

Profile of LIS Applicants Selecting Different Specialisations

CHRISTOPHER S.G. KHOO AND CHENNUPATI K. RAMAIAH

Division of Information Studies, School of Communication and Information,
Nanyang Technological University, Singapore

The Division of Information Studies at the Nanyang Technological University, Singapore, revised its curriculum in 2000 and defined eight areas of specialisation. Applicants to the MSc (Information Studies) programme were asked to fill out a questionnaire and indicate the specialisation and the subjects in which they were interested. A cluster analysis of students based on the subjects they selected identified four clusters of students corresponding to the following areas: library service, digital library, information technology, and knowledge management. A statistical analysis was then performed to identify the characteristics and background of applicants selecting the various specialisations and belonging to the different clusters. Applicants selecting different specialisations were found to have different profiles, educational and employment backgrounds. Age and gender differences were also found. Applicants tend to select the specialisation that is related to their educational and employment back-

ground. Teachers tend to select the school libraries specialisation; people with finance, business and accountancy background tend to select corporate information services and knowledge management; and IT workers tend to select information systems. The library specialisations tend to be selected by arts & social sciences graduates, whereas science and technology graduates prefer information systems and the Internet specialisations. However, the Internet specialisation appears to cut across all sectors, with applicants from every industry selecting it. Gender and age differences were also found. The public library and school library specialisations tend to attract female applicants. The library specialisations also attract older applicants than the information systems and Internet specialisations. Men and younger applicants are more interested in IT subjects, and the knowledge management area tends to be selected by slightly older applicants and male business/accountancy graduates.

Introduction

Library and information science (LIS) schools often face the question of whether to provide a generalist or a specialist education. Should LIS schools provide a broad, general LIS education – a foundation for any kind of information related work – and leave it to the graduate to specialise through work experience? Or should LIS schools attempt to educate graduates for particular specialised areas or information professions?

The Division of Information Studies at the School of Communication & Information, Nanyang Technological University, Singapore, was faced with this question in its 2000 curriculum revision and after much debate, decided to define eight areas

of specialisation in its MSc in Information Studies programme (Higgins & Chaudhry 2003):

- Academic libraries
- Corporate information services
- Public libraries
- School libraries & media resources
- Document & records management
- Information systems & products development
- Internet & multimedia-based information services
- Knowledge management

These specialisations were based partly on the main types of institutions and environments the graduates were expected to work in, the main

types of work they were likely to do and the different skill sets needed.

Some of the reasons for defining specialisations, as reported by Higgins and Khoo (2000), were that

1. LIS graduates have to be knowledgeable and competent in specialised areas to compete for jobs in non-library settings and in emerging information professions – where they have to compete with graduates from computer science, information systems and management programmes
2. Defining specialisations is a good marketing strategy because they give prospective students a clearer idea of what the programme offers.
3. Areas of specialisation also give an LIS programme a sense of direction – to develop depth and strength in particular areas of the LIS field.

In an earlier study (Khoo et al. 2001), we carried out a cluster analysis of students, graduates and applicants to find out whether there were groups of students with similar subject interests – based on the elective courses they selected in two questionnaire surveys. We found two distinct clusters – a library-oriented cluster of students and an IT/information management-oriented cluster. In each cluster, further sub-clusters were found that corresponded to known specialisations.

This paper reports the results of an analysis of questionnaire data obtained from applicants to the MSc (Information Studies) programme at the Nanyang Technological University to answer questions about the background and characteristics of applicants who selected the different specialisations. What are the differences in background between applicants who selected the different specialisations? Do applicants with particular characteristics, academic backgrounds and work experiences tend to select particular specialisations? Are applicants who select particular specialisations already working in those areas, or are they seeking to move to this specialisation from a different area?

The analysis also attempts to answer the same questions about the different clusters of students with similar subject interests. Do students with a particular background tend to have particular subject interests?

The answers to these questions have implications for the education of students in different LIS specialisations, as well as implications for the LIS

field itself because it suggests that people entering different types of information professions or specialities have different background and characteristics.

Literature survey

This section gives an overview of the *generalist versus specialist* debate in LIS education and examines the differences in the characteristics of people working in different information professions.

The issues in the *generalist versus specialist* debate in LIS education were reviewed by Williams and Zachert (1986). The debate in the first half of the 20th century was, they said, focused on general versus special subject libraries (e.g. medical, law and academic libraries). In the second half of the century, new information professions joined the debate – documentalists, information scientists, archivists, records managers, online searchers, information brokers, information analysts, corporate information services, school media specialists, etc. Williams and Zachert argued that resistance in LIS programmes to specialisations in specific subject areas as well as in information science and information systems has caused the profession to be fractured into segments that rarely communicate with one another, and has limited the profession to a narrow portion of the work that it could be performing in the information society today.

