Journal of
INDUSTRIAL TECHNOLOGY

Volume 15, Number 2 - February 1999 to April 1999

Key Characteristics of Industrial Technology Faculty: A National Survey of NAIT Accredited IT Programs

By Dr. Ahmad Zargari, CSIT & Dr. Charles E. Coddington

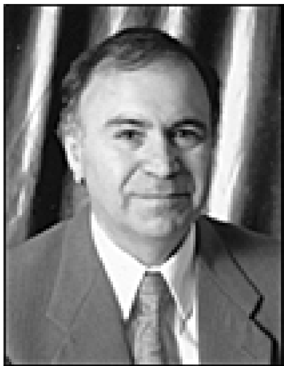
KEYWORD SEARCH

Administration
Leadership
Research

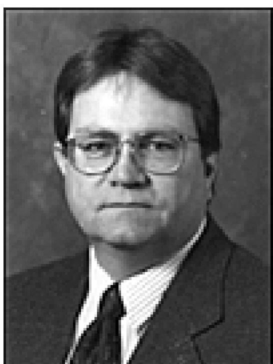
Reviewed Article

Key Characteristics of Industrial Technology Faculty: A National Survey of NAIT Accredited IT Programs

By Dr. Ahmad Zargari, CSIT & Dr. Charles E. Coddington



Ahmad Zargari, Ph.D., CSIT. Research interest in Industrial Technology Graduate Programs, Job Market for IT, Alumni and Employers Feedback, Microprocessors, Total Quality Management, Statistical Process Control (SPC) and Design of Experiments (DOE). Morehead State University's NAIT Student Chapter Advisor. A senior member of Society of Manufacturing Engineers, member of Epsilon Pi Tau, National Association of Industrial and Technical Teacher Educators, International Technology Education Association (ITEA) and member of National Association of Science Technology and Society (NASTS).



Dr. Charles E. Coddington, professor of Industrial Technology and chair of the School of Technology at Eastern Illinois University. He is a senior member of SME and a member of NAIT. Professional research interests also include Benchmarking for Quality Improvement and International Networking.

Introduction

To meet the needs of business, industry, education, and government for technical-management personnel, many industrial technology programs have been established and developed. A relative newcomer in the higher education arena, the discipline of industrial technology has been quite successful as a profession, and Industrial Technology (IT) programs have experienced rapid growth.

Despite the current climate in higher education in which downsizing and elimination of academic programs seems to be the norm, an increasing demand for high-tech workers has provided the IT profession with an exceptional opportunity to take a leadership role in the development of the national economy. As the need for technical and technical-management personnel increases and the discipline of industrial technology matures, the need for innovative programs and qualified faculty members and administrators also increases.

Since the knowledge of where we have come from and who we are is essential to understanding where we are going, this manuscript attempts to define the key characteristics of industrial technology faculty in institutions of higher education. The information provided could help colleges and universities recruit, employ, and prepare qualified IT faculty and administrators for the 21st century.

Background

In the late 1950s, technological developments in industries created new occupations that required a balance between management knowledge and technical skills. This has become the technical-management profession—"management" jobs with a decidedly "technical" nature. The discipline of IT was established to meet the needs of business and industry for employees who could use the complex tools of production and at the same time were able to manage personnel and facilities. Since the late 1960s, industrial technology programs have gone through a number of revisions in order to prepare management-oriented technical professionals for the economic enterprise system (Keith &Talbott, 1991; Miller, 1991; Rudisill, 1987).

The establishment of National Association of Industrial Technology (NAIT) in 1965 led to the development and expansion of IT programs in institutions of higher learning (Chowdhury, 1996). The recognition of NAIT by the National Commission on Accreditation (NCA), which later became the Committee on Post Secondary Education (COPA), and by the United States Department of Education (USDE) as the accreditation agency for industrial technology programs resulted in further recognition of the technical-management profession as a discipline. The accreditation standards and guidelines provided a clear direction and incentives for the revision and development of industrial technology programs (Keith & Talbott, 1991). The accreditation process led to the approval of 85 Baccalaureate Degree programs (186 program/options) at 45 institutions and 19 Associate Degree programs (48 program/options) at 9 institutions (Israel, 1998).

