
The impact of IAIMS on the work of information experts*†

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Integrated Advanced Information Management Systems (IAIMS) programs differ but have certain characteristics in common. Technological and organizational integration are universal goals. As integration takes place, what happens to those implementing the vision? A survey of 125 staff members, or information experts, involved in information or informatics at an IAIMS-funded institution was conducted during the last year of the implementation phase. The purpose was to measure the impact of IAIMS on the jobs of those in the library and related service units, and the computing, telecommunications, and health informatics divisions. The researchers used newly developed scales measuring levels of integration (knowledge of and involvement with other departments), customer orientation (focus on the user), and informedness (changes in the nature of work beyond automation of former routines). Ninety-four percent of respondents indicated that their jobs had changed a great deal; the changes were similar regardless of division. To further investigate the impact of IAIMS on librarians in particular, a separate skills survey was conducted. The IAIMS librarians indicated that technology and training skills are especially needed in the new, integrated environment.

INTRODUCTION

The information experts who serve faculty, staff, and students at health sciences centers can be considered the knowledge workers' knowledge workers. As such, these information specialists are at the forefront of technology implementation and use. Those at institutions using Integrated Advanced Information Management Systems (IAIMS) also are expected to accomplish both technological and organizational integration.

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implementing the vision? A survey of 125 staff members involved in information or informatics at Oregon Health Sciences University was conducted during the last year of the implementation phase of an IAIMS contract. The purpose was to assess the impact of IAIMS on those in the library and related service units, and the computing, telecommunications, and health informatics divisions. Differences among divisions were investigated, with an emphasis on the nature and intensity of change. Hypotheses were tested concerning perceptions of changes in actual work, as opposed to duties outlined in job descriptions. The researchers measured integration (knowledge of and involvement with other departments), customer orientation (focus on the user), and informedness (a term coined by Shoshona Zuboff meaning changes in the nature of work beyond automation of former routines) [1]. To investigate more fully the impact on librarians, a second, written survey based on one by the Medical Library Association (MLA) Task Force on Knowledge and Skills was developed and carried out.

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Table 1
Job survey questions and results (five point Likert scale ranging from 5 = very much to 1 = not at all)

Integration questions	mean	SD
1. Do you feel you have more knowledge about BICC departments outside your own than you did in 1989?	3.542	1.179
2. How much do you interact with BICC departments outside your own?	3.389	1.0989
3. Have you been more involved in projects, committees or task forces with people from other BICC departments since 1989?	2.776	1.475
Customer orientation questions		
4. The budgets of some departments depend a great deal on charging for services. Do you feel pressure to generate income to provide funding for your department?	2.793	1.619
5. Are you interacting with users/clients/customers more than you were in 1989?	3.086	1.454
6. Do you do more teaching and training of users/clients/customers than before, whether formally or informally?	2.948	1.444
Informedness questions		
7. Since the fall of 1989, has your job changed?	3.729	1.375
8. How much more "technical" has your work become since 1989? (has your use of computers increased?)	3.474	1.524
9. If your use of computer technology has not changed (if you answered "not at all" for question 8), is it because you were already using it a good deal in 1989 or when you began working in the BICC? [not included in scale]	25% yes	
10. Have any of the routine/repetitive aspects of your job changed so that they are more varied?	2.932	1.363
11. To what extent have new duties been added to your old ones?	3.407	1.366

THE LOCAL ENVIRONMENT

In the fall of 1989, the Biomedical Information Communication Center (BICC) was formed at Oregon Health Sciences University, consolidating administration of most information systems and services on campus [2-3]. In 1991, many staff members moved into a new structure, the first in the nation built expressly around the IAIMS concept. The staff of nearly 150 was regrouped, reassigned, and in many cases expected to integrate with functional divisions that were unfamiliar. The telecommunications division, which manages the telephone system for 6,000 campus users, became part of the BICC, along with library-related activities, media and photography, microcomputer training and sales, networks and computing, and the health informatics department. Individual staff members had to readjust their views of the business they were in. Instead of the phone business, the computer business, or the library business, everyone was suddenly in the information business.

Individuals in the BICC were the first to test and use enhancements to the campus information network. Then, as state funding was reduced, there were layoffs. The original BICC director resigned. Another

reorganization took place when the hospital information systems division merged with the BICC and the vice president for academic affairs became acting director. With two reorganizations, layoffs, the pressure of working in a "model" cutting-edge technology-literate organization, a physical move to a new building, and the inevitable changes in the information and medical professions, the BICC information experts were subjected to an unusual amount of change [4].