The resistance in LIS schools to specialisations was due, in part, to the lack of demand for specialised training from students, who were not well informed about careers in the various specialties. White and Mort (1990) found that geographic convenience was students' primary criterion in selecting a library school to attend, and this consideration was more important than perceptions of quality or availability of specialised courses. White (1988) said that employers appeared to hire based on geographic availability, and many non-academic libraries would hire the first reasonable candidate.

This generalist versus specialist debate expanded in scope as new information professions came on the scene in the 1990s. With the growth of the World Wide Web and the knowledge economy, a range of new information careers has appeared in the areas of knowledge management,

Web-based information systems and services, digital library, intranets and Web portals, data warehousing and information mining. Myburgh (2000) noted that the new information careers that have appeared include knowledge managers and analysts, cybrarians, information brokers, corporate information managers, Web masters, network navigators, and information mappers and architects, and that LIS programmes are offering courses in new disciplines and defining new concentrations in their programmes.

Pors (1994) reported that the private sector had, increasingly, been the main employer of graduates from the Danish Royal School of Librarianship. However, graduates had to compete hard with the other professionals (such as teachers, economists, engineers and marketing professionals) for these jobs, and that the specialisations chosen by students in the LIS programme had an effect on job opportunities. However, it was not clear to Pors whether graduates obtained their jobs because of their professional skills/qualifications, or because of their personalities, attitudes and motivation.

Several studies have found gender differences in the areas of specialisation selected by students as well as graduates (Hildenbrand 1999; Williams 1995). In particular, men are better represented in IT-related specialties, and women in more service-oriented areas. Corbin (1992) found that men were disproportionately employed as computer specialists and in the higher levels of library computer administration. Hildenbrand (1999) noted that specialised Master's programmes oriented towards IT (e.g. information science and telecommunications) offered by LIS schools attracted largely male students. The faculty in these programmes also tended to be male. Their graduates were more likely to find employment in the private sector in non-library settings (Williams 1994). Furthermore, revisions of LIS programmes to incorporate more IT in recent years may have led to a decline in female enrolment in LIS programmes (Murphy 1997).

With new information careers and new disciplines appearing on the scene and with library schools restructuring their programmes to educate professionals for these new areas, it is important to find out what kind of people are being attracted to these new areas and how their prior background will affect the information profes-

sions, the information field as well as LIS education.

Preliminary analysis of admission questionnaire data

A questionnaire was administered to applicants to the MSc (Information Studies) programme at the Nanyang Technological University, Singapore, in April 2000 just before the applicants took the admission test. Besides demographic information, the applicants were asked about their educational and employment background as well as to indicate one area of specialisation (out of eight) and 6 elective subjects (out of 27) that "are of most interest" to them. The questionnaire was completed by 327 applicants. Information from the questionnaire was supplemented with information taken from the applicants' application forms.

The aggregate responses to the questions are summarized in Table 1. Overall, 58% of the applicants were male. The majority of applicants were aged 25 to 34 years (71%). They were from a cross-section of industries, mainly education, engineering, information technology and "others". Only about 12% were from the library and information services sector. Applicants also came from a wide range of educational backgrounds. 80% of the applicants had been in their current job 5 years or less. There were a substantial number of non-Singaporean applicants from Malaysia, China and India. Many of these were Singapore permanent residents or working in Singapore. We did not distinguish between non-Singaporean applicants who were residing in Singapore and international applicants who applied from abroad.

We carried out a cluster analysis of the applicants based on the subjects that they selected. The SAS statistical analysis software was used to perform an agglomerative hierarchical clustering using the average linkage method (Aldenderfer & Blashfield 1984). The results were reported in Khoo et al. (2001). We wanted to find out whether there were well-defined and coherent clusters of LIS applicants who exhibited similar interests in terms of the subjects that they preferred, what the "core subjects" were for each cluster of students, whether the core subjects corresponded to a known specialisation in the field, and whether people in a particular cluster tended to choose a particular area of specialisation.