Industrial Technology in the 21st century

In our technology-oriented world, the pool of qualified employees will be shrinking instead of growing (Cordtz, p. 66). In the 21st century, workers' knowledge and qualifications will have more to do with economic success than will other resources (Drucker, 1993). As a result, the competition among employers for skilled workers will increase dramatically (Zeiss, 1990, p. 35).

According to the latest projections of the Bureau of Labor Statistics (BLS), employment in professional specialties will increase the fastest and will add the most jobs from 1996 to 2006. The group with the second fastest growth rate is technicians and related support occupations (Silvestri, 1997, p. 59). Scheetz and Gratz (1996) argued that, "As we leave the age of production and enter the age of knowledge, new careers are likely to develop, different skills will be needed, and certain industries will grow while others fade" (p. 32).

Forecasters predict that more than a third of all new jobs will be filled by college graduates with a technology background. The new information-based economy requires employees to be energetic, quick learners, computer literate, analytical thinkers and problem-solvers, and have a desire for lifelong learning (Scheetz & Gratz, 1996; Schmidt, 1998). To ensure that the skills of IT professionals will be sufficient to improve the competitiveness of the national economy, industrial technology programs should update their curricula and employ qualified faculty members.

Clearly, the discipline of industrial technology will continue to have the opportunity to play a significant role in the development of national and international economies as we approach to the 21st century. The preparation of industrial technology faculty and the revision of IT programs are fundamental to the supply of a workforce who will be able to successfully perform in the 21st century's technology-driven organizations.

Need for Industrial Technology Faculty

The industrial technology faculty members who made the transition from industrial arts to industrial technology are retired or will soon retire (Brown, 1983; McAlister & Erekson, 1988). To meet the specific needs of industrial technology students, academic programs should consider ways of preparing a sufficient number of qualified IT professionals in order to fill the vacant faculty positions. Concerned with the preparation of IT faculty for the 21st century, Chowdhury (1995) pointed out that, ". . . Where will the next generation of university faculty come from? Who is producing them? What is the terminal degree requirement in the industrial technology profession?"(p. 35).

Presently, there are 1,648 industrial technology faculty members with diverse academic backgrounds that are involved in various industrial technology programs (Industrial Technology Baccalaureate Program Directory, 1998). Industrial Teacher Education Directory (1997-98) listed 219 universities with technology related programs. This list included 62 industrial technology programs (Bell, 1997-98).

The task of preparing qualified IT faculty members who share a common purpose and are able to fill administrative and teaching positions in industrial technology programs created the need for the present study.

Purpose

The purpose of this study was to identify key characteristics of industrial technology faculty in the institutions of higher education. The study was conducted to provide reliable data on academic background, teaching responsibilities, employment status, and the qualifications expected of industrial technology faculty. The results of the study would enable industrial technology programs to look ahead and address some very important issues affecting the development of IT programs including the preparation of qualified IT faculty for the future.

Method

A three-page survey instrument was developed and validated based on the review of literature pertaining to the characteristics of industrial technology faculty. Also key to the survey development was information provided by previous research, and interaction with faculty and chairs of industrial technology programs (a copy can be obtained from the authors). The survey was administered using 53 chairpersons of NAIT accredited programs. To insure a high return rate, the follow-up surveys were sent by mail, fax, and e-mail. The instrument focused on key characteristics of industrial technology faculty including their primary field of preparation, teaching and research responsibilities, academic status, earned degree, and retirement status.

Results

Of the total of 53 questionnaires mailed, 31 were completed and returned, for 58% return rate. The 31 respondents reported on 408 industrial technology faculty members. The responses were then analyzed and organized around the following topics.

Degrees Offered:
Table 1 shows the type of degrees offered by 31 responding departments.

Programs Offered:
Table 2 displays the IT programs. Included are numbers and percentages.

As shown in Table 2, a variety of industrial technology programs are offered by institutions. These programs are tailored to the specific needs and requirements of the institutions' service region. It is clear that the majority of institutions offer programs in manufacturing, electronics, construction, and design/graphics technology.

Type of Degree	Number	Percent
Associate Degree	6	19%
Baccalaureate Degree	30	96%
Masters Degree	29	93%
Education Specialist (Ed.S.)	1	3%
DIT	1	3%
Ph.D.	1	3%

Table 1. Type of Degree

How Are New Faculty Recruited?

Table 3 displays the methods used by IT programs to recruit new faculty.

