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# IT Skills in the Public Sector: Comparing the Views of Middle Managers and Their Supervisors

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## Abstract

This paper reports on a two-phased study designed to examine the perceived importance of a wide range of information technology (IT) skills by mid-level and senior managers in a large public sector organization. The first phase gathered data from 242 lower to mid-level IT professionals. The second phase gathered the same data from the senior supervisors of those professionals to provide some additional perspectives from those in the organization responsible for the career advancement of the individuals sampled in the first phase. The results suggest that both groups perceive interpersonal skills to be the most important IT skill set, followed by managerial skills. Technical skills, while important, were perceived to be the least important (relatively speaking) for current IT professionals within this organization. One possible explanation for the latter finding takes into account the current trend toward outsourcing some of the technical functions within organizations, rather than relying on in-house skills to provide those services. Recommendations for IT curriculum development and the education of future IT professionals are provided.

## Introduction

“Just as businesses are guilty of operating without a clear vision of where they want to go, so too are many information technology professionals. Unless you know where you want to go professionally, [IT professionals] will never get there. Only by continually revisiting your goals and expectations and challenging your assumptions about your skills and the demand for your services, can [the IT professional] achieve success” (Martin, 1995, pg. 37).

The importance of information technology in meeting new challenges and creating new opportunities for organizations in both the private and public sector is unchallenged. The problem of training and retaining qualified information technology professionals is one of the most difficult challenges for CIOs to deal with (Leitheiser, 1992). Given a number of resource constraints, this problem is often amplified for public sector managers (Caudle, et al., 1991). Nonetheless, given the importance of information technology (IT), it is imperative that public sector personnel are properly trained to manage new technology and systems to insure

the public receives an adequate return on its tax-dollar investment. For example, a recent GAO report mentions the Federal Aviation Agency (FAA) had to scrap a \$7.6 billion system, and that the objectives for the Department of Defense’s (DoD) Corporate Information Management (CIM) plan—after 8 years and \$20 billion—remains unmet (GAO/HR-97-9, 1997).

As illustrated in the aforementioned examples, there is a great deal to gain or lose in the IT management profession. To address this, many public sector organizations have now mandated the establishment of a Chief Information Officer (CIO) function. The CIO is often charged with assessing established knowledge and skill within the organization, evaluating the extent to which IT managers meet skill requirements, and developing strategies for human resource management with respect to IT. Given these responsibilities, it is important that public sector managers evaluate and understand the core skill requirements which are believed to be the most important within the broad scope encompassed by IT management in public sector organizations.

## Review of the Literature

This study addresses the core skills required of IT managers in public sector organizations generally, and the Air Force (as an example of a large, albeit unique, public sector organization) in particular. This is not a new area of concern; in fact, initial research looking at the skill requirements of public sector IT managers dates back over a decade. For example, Scott (1990) investigated the actual educational background and knowledge base of Air Force information management (IM) officers. Scott reported that information managers should be knowledgeable in the topic areas of people, computers, systems, models, organizations, and society; however, her study concluded that “...[IM] officers have been given a job which they are unprepared educationally to perform” (pg. 83).

The relevance of various skill sets has long been an area of interest to researchers within the private sector as well. An impressive array of studies have been completed looking at a wide range of skill sets and the relative importance of those skills as perceived by IS academics and industry (e.g., Trauth, Farwell, and Lee, 1993; Lee, Trauth, and Farwell, 1995; Leitheiser, 1992; Young and Lee, 1997; Lewis, Snyder, and Rainer, 1995; Longenecker, Simonetti, and Mulias, 1996). Looking across all these studies, several aggregate sets of skills emerge as central to the IS profession. While the names of these sets do not correspond exactly, the skills can generally be mapped into one of three categories: (1) managerial/business skills, (2) technical skills, and (3) interpersonal skills.

It is clear that each of these broad categories represents an important niche of the IS profession; however, it is not clear from the literature which set is *most* important to IT professionals. For example, Lee et al. (1995) found that business functional knowledge and management skills were the most important skill set for IT professionals. However, other research has made a case for technical skills being the most valued (e.g., Trauth et al., 1993), while still other studies have argued that interpersonal skills are the most critical (e.g., Leitheiser, 1992; Young et al., 1997). Given the broad range of skills encompassed by these areas, one of the goals of this research was to identify which category was perceived as most important by public sector managers in today's environment.