Table 1. General profile of applicants to the MSc(Information Studies) programme

Attribute	Response	No.	%	
Gender	Male	190	58.1	
	Female	137	41.9	
Age	20-24	33	10.1	
	25-29	153	46.8	
	30-34	78	23.9	
	35-39	32	9.8	
	40-44	25	7.6	
	>45	6	1.8	
Industry / Work background	Education	46	14.1	
	Library	17	5.2	
	Engineering	68	20.8	
	Finance / Accounting	26	8.0	
	Information Technology	82	25.1	
	Others	72	22.0	
Number of years in current job	Unemployed	16	4.9	
	0-1 yrs	90	27.5	
	1-3 yrs	117	35.8	
	3-5 yrs	54	16.5	
	5-10 yrs	32	9.8	
	>10 yrs	18	5.5	
Nationality	Singapore	182	55.7	
	Malaysia	24	7.3	
	China (People's Republic)	42	12.8	
	India	37	11.3	
	Others	26	8.0	
	Unknown	16	4.9	
Type of Bachelor's degree	B. Arts	35	10.7	
	B. Social Science	4	1.2	
	B. Business	41	12.5	
	B. Science	71	21.7	
	B. Engineering	72	22.0	
	B. Computer Science	39	11.9	
	B. Management	3	0.9	
	B. Accountancy	5	1.5	
	B. Economics	10	3.1	
	Others	10	3.1	
	Unknown	37	11.3	
	Type of postgraduate qualification	Diploma	32	9.8
		Masters	16	4.9
Postgrads of unknown type		9	2.8	
Length of work experience	Nil	16	5.1	
	0-1 yrs	37	11.9	
	1-3 yrs	78	25.1	
	3-5 yrs	53	17	
	5-10 yrs	86	27.7	
	10-15 yrs	27	8.7	
	>15yrs	14	4.5	
Area of specialisation selected	Unknown	16	6.1	
	Academic / corporate / public libraries	20	6.1	
	School libraries	17	5.2	
	Document & records management	7	2.1	
	Information systems & products development	76	23.2	
	Internet & multimedia-based information services	146	44.6	
	Knowledge management	48	14.7	
	Not decided	13	4	

The cluster analysis found four distinct clusters:

1. A *library service* cluster (3% of the total 327 respondents). This cluster of applicants selected the following subjects, in decreasing order of popularity: information management, public libraries, academic & research libraries, school media resource centres, information organization, collection development & management, library services for children & young adults, and multimedia information systems (with at least 40% of the cluster choosing each subject).
2. A *digital library* cluster (11%). This cluster of applicants selected the following subjects: digital libraries, academic & research libraries, cataloguing and classification, collection development & management, electronic commerce, and Internet and Web technologies.
3. An *IT* cluster (77%) with emphasis on electronic commerce and Internet technology. This cluster selected subjects on electronic commerce, Internet & Web technologies, Web-based information systems, data communication & networking, database management systems, business information, and computer programming.
4. A *knowledge management* cluster (8%), where subject choices were focused on knowledge management, knowledge-based organisations, information management, information organisation, information mining, and business information.

The questionnaire also asked the respondents to select an area of specialisation (out of the 8 specialisations listed). Table 2 lists the specialisations and the percentage of each cluster selecting a specialisation. We examined the relationship between the clusters of applicants and their choice of specialisations to see how well the defined specialisations correspond to the clusters of applicants.

There is generally good correspondence between cluster membership and area of specialisation selected. Of the applicants in the IT cluster, 52% selected the *Internet & multimedia-based information services* specialisation, and 28% selected the *information systems & products development* specialisation. The majority of the applicants in the knowledge management cluster selected the *knowledge management* specialisation, but 15% selected the *Internet & multimedia-based information services* specialisation. The library service cluster is split between the *public libraries* and the *school libraries* specialisations. The digital library cluster is split between the *school libraries & media resources* and the *Internet & multimedia-based information services* specialisations.

Table 2. Clusters of applicants with similar subject interests, and the areas of specialisation selected by each cluster

Area of Specialisation	Clusters							
	IT (n=253)		Knowledge management (n=27)		Library service (n=10)		Digital library (n=37)	
	No.	%	No.	%	No.	%	No.	%
Academic libraries	1	0%	0	0%	1	10%	2	5%
Corporate information services	5	2%	3	11%	0	0%	1	3%
Public libraries	0	0%	0	0%	2	20%	5	14%
School libraries & media resources	1	0%	0	0%	4	40%	12	32%
Document & records management	4	2%	2	7%	0	0%	1	3%
Information systems & products development	72	28%	3	11%	1	10%	0	0%
Internet & multimedia-based information services	132	52%	4	15%	1	10%	9	24%
Knowledge management	32	13%	15	56%	0	0%	1	3%
Not decided	6	2%	0	0%	1	10%	6	16%

Focusing on the areas of specialisation, we find that the *Internet & multimedia-based information services* specialisation figures prominently in two clusters – the IT cluster and the digital library cluster. The *school libraries* specialisation figures prominently in the library service cluster and the digital library cluster.