Qualifications Expected of IT Faculty

Table 4 displays the mean rating of qualifications expected from IT faculty based on a Likert-type scale of: 0 = Least important; 5 = Most important.

From the data presented in Table 4, it can be seen that the respondents have placed their highest emphasis on a terminal degree in industrial technology.

Field of Preparation

Table 5 displays the 408 faculty members field of preparation.

As shown in Table 5, 155 or 38 percent of the 408 faculty, were prepared in the fields of industrial arts and technology education. Only 122, or 30 percent, were primarily prepared for industrial technology.

Highest Degree Earned

Table 6 shows the highest earned degree by the 408 IT faculty members included in the survey.

Only 290, or 71 percent of the 408 faculty, included in the study had a terminal degree. From this data, it can be assumed that the IT faculty generally have earned academic degrees beyond the masters. The Doctor of Industrial Technology (DIT) has the potential to make a significant impact on the profession.

Employment Status

Table 7 displays the employment status of the 408 faculty members included in the study.

Three hundred seventy-five, or 92 percent of the 408 faculty members, are either tenured or tenure eligible. Only 33, or 8 percent of the faculty, were neither tenured nor on a tenure track appointment.

Academic Rank

In Table 8, academic rank of the 408 industrial technology faculty members is displayed.

Obviously, 65 percent of the faculty, included in the study were professors and associate professors. Only 36 individuals, or 9 percent, had the rank of instructor.

Programs	Number	Percent
Manufacturing	19	63%
Electronics	15	48%
Construction	14	45%
Design/Graphics	14	45%
Computer Integrated Mfg.	7	22%
Computer Technology	5	16%
Communication Technology	4	12%
Industrial Distribution	4	12%
Aerospace	4	12%
Industrial Management	3	9%
Occupation Safety	2	6%
Production Planning/Control.	2	6%
Packaging — Automotive	1	3%
Digital Communication	1	3%
Printing Management	1	3%
Quality Control— Plastics	1	3%
Instrumentation	1	3%
Bio-medical	1	3%
Fashion and Graphic Arts	1	3%
Telecommunications	1	3%
Technology Management	1	3%
Facilities Management	1	3%
Aviation Management	1	3%

Table 2. Programs Offered.

Recruiting Methods	Percent
Professional journals	83%
Advertisement	80%
Conferences — Conventions	64%
Industry	41%
University Placement Services	31%

Table 3. How Are New Faculty Recruited?

Qualifications Expected	Mean Rating (max = 5)
Terminal Degree (Ph.D., Ed.D., DIT) in IT	4.2
Teaching Experience	3.6
Terminal Degree with IT Specialization	3.5
Teaching Expertise	3.4
Industrial Experience	2.9
Leadership-Management Experience	2.7
Terminal Degree in Engineering	2.5
Terminal Degree in Engineering Technology	2.5
Research and Development Experience	2.4
Curriculum Planning Experience	2.4

Table 4. Qualifications Expected of IT Faculty

Teaching Responsibilities

Table 9 shows the teaching responsibilities of the faculty included in the survey.

As shown in Table 9, almost half of the 408 faculty members included in the study taught graduate courses and 94 percent taught undergraduate courses.

Projected Retirement

Table 10 shows the projected retirement of those industrial technology faculty members who were included in the study.

In less than 5 years, industrial technology programs will have to fill the vacant positions for 70 faculty who will retire. As shown in Table 10, 144, or 35 percent of faculty members, will retire in less than 10 years.

Conclusions

Clearly, less than a third of the faculty currently involved in the IT discipline have been originally prepared for industrial technology, and almost a third do not have a terminal degree. In less than five years, there will be a need for 70 new faculty members to fill the vacant positions of those who will retire. The findings of this study support the concern that, as we approach to the 21st century, the supply of qualified faculty members will be an issue of major concern that must be addressed. The development of terminal degree programs in industrial technology would help the IT discipline to prepare qualified faculty members and industrial leaders, as well as enhancing the image of IT programs.

The multidisciplinary approach to developing technical-management skills has created historic opportunities as well as challenges that need to be addressed by industrial technology professionals. Opportunities are provided for IT programs to meet the needs of a competitive and high-tech workplace for industrial technologists. Surveys of employers and alumni reveal that our graduates are competitive with graduates of management and engineering programs, and employer support is remarkable.

