operating Systems	14%
Networks	46%
Data Center Operations	32%
Application Development	71%

Table 7: Business Intelligence Table

Corporations	79%
Small Corporations	88%
Government, Health Care, NFP	92%

## OUTSOURCING

Survey respondents have demonstrated an accelerating trend toward the outsourcing or contracting of IT services formerly performed in-house. Contractors have the capability to specialize in more narrow technological areas as information needs differentiate (Ware, 2002).

The reasons to engage in outsourcing, as noted by respondents, are:

- Concentration on core business affairs
- Reduced IT costs
- Lack of relevant in-house IT staff
- Faster time to market
- Increased flexibility
- Access to specialized experience
- Projects defined by specific time limits lend themselves to contracting

The disadvantages of outsourcing are:

- Loss of control of the technological base within the company
- Security issues may arise
- Quality of company workforce may decline
- Downsizing or re-direction of IT employee base
- Decreased morale and/or loyalty of employees

Large companies tend to outsource more often than smaller ones. Larger entities have a greater, more diverse set of functional activities to be outsourced, thus a greater number of possibilities for services exist (Beaumont & Costa, 2002).

Table 8: Outsourcing of IT Functions

All Corporations and Entities	
Web Design/Hosting	26%
Tech Support/Help Desk	23%
Database Operations	10%
Networking	32%
Data Center Operations	27%
Application Development	30%

Table 9: Strategic IT growth areas

All Corporations and Entities	
Information Security	71%
Web Services	63%
Database Applications	54%

Table VIII displays the percentage of companies that outsource each of six functional IT areas that surveyed corporations considered most applicable for contracting services.

The most intriguing question that rises from the infrastructure of all contracting studies is that of the ultimate corporate downsizing movement-offshore outsourcing of Information Technology skills. This latent but accelerating transition threatens to change the landscape of IT in the United States. A large majority (92%) of respondents either evaded the subject of offshore outsourcing or felt that their company was not appropriately positioned to take advantage of it due to size, strategic outlook, or the fear of employee morale ramifications (Hayes, 2003). Thus, the final piece of the outsourcing puzzle remains an elusive but promising future endeavor.

The corollary survey question of immediate and future growth of specific technological skills or skill areas focuses on the upcoming and emerging growth patterns in Information Technology. Table IX displays the three entities that received the highest percentage of positive responses of IT directors who believed that these entities would

present the most significant growth and added corporate value. This does not necessarily indicate that other skill areas on the questionnaire would decline or plateau, or would not also increase somewhat in strategic advantage and job growth.

## CONCLUSIONS

Higher Education, in accord with corporate needs, must aggressively update curricular offerings on an ongoing basis. Academic/Corporate partnerships provide an avenue of strategic and synergistic alliance that serves the intersecting interests of each community. Academic accreditation agencies and Information Technology Standards Associations provide input and guidance in assessing and implementing student curricular offerings. Emerging patterns of growth in the IT disciplines must be identified through research then promptly integrated into the curriculum. Development of integrated IT/business skills learning resources for students should become a priority in higher education, although a difficult endeavor. Outsourcing of IT skills will continue to grow, and remain a problem with no obvious solution (Hayes, 2002).

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