The data suggest that the two specializations, *information systems & products development* and *Internet & multimedia-based information services*, are not distinct. The data also indicate that there should be a new specialization in *digital libraries*. Furthermore, the specializations in academic libraries, public libraries and school libraries can be consolidated into a unified *library services* specialization, since the people selecting them do not form separate clusters.

The Division of Information Studies reviewed the programme again in 2001–2002, and the results of this analysis provided information for rationalising and redefining the areas of specialisation. The *information systems & products development* and *Internet & multimedia-based information services* specialisation were combined to form one *information systems* concentration. The specialisations in academic libraries, corporate information services and public libraries were combined to form a unified *library & information science* concentration. The *school libraries & media resources* specialisation was retained (and renamed *school media resource management*) because it represented a strategic growth area to be developed. The Division decided not to define a separate *digital libraries* specialisation as it felt there was not a

sufficiently large employment market to support graduates with this specialisation. However, the *digital libraries* cluster found in the analysis provided support for retaining the school media specialisation as a large proportion of applicants in the *digital libraries* cluster selected the specialisation, suggesting that the specialisation requires a different skill set from the general *library & information science* concentration.

Method of analysis

We carried out further analysis of the questionnaire data to find out the profile and background of applicants who selected the various specialisations and who belonged to the four clusters.

In the statistical analysis, the dependent variables of interest are:

1. Areas of specialisation, which has 8 categories:
 - Academic
 - Corporate information services
 - Public libraries
 - School libraries & media resources
 - Document & records management
 - Information systems & products development
 - Knowledge management
 - Internet & multimedia-based information services
2. Areas of concentration. The first four specialisations above are grouped to form the *Library Science* area and the second four specialisations form the *Information Management/Technology* area.

3. Clusters of applicants with similar subject interests:

- Library service cluster
- Digital library cluster
- Knowledge management cluster
- Information technology cluster.

The independent variables of interest in the statistical analysis are as follows:

1. *Personal profile*: gender (which has the values 1=male, 0=female), age, race (1=Chinese, 0=others), marital status (1=married, 0=single), nationality (Singapore, China, Malaysia, India).

2. *Educational & employment history*:

- Educational background (B. Econ., B. Engineering, B. Arts, B. Sc., B. Computer Sci., B. Soc. Sci., B. Business, B. Management, B. Accountancy, and Others)
- Educational area (Technology – combining economics, science, engineering and computer science – Arts and Social Science, and Business/Management/Accountancy)
- Country of undergraduate education (Singapore, Australia, Malaysia, USA, and UK)
- Industry / employment area (Education, Engineering, Finance/Accountancy, Library service, Information technology)
- Number of years in current job
- Number of years since graduation
- Postgraduate education
 - Whether applicant has a postgraduate qualification
 - Postgraduate education in Singapore
 - Postgraduate education in another country
 - A postgraduate diploma
 - A Master's degree

3. *Interaction effects*. We also investigated every pair of independent variables to check whether a particular independent variable has an effect on the dependent variable only in the presence of another independent variable.

The statistical analysis was performed in two stages:

1. *Analyse the relation between each dependent variable and each independent variable separately*, to see if the relationship is statistically significant. If the independent variable is categorical, a Chi-square test of independence was performed. If the independent variable is continuous, a t-test or analysis of variance was performed.

2. *Perform multiple regression analysis*, to construct a model or equation with the independent variables to predict the value of the dependent variable. This also analyses to what extent each independent variable contributes to the prediction of the dependent variable over and above the contribution of the other independent variables. The regression analysis was also used to investigate interaction effects.

Logistic regression is a regression analysis technique that is commonly used when the dependent variable is categorical as in this study (Hosmer & Lemeshow 1989; Menard 1995). Logistic regression constructs a model that predicts the log odds (or probability) that the dependent variable has the value 1. When the dependent variable is multi-valued (i.e. has several categories), logistic regression can be used by selecting one of the categories as the reference category. The other categories are then coded as separate variables, and a regression model is constructed for each category that estimates the log odds that an item belongs to this category rather than the reference category. So each category has a regression model that compares it with the reference category.