The IT profession's main challenge, at this critical time when higher education programs are forced to prove

Field of Preparation	Number	Percent
Engineering	61	15%
Industrial Arts-Technology Education	155	38%
Industrial Technology	122	30%
Others: Voc. Ed., Math, Computer, Management, Physics, Training, etc.	70	17%

Table 5. Field of Preparation

Degree	Number	Percent
Ph.D.	183	45%
Ed.D.	102	25%
DIT	5	1.2%
Ed.S.	12	3%
Masters	94	23%
Others	12	3%

Table 6. Highest Earned Degree

Employment Status	Number	Percent
Tenured	277	68%
Tenure Track	98	24%
Temporary	24	6%
Part-time - adjunct	9	2%

Table 7. Employment Status

Academic Rank	Number	Percent
Instructor	36	9%
Assistant professor	107	26%
Associate Professor	130	32%
Professor	135	33%

Table 8. Academic Rank

Teaching Responsibilities	Number	Percent
Undergraduate	383	94%
Graduate	212	52%
Lecturer	16	4%

Table 9. Teaching Responsibilities

Projected Retirement	Number	Percent
Less than 5 years	70	17%
6 to 10 years	74	18%
11 to 15 years	94	23%
16 to 20 years	130	32%
Over 20 years	40	10%

Table 10. Projected Retirement

their usefulness and efficiency, is to gain recognition on a national level with evidence of the discipline's value to students, industry and academies. In order to survive in a highly political and competitive environment, IT professionals should be actively involved in NAIT's efforts to provide national recognition for the discipline of industrial technology. What the Industrial Technology profession needs, first and foremost, is an organizational vision for the future which is understood and shared by all IT professionals. This requires the active involvement and total participation of all industrial technology professionals including faculty, students, and alumni in the NAIT programs.

For the IT discipline to continue to grow, it is essential that all faculty members and administrators share a common vision, regardless of their background, and focus on the preparation of technical-management personnel. It is important that we be aware of and attentive to the basics that underlie the discipline of industrial technology. If we support and strengthen our fundamental purpose, we will enhance the profession's potential to compete successfully and to provide outstanding service to students, industry and higher education.

References

Bell, T. P., Editor (1997-98). Industrial Teacher Education Directory (1997-98), CTTE and NAITTE, Department of Industry and Technology, Millersville, PA.

Brown, B. W. (1983). From where the next generation of industrial technology instructors come? Proceedings of the 16th Annual Conference of the National Association of Industrial Technology. Bowling Green, OH: Bowling Green State University.

Chowdhury. R. A. (1995/96, Winter). University division editorial. Journal of Industrial Technology. 12(1), 35.

Chowdhury. R. A. (1996, Fall). University division editorial: Preparing for the 21st century. Journal of Industrial Technology. 12(4), 44-48.

Cordtz, J. (1992). The changing nature of work. Financial World. 161(13), 66-75.

Drucker, P. (1993). The rise of the knowledge society. Wilson Quarterly. 17(2), 52.

Industrial Technology Accreditation Handbook (1997). National Association of Industrial Technology: Ann Arbor, MI.

Industrial Technology Baccalaureate Program Directory (1998). National Association of Industrial Technology, Ann Arbor, MI.

Israel, E. (1998). Programs Accredited by NAIT. NAIT Web Page: http://nait.org/naitaccr.html.

Keith, C. W. & Talbot, L. F. (1991). A history of the baccalaureate degree in industrial technology in the United States. National Association of Industrial Technology, Ann Arbor, MI. Technology. 14(1), 31.

McAlister, B. K., & Erekson, T. M. (1988, December). Supply and demand for university technology faculty: 1987-88 position vacancy and search result analysis (Research in technology education series. Rep. no. 4). Champaign, IL: University of Illinois, Department of Vocational & Technical Education.

Miller, P. W. (1991). National study of industrial technology programs. National Association of Industrial Technology. Ann Arbor, MI.

Rudisill, A. E. (1987, Spring). Technology curricula: Chaos and conflict. Journal of Industrial Teacher Education, 24(3), 7-16.

Scheetz, L., and Gratz, P. (1996, October). Careers for the new millennium. Black Collegiate Service Inc., 27(1), 32-37.

Silvestri, G., T. (1997, November). Occupational employment projections. Monthly Labor Review, 120(11), 58-83.

Zeiss, T. (1990). Employee retention. Community, Technical, and Junior College Journal, 60 (4), 35-38.