IAIMS goals in this setting included development of a unified information organization and an integrated, networked technology-based system to support clinical, research, educational, and administrative activities. Great efforts were made to educate staff members about the functions of the various BICC departments and to promote sharing of expertise. The study reported here measured the level of integration achieved by 1993. Another IAIMS goal was to provide "one stop shopping" for the primary clientele, which includes all Oregon health professionals as well as campus personnel. This customer orientation is the driving force behind the integration effort, so the present study measured the level of customer orientation.

The study also measured informedness, Zuboff's term for "going beyond doing the same thing as before" when using new technology [5]. In other words, work not only has been automated, but also has changed in richer ways. Zuboff claims that as integrated systems are implemented, the "informating" capacity increases. Informating requires the following changes in the nature of work: The staff constantly must develop new skills; the staff must develop intellectual skills, which are more symbol oriented; there are fewer but better jobs for clerks, whose duties are enriched by an informating technology; and collaboration and team spirit are fostered by integrated electronic text. Because informating demands knowledge management by everyone, the lines between managers and the managed become weaker.

The final objective of the study was to identify the skills librarians feel are needed in this IAIMS organization and compare them to the skills that health sciences librarians across the country believe they need.

METHOD

A short "job survey" was designed in the summer of 1993 and pretested twice on a cross section of staff representing academic, management, and classified personnel before being mailed to all BICC staff. The survey consisted primarily of five-point Likert scale questions (Table 1).

A "skills survey" instrument was designed specif-

ically for librarians. The skills list developed by the MLA Knowledge and Skills Task Force [6] was adapted for this exercise. The task force list included 63 skills, which were reviewed and slightly modified. The final list included 65 skills, which the librarian respondents were asked to rank according to importance.

Because of the BICC reorganizations, it was not easy defining who should receive the job survey. The researchers eventually decided to send it to anyone who worked in a BICC department in 1989 and still worked in the BICC in 1993. Hospital information systems staff, because they became aligned with the BICC at about the time the survey was developed, did not receive it unless they had worked at BICC at any time before. In all, 125 surveys were mailed out.

Fourteen librarians were sent the skills survey in addition to the job survey. Ten worked in the library and four worked in related roles (informatics research, outreach, and administration) elsewhere within the BICC.

The job survey data were entered into SAS for analysis. The skills survey results were tallied by spreadsheet.

RESULTS

Job survey

Of 125 job surveys sent out, 60 (48% of the total) were returned. Fifty-four of these had names or numbers on them, with the remainder returned anonymously. Of the completed surveys with identification information, 51% of female recipients and 64.3% of all male recipients were represented. Of the academic staff, 60.9% responded; of classified and management services, 32.5% responded. The response rates in each of six BICC divisions were 60.7% for the library staff; 57.9% for the instructional media department, educational communications, photography, and educational technology; 35.3% for the networks and computing staff; 11.4% for telecommunications; 55.6% for health informatics; and 60% for the BICC administration. These are good response rates except for telecommunications.

Table 1 shows mean rankings and standard deviations of responses to survey questions. The first three questions measured the level of integration. While knowledge of other departments is high (mean of 3.452 on a five-point scale with 5 the high end), and departments are interacting, respondents indicated that involvement in interdepartmental projects, committees, and task forces had not increased a great deal since 1989 (mean of only 2.776).

Questions 4–6 measured customer service orientation. Because the BICC is trying to offer increased

customer service with a reduced staff, fees have been imposed for many services such as mediated online searches, interlibrary loans, network charges, audiovisual equipment, and staff time. But responses indicated that the pressure to generate income is not great. Interaction with users has increased while teaching responsibilities have expanded somewhat as indicated by means of 3.086 and 2.948, respectively.

Questions 7–11 concerned "informedness." Question 7 asked the basic question, How much has your job changed? Fully 94% of respondents said their jobs had changed quite a lot or very much. Answers to the other questions provided insight into the changes. Technology use was at a high level, with a mean of 3.474. In 25% of the cases, the use of technology had not changed because it was already at a high level in 1989. Question 10, which concerned routine jobs, was asked because Zuboff believes so strongly that future work will be more varied and require a higher skill level than current duties. Responses indicated that the shift toward less routine work has been only moderate to date.

To discover how well the survey instrument measured what it was supposed to measure, and to make sure it was internally consistent, Pearson's correlation coefficients and Cronbach's alphas were run on the data. Pearson's correlation coefficients indicated the questions formed natural groupings in the three areas of interest: integration, customer service orientation, and informedness. Correlation coefficients can range from -1 to $+1$, with -1 indicating a negative correlation, 0 meaning no correlation, and anything above that reflecting a positive correlation. All correlations within groups were positive and quite strong, justifying the joining of questions into three scales.