In this study, forward stepwise logistic regression was performed using the Proc Logistic function in the SAS v.6 statistical analysis software. In forward stepwise regression, the independent variables are added to the model one at a time, until no more variables contribute significantly to the model. Independent variables are added to the model if they are significant at the 0.05 level.

Results of statistical analysis

Relation with individual independent variables

We analysed the relation between each dependent and each independent variable separately to see if the relationship is statistically significant. Only the following independent variables were found to be significant: gender, age, nationality, educational background, employment background, and whether the applicant has a postgraduate qualification.

Gender

Table 3 shows the number and percentage of males and females in the various specialisations. The relation between gender and the specialisa-

Table 3. Relation between gender and the specialisations

	male		female	
	No.	% of row	No.	% of row
<i>Specialisation</i>				
Academic Lib.	3	75%	1	<i>25%</i>
Corporate Info. Serv.	5	56%	4	44%
Public Lib.	1	<i>14%</i>	6	86%
School Lib.	2	<i>13%</i>	14	88%
Document/Records Man.	4	57%	3	43%
Info. Systems	52	68%	24	32%
Internet	82	56%	64	44%
Knowledge Man.	34	69%	15	<i>31%</i>
<i>Area of concentration</i>				
Library Sci.	11	31%	25	69%
Info. Man./Tech.	172	62%	106	<i>38%</i>
<i>Cluster</i>				
Knowledge Man.	20	74%	7	<i>26%</i>
Digital Lib.	8	<i>22%</i>	29	78%
Lib. Service	2	<i>20%</i>	8	80%
Info. Tech.	158	62%	95	<i>38%</i>
<i>Overall</i>	183	58%	131	<i>42%</i>

Note: Percentages that are substantially higher than the overall percentage are bolded. Percentages that are substantially lower than the overall percentage are italicised.

tions, areas of concentration and clusters are all significant at the 0.001 level.

Overall, 58% of the respondents are male. The specialisations with a high percentage of males are:

- Information systems (68% male)
- Knowledge management (69% male)

For the academic library specialisation, the sample size is too small to draw a meaningful conclusion.

Specialisations with a high percentage of women are:

- Public library (86% female)
- School library (88% female).

As expected, the library service area of concentration has a high proportion of women (69%).

Furthermore, men seem to be more interested in knowledge management subjects (knowledge management cluster), whereas women dominate the digital library and library service clusters. The high percentage of women in the digital library cluster is because a substantial number of

Table 4. Average age of applicants selecting various specialisations

	Avg Age in years
<i>Specialisation</i>	
Academic Lib.	25
Corporate Info. Serv.	33
Public Lib.	27
School Lib.	33
Document/Records Man.	29
Info. Systems	26
Internet	28
Knowledge Man.	30
<i>Area of concentration</i>	
Library Sci.	31
Info. Man./Tech.	28
<i>Cluster</i>	
Knowledge Man.	30
Digital Lib.	31
Lib. Service	31
Info. Tech.	28
<i>Overall</i>	28

applicants selecting the school library specialisation are interested in digital library-related subjects.

However, there is an even proportion of men and women in the IT and Internet-related specialisations. The proportion of women in the Internet specialisation, information management/technology area of concentration and IT cluster is close to 42% – the overall percentage of women in the pool of applicants. So, women seem to be holding their own in the IT specialisations. The problem seems to be in attracting men to the library specialisations.

Age

The average age of applicants selecting various specialisations is given in Table 4. There is a significant relation between age and specialisations (0.05 level) and between age and the clusters (0.01 level). The relation between age and areas of concentration is not significant. The average age of the applicants is 28 years. Applicants selecting the corporate and school library specialisations appear to be older than average (33 years). Also, applicants in the Digital Library and Library clusters are also older at 31 years. Older applicants seem to appreciate the library (particularly school library) specialisations and library subjects more.