## Methodology

In order to investigate public sector perceptions, a single study with two separate phases was conducted to examine the perceived importance of core IT management skills (identified above) by both lower and mid-level Air Force managers and senior (CIO-level) managers. While military organizations are unique in many ways, from an IT management perspective, the results from this study should provide insight into the core skills required within other public sector organizations. Phase 1 utilized a stratified random sample of 501 Air Force low/mid-level officers (Lieutenants and Captains) currently serving in the Communications and Information career field. Phase 2 then surveyed senior managers (Majors, Lieutenant Colonels, and Colonels) of those sampled in the first phase. Two studies were conducted because the researchers felt it was possible that the views of senior-level managers might diverge from the views expressed by those with less experience. Furthermore, since these senior-level managers play a significant role in determining extrinsic rewards (promotion

opportunities, plum assignments, etc.), the researchers felt that it was important to capture the perspective of this senior group in order to compare and contrast their views with those of the lower-level managers charged with the responsibility of carrying out those day-to-day tasks within the organization.

## *Instrument Development and Data Collection*

A questionnaire was developed based on the literature reviewed earlier in the paper. The skills were extracted from the articles and a consolidated list was refined, containing the 24 skills most frequently found in the literature. The instrument consisted of three major sections: a demographic area, a list of skills where participants were asked to rate the importance of each skill in performing IT management duties based on a 5-point Likert scale, and a final section on training for each of those skills (analyzed separately as part of a second study that is not reported here in the interest of space).

## *Procedures*

Following pilot testing and the resultant changes, the questionnaire packages were sent to the 501 Air Force Communication and Information officers (Phase 1) and the 210 senior managers (Phase 2) identified. Each package contained the questionnaire, a cover letter that included instructions and a pre-addressed return envelope. The cut-off date for returned surveys was established three months after the mail-out date. For Phase 1, 242 usable surveys were returned for a response rate of 48.3%. Phase 2 included 130 usable surveys for a response rate of nearly 62%. The high response rates well exceed typical response rates for this type of survey and suggest a high level of interest in the topic from both groups.

## Results

Phase 1 of this study addressed the question "what skills do IT managers in the field perceive as being most important?" For Phase 1, 19 of the 24 skills (79%) were identified as being "very important"; a mean score of 3.0 or higher. The remaining 5 skills had slightly lower mean scores, ranging from 2.35 to 2.90. It is interesting to note that four of the top five skills belonged to the interpersonal skill group, while the technical skill group had the lowest eight mean scores.

Phase 2 asked "what skills do the supervisors of IT managers (i.e., those in Phase 1) perceive as being most important?". In this study, 18 of the 24 skills (75%) were identified as "very important." Four of the top five skills rated by senior managers were from the interpersonal category, mirroring the results from the less experienced group. Furthermore, the lowest 7 rated skills and 9 of the bottom 10 were from the technical area, consistent with the results seen in Phase 1. This is not to say that those

skills were not important, only that they were less important than other skill types on a relative basis.

The Appendix illustrates the ranking of the 24 skills based on their mean score. This method of ranking skills based on their mean scores, derived by utilizing a Likert scale, was used in several prior studies in the domain (e.g., see Young et al., 1997; Trauth et al., 1993; Lewis et al., 1995; Leitheiser, 1992). The table is ordered based on the responses of the low/mid-level managers (Phase 1). The commensurate ratings by senior managers (Phase 2) are presented to allow the reader to compare and contrast their responses with those from their subordinates in Phase 1 of the study.

Table 1 depicts the three major skill areas (interpersonal, managerial, and technical) by aggregate mean score. As shown in the table, the interpersonal skill category has the highest aggregate mean score for both groups. While this finding was somewhat surprising, it does correlate with other empirical work in the domain (e.g., Leitheiser, 1992; Young et al., 1997). Both groups were also in agreement on the less important aggregate skills in that technical skills had the lowest aggregate mean score in both studies, consistent with some of the previous work in this area (e.g., see Lee et al.; 1995; Longenecker, 1996). A test for differences across each of the three aggregate groups using one-way analysis of variance (and post hoc Tukey tests) indicated that all differences were significant ( $p < .05$ ).