Cronbach α s indicated that the survey was internally consistent. Alphas, which can range from 0 to 1, measure the degree to which the questions mean the same thing to all readers. Alphas of .56 and .57 for the customer orientation and informedness scales were only moderate. Refinement of the questions prior to further use of the instrument could improve these values. The α for the integration scale was .71, which is better, but it also could be improved through rewording of the questions.

The main question was whether there were differences among units in the extent of change in integration, customer service orientation, and informing. Analysis of variance indicated statistically significant differences among units for customer service and integration ($P < .05$). The informing change is significant at $P = .10$ but not at $P = .05$.

To determine differences among divisions, informally grouped as service, technology, and administration and informatics, F tests were run. The differences were not as expected. One might assume service departments would differ from the other two groups,

Table 2
Librarian skills list in ranked order of importance

	IAIMS sur- vey rank	MLA sur- vey rank	MLA 21st century pre- dic- tion
Oral and written communication	1	1	1
Computerized database searching	2	—	—
Development of services to meet information needs	3	10	11.5
Computer software	4	9	6.5
Personnel management	5	18	19
Interpersonal relations and networking	6	8	17
Planning	7	6	8
Cross-departmental teamwork	8	—	—
Telecommunications and networking	9	15.5	6.5
Reference interview	10	—	—
Public relations and marketing	11	17	13.5
Staff development	12	21	22
Project management	13	25	27
Selection of information resources	14	5	13.5
Teaching methodologies	15	52	52
Information needs assessment	16	15	11.5
Resource sharing	17	14	15.5
Computer hardware	18	23.5	18
Integrated library systems	19	29	20.5
Bibliographic tools	20	11	20.5
Educational needs assessment	21	45	49
Knowledge of health sciences information resources	22	3	4
Budgeting	23	7	5
Serial publications	24	22	30.5
Acquisitions	25	33.5	40.5
Retrieval techniques	26	4	3
Information systems—design, use, evaluation	27	38	28
Human-computer interface issues	28	36	33
Instructional design	29	54	53
Methods of information delivery	30	12	9.5
Curriculum development	31	57.5	55
Health sciences terminology	32	—	—
Institutionwide information management	33	33.5	26
Cataloging	34	—	—
Evaluation and synthesis of information	35	19	15.5
Subject expertise	36	—	—
Inter-institutional relations	37	26.5	32
Grant writing	38	—	—
Fund-raising	39	50	45
Organizational behavior	40	26.5	30.5
National Library of Medicine programs and policies	41	23.5	25
Copyright	42	35	36
Evaluation of learning outcomes	43	55	54
Publishing	44	51	51
Systems analysis	45	56	50
Professional library associations	46	39	47.5
Space planning	47	31	35
National and international standards	48	53	56
Resource preservation	49	42	38
Inventory control techniques (collection)	50	57.5	61
Thesauri construction	51	59	59
Cataloging and classification theory	52	47.5	60
Health care policies	53	13	9.5
Program evaluation	54	28	29
Database construction	55	30	23
Bibliometric techniques	56	62	62
Computer programming	57	63	63
Application of research	58	44	40.5
Indexing, abstracting and classification systems	59	37	42
Circulation systems	60	49	57.5
National information policies	61	41	37
Evaluation of research	62	46	44
Research methodology	63	47.5	47.5
Artificial intelligence and expert systems	64	61	46
Quantitative techniques	65	40	43

but they did not. One also might expect the library to differ from all other departments, but it did not. However, there were differences within the group of service units in customer service, and within the other groups in informing and integration.

Skills survey

The skills survey was designed to answer two questions: Are the skills needed at IAIMS libraries different from those required at other libraries? And are the IAIMS skills perhaps closer to those that health sciences librarians will need in the twenty-first century?

Fourteen professional library staff members were asked to rank the skills on the list by allocating a total of \$660 (average of \$10 per skill). All completed the survey, with the results shown in the first column of Table 2. The second column indicates the ranking reported in the MLA study for those skills. Both columns indicate skills that librarians consider important now. The third column shows the MLA rankings for the twenty-first century.

The IAIMS librarians consistently ranked technological skills higher than did MLA respondents in terms of importance now and they even ranked most of these skills higher than did MLA respondents for the 21st century. The IAIMS librarians also ranked any skills related to educating and training users (development of teaching methodologies, educational needs assessment, instructional design, curriculum development, and evaluation of learning outcomes) higher than did MLA members for either now or the future. While the IAIMS librarians ranked traditional library skills (use of bibliographic tools, knowledge of health sciences information resources, serial publications, acquisitions, methods of information delivery, resource preservation, use of circulation systems) lower than did MLA librarians in terms of immediate importance, the IAIMS rankings are similar to those of MLA for the twenty-first century.