**Table 1. Aggregate Mean Scores by Skill Group**

| Aggregate Skill Set | Phase 1 | Phase 2 |
|---------------------|---------|---------|
| Interpersonal (I)   | 4.31    | 4.55    |
| Managerial (M)      | 3.91    | 4.20    |
| Technical (T)       | 3.07    | 3.27    |

\*Note:  $I > M > T$  for both studies ( $p < .05$ )

## Discussion, Conclusions, and Suggestions for Future Research

Ascertaining the critical IS skills identified by leaders in the field is an important step in determining the current human resource and educational requirements within the organization. This study used a large sample of Air Force officers; thus, the results of this study should be interpreted appropriately. In particular, readers should be cautious when trying to generalize the results reported in this study to other public sector organizations. Despite the central and obvious role of technology across all career fields in the Air Force, it was interesting--and surprising--to find that interpersonal skills were most highly valued, while technical skills were seen as less important (although still rated highly). This suggests that current education and training for IT professionals should attempt to focus on interpersonal and managerial issues

with respect to technology vs. focusing on the technology itself (except, perhaps, in several key areas). This is not to say that education and training in technical areas is not important—clearly it is. However, the results of this study might suggest that in an era of constrained training resources, that interpersonal and managerial areas should receive the greatest attention.

One possible explanation for the dominance of interpersonal (and managerial) skills in this sample is that many public sector organizations, and the military services in particular, have aggressively pursued outsourcing of many technical functions (e.g., network management, database administration) as a means of reducing personnel costs. As a result, traditional roles for IT managers--particularly entry level officers--is undergoing a period of rapid change. It is possible that the results seen here reflect those changes, namely, the evolution of the entry and mid-level management role from one of "technical expert" to one of "project manager" or "facilitator." Such a role would tend to (perhaps) de-emphasize technical skills and more highly value coordination and communication skills, both of which are reflected in the interpersonal and managerial skill sets here.

Another possible explanation mirrors the idea suggested by Swain, White, and Hubbert (1995). This idea states that the respondents' greater concern for managerial versus technical issues can be explained by the fact that the respondents held "managerial" positions (consistent with the macro-level responsibilities of all military officers) in their organizations. They state, "at such organization levels they are expected to be concerned more with managerial issues than with technical ones" (pg. 279). Along those same lines, it is possible that IT managers perceive interpersonal skills to be important for all IT professionals, while specific technical skills are only relevant for a subset (e.g., network engineers). If true, such a view may help explain the present results. Future research might usefully take a "portfolio" approach asking which skills are necessary as part of an overall skills portfolio and in what quantity.

While this research examined critical IT skills in the public sector, there appear to be important and interesting avenues for further research in this domain. For example, what are the curriculum implications for these findings? Moreover, how can schools effectively balance the demanding technical requirements of the field while still emphasizing the "people" and "managerial" skills that are clearly important. Future research might also investigate which sources (e.g., degree-granting institutions vs. "just-in-time" technical schools) would be best positioned to provide training across the areas identified above. Given that there are many points in an IT professional's career where different types of training may be more relevant, there exists opportunity for design of non-traditional educational approaches. In order to establish a successful

schema for career-long learning, it may be necessary to mix not only training sources, but also courses taken. For example, relative "mix" of appropriate courses may differ at the entry level (perhaps being more technically focused) with more managerial courses following as the professional advances into senior management. Similarly,

## Conclusion

Public sector organizations share many common challenges with private sector organizations. At the same time, many of the challenges faced by these organizations are unique. Given compressed pay flexibility, constrained resources, and a lack of available training, personnel issues often become an IT manager's most vexing problem. This study provides some insight to managers about those skills perceived as most critical by two separate groups: entry/mid-level managers and their superiors. Furthermore, given the uniformity of the findings across both groups in this study, it does appear that "people" skills are recognized as increasingly important. Although IT professionals must walk a high-wire act of sorts, balancing technical, business, and interpersonal expertise, knowing which skill sets that are perceived to be most critical can help managers better tackle IT-related personnel issues. The results of this study should be useful in prioritizing training and education requirements as well as the accompanying fiscal commitments, especially in public sector organizations. In addition, the results of this study may also serve to augment the evolving philosophy and approach to IT training and education curricula. While not ignoring the critical technical focus of IT management, the central role of people and communication remains a powerful message for both IT professionals and managers alike.