One skill area that IAIMS librarians consistently ranked lower than did MLA members for either now or the future was research-related skills (application of research, evaluation of research, development and use of research methodology and quantitative techniques). Several respondents commented that others should do this, presumably meaning that because the informatics faculty does research, librarians need not spend time on it.

DISCUSSION

The results of the job survey indicate that jobs have changed a great deal over the last four years for most (94%) of the information experts in BICC, a prototype information organization. The results also provide

insight into the nature of the changes. Integration has been successful to the extent that half the respondents know much more about other departments than they used to, although true integration in the sense of people working together on projects and task forces had not occurred as of 1993. Since then, further effort has been made to develop integrating mechanisms. To assess informedness, the study gauged degree of technology use, which as expected was high, and the duties and routineness of jobs. Many duties have been added, although respondents did not feel their jobs were necessarily more varied now. Customer orientation seems to have grown, especially with respect to interaction with users.

Statistical tests indicated the six units differ significantly on the customer orientation and integration scales. The customer orientation differences were primarily within the service departments, possibly because some staff members felt they were already at a high level and said there had been little change. The integration scale measured knowledge of, and interaction and involvement with, other departments. The differences here were within non-service units, perhaps because anyone dealing with administrative matters indicated high involvement (Question 3), whereas few classified technical staff or informatics faculty did so. Response patterns regarding interaction (Question 2) were similar. Responses concerning knowledge of other departments (Question 1) may have reflected attendance at voluntary interdepartmental training sessions.

The informedness scale measured routineness of job, new duties, increased use of technology, and job change. There was not a significant overall difference among groups here, possibly because most departments have changed at the same rate on these measures. There was a significant difference within the non-service departments, however, perhaps because the computing staff and informatics faculty indicated little increased use of technology, while administration and telecommunications staff reported great increases. The library seems to be representative of the entire group, in that there are no strong differences between it and other departments on key variables.

The IAIMS librarians who completed the skills survey said that technological and training skills are already more important than traditional library skills and ranked them even higher in current importance than the MLA ranking for the future. The IAIMS librarians differed most from the MLA respondents in rankings of the following skills: development of services to meet information needs, personnel management, telecommunications and networking, teaching methodologies, educational needs assessment, knowledge of health sciences information resources, budgeting, methods of information delivery, and health care policies.

Post-survey interviews with respondents provided some explanations for the discrepancies. Personnel management naturally would be more important for a larger IAIMS library with more staff than a small library. Budgeting would rank lower at a large library, because few non-administrative librarians do it; in smaller libraries, the majority of librarians would need this skill. The MLA survey included responses from librarians at many small libraries. The librarians at smaller institutions, especially hospitals, would tend to rank health care policies higher in importance than would IAIMS librarians because the former are more directly affected by such policies. The teaching and education skills that rank higher in the IAIMS environment than in the MLA survey may reflect a desire among IAIMS librarians to encourage users to seek information themselves. Knowledge of resources and information delivery may have been ranked low by IAIMS librarians because users, as a result of training offered by the library, are expected to know a good deal themselves. The high rankings for development of services to meet information needs and for telecommunications and networking probably reflect the IAIMS goals of developing new programs and experimenting with new technology.

The low rankings for research skills in the present survey may be an early warning of what could happen as informatics researchers work increasingly closely with library staff. It may be too easy for librarians to shirk responsibility for applied research by claiming that enough is done by informatics colleagues. It is especially tempting to put research aside when librarians are overwhelmed by the task of developing skills in so many other areas.

The results of this study are closer to those found by Snape [7], in that her five top-ranked skills (out of nine) are all within the top fifteen (out of sixty-five) in the present study. Snape's survey of skills that can transfer to nontraditional jobs ranked the following skills the highest: presentation/training, management, reference interview, computer, and interpersonal.

IMPLICATIONS AND RECOMMENDATIONS

Clearly, library jobs, along with those of other information experts, are changing rapidly and to a great extent. The tools have changed dramatically. The customer focus, with its emphasis on user training, is stronger than ever. Both surveys point to the need for technological and training skills.

It is heartening that the survey showed that disparate units are more alike than they are different. The journey through the integration process involves a comparable degree of hard work, flexibility, understanding, and empathy on the part of staff in all units.

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