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providing focused "just in time" short courses, either in-residence or via distance learning that serve as technology refreshers may be more effective than relying on technical courses taken early in the career that can quickly become dated.

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## Appendix. Core IT Skills Ranked by Mean Score

| <i>Phase 1<br/>(Low/Mid-Level<br/>Managers)</i> |                          |               |  | <i>Phase 2<br/>(Senior-Level<br/>Managers)</i> |                          |
|---|--------------------------|---------------|--|--|--------------------------|
| <b>Rank</b>                                     | <b>Mean (St<br/>Dev)</b> | <b>Group*</b> | <b>CORE SKILL</b>  | <b>Rank</b>                                    | <b>Mean<br/>(St Dev)</b> |
| 1   | 4.49<br>(.68)            | I             | Ability to work closely with customers and maintain a productive user or client relationship | 1  | 4.72<br>(.60)            |
| 2   | 4.38<br>(.73)            | I             | Ability to communicate verbally, one-on-one and group briefings                              | 3  | 4.68<br>(.53)            |
| 3   | 4.34<br>(.73)            | I             | Ability to plan, organize, and lead projects (project management)                            | 4 (tie)  | 4.61<br>(.56)            |
| 4   | 4.23<br>(.82)            | I             | Ability to write clearly, succinctly, and purposefully                                       | 2  | 4.69<br>(.53)            |
| 5   | 4.16<br>(.90)            | M             | Ability to learn and implement new technologies  | 4 (tie)  | 4.61<br>(.58)            |
| 6   | 4.11<br>(.90)            | M             | Information and system security  | 8  | 4.49<br>(.67)            |
| 7   | 4.10<br>(.89)            | M             | Ability to understand technological trends and potentials                                    | 6  | 4.57<br>(.57)            |
| 8   | 4.03<br>(.95)            | M             | Ability to plan and set standards for corporate-wide information system technology plan      | 9  | 4.29<br>(.74)            |
| 9   | 3.99<br>(1.04)           | T             | Networks (LAN, WAN, Corporate-wide, etc)   | 7  | 4.55<br>(.60)            |
| 10  | 3.95<br>(.90)            | I             | Ability to train/teach others to include end-users   | 12   | 4.06<br>(.76)            |
| 11  | 3.88<br>(.90)            | M             | Ability to interpret and solve business problems   | 13   | 4.05<br>(1.03)           |
| 12  | 3.76<br>(1.06)           | T             | Office automation (e-mail, schedulers, etc)  | 11   | 4.18<br>(.87)            |
| 13  | 3.75<br>(1.04)           | M             | Contingency planning/disaster recovery   | 14   | 4.00<br>(.73)            |
| 14  | 3.62<br>(1.02)           | T             | Systems integration  | 15   | 3.95<br>(.85)            |
| 15  | 3.53<br>(1.14)           | T             | Telecommunications (hardware, phones, modems, cables, satellites, etc)                       | 10   | 4.19<br>(.71)            |
| 16  | 3.39<br>(1.01)           | M             | Establish/monitor corporate data structure   | 17   | 3.39<br>(.90)            |
| 17  | 3.37<br>(1.13)           | T             | Systems life cycle management  | 16   | 3.42<br>(.95)            |
| 18  | 3.03<br>(1.09)           | T             | Systems analysis/structured analysis (formal method)   | 19   | 2.98<br>(.90)            |
| 19  | 3.02<br>(1.13)           | T             | Operating systems for mainframe, minis, micros, networks                                     | 18   | 3.18<br>(1.02)           |
| 20  | 2.90<br>(1.05)           | T             | Relational databases   | 22   | 2.68<br>(.93)            |
| 21  | 2.87<br>(1.05)           | T             | Distributed processing   | 20   | 2.81<br>(.88)            |
| 22  | 2.80<br>(1.11)           | T             | Decision support systems   | 21   | 2.69<br>(.93)            |
| 23  | 2.42<br>(1.00)           | T             | CASE methods or tools  | 23   | 2.34<br>(.82)            |
| 24  | 2.35<br>(1.08)           | T             | Expert systems/artificial intelligence   | 24   | 2.31<br>(.83)            |

I = Interpersonal, M=Managerial, T=Technical