Table 5. Relation between nationality and specialisations

	Singapore		China		Malaysia		India		Others	
	No.	% of row	No.	%	No.	%	No.	%	No.	%
<i>Specialisation</i>										
Academic Lib.	4	100%	0	0%	0	0%	0	0%	0	0%
Corporate Info. Services	7	78%	0	0%	1	11%	1	11%	0	0%
Public Lib.	6	86%	0	0%	1	14%	0	0%	0	0%
School Lib.	15	88%	0	0%	0	0%	2	12%	0	0%
Document/Records Man.	4	57%	0	0%	1	14%	0	0%	2	29%
Info. Systems	32	42%	10	13%	6	8%	14	18%	14	18%
Internet	75	51%	24	16%	11	8%	16	11%	20	14%
Knowledge Man.	33	69%	4	8%	4	8%	3	6%	4	8%
Total	176	56%	38	12%	24	8%	36	11%	40	13%
<i>Area of concentration</i>										
Library Sci.	32	86%	0	0%	2	5%	3	8%	0	0%
Info. Man./Tech.	144	52%	38	14%	22	8%	33	12%	40	14%
Total	176	56%	38	12%	24	8%	36	11%	40	13%
<i>Cluster</i>										
Knowledge Man.	17	63%	3	11%	4	15%	0	0%	3	11%
Digital Lib.	31	84%	0	0%	1	3%	1	3%	4	11%
Lib. Service	7	70%	0	0%	1	10%	1	10%	1	10%
Info. Tech.	128	51%	36	14%	18	7%	35	14%	36	14%

Table 6. Relation between employment background and specialisations

	Employment Background (Industry)											
	Education		Engineering		Finance/ Accounting		Library		IT		Others	
	No.	% of row	No.	%	No.	%	No.	%	No.	%	No.	%
<i>Specialisation</i>												
Academic Lib.	2	50%	0	0%	0	0%	2	50%	0	0%	0	0%
Corporate Info. Services	1	11%	0	0%	4	44%	1	11%	2	22%	1	11%
Public Lib.	0	0%	1	14%	0	0%	3	43%	1	14%	2	29%
School Lib.	13	87%	0	0%	0	0%	2	13%	0	0%	0	0%
Document/Records Man.	1	14%	2	29%	0	0%	0	0%	1	14%	3	43%
Info. Systems	7	10%	17	24%	4	6%	0	0%	22	31%	20	29%
Internet	17	12%	35	25%	14	10%	5	4%	41	29%	29	21%
Knowledge Man.	2	4%	9	18%	4	8%	3	6%	12	24%	19	39%
Total	43	14%	64	21%	26	9%	16	5%	79	26%	74	25%
<i>Area of concentration</i>												
Library Sci.	16	46%	1	3%	4	11%	8	23%	3	9%	3	9%
Info. Man./Tech.	27	10%	63	24%	22	8%	8	3%	76	28%	71	27%
Total	43	14%	64	21%	26	9%	16	5%	79	26%	74	25%
<i>Cluster</i>												
Knowledge Man.	5	18%	3	11%	5	18%	2	7%	6	21%	7	25%
Digital Lib.	17	30%	0	0%	0	0%	8	14%	2	4%	29	52%
Lib. Service	4	44%	1	11%	0	0%	4	44%	0	0%	0	0%
Info. Tech.	20	8%	64	26%	21	9%	3	1%	74	30%	61	25%

Nationality

Table 5 shows the relation between nationality of the applicants and specialisations. The relation between nationality and specialisation is significant at the 0.01 level. Most of those who selected the library and knowledge management

specialisations are Singapore citizens. Few people of other nationalities selected these specialisations. On the other hand, non-Singapore citizens are interested in the information systems specialisation. This may be a reflection of the interests of immigrants and foreign nationals working

Table 7. Relation between undergraduate education area and specialisation

<i>Specialisation</i>	Undergraduate Education Area					
	Science & Technology		Arts & Social Science		Business, Management & Accountancy	
	No.	% of row	No.	% of row	No.	% of row
Academic Lib.	2	40%	3	60%	0	0%
Corporate Info. Serv.	5	63%	0	0%	3	38%
Public Lib.	3	43%	2	29%	2	29%
School Lib.	5	31%	8	50%	3	19%
Document/Records Man.	2	67%	1	33%	0	0%
Info. Systems	51	78%	4	6%	10	15%
Internet	93	77%	9	7%	19	16%
Knowledge Man.	24	55%	8	18%	12	27%
Total	185	69%	35	13%	49	18%
<i>Area of concentration</i>						
Library Sci.	15	42%	13	36%	8	22%
Info. Man./Tech.	170	73%	22	9%	41	18%
Total	185	69%	35	13%	49	18%
<i>Cluster</i>						
Knowledge Man.	13	57%	4	17%	6	26%
Digital Lib.	12	38%	16	50%	4	13%
Lib. Service	5	50%	4	40%	1	10%
Info. Tech.	162	75%	15	7%	38	18%
Total	192	69%	39	14%	49	18%

in Singapore. However, there is uniform interest in the Internet specialisation from all countries.

Employment background

Table 6 shows the number of people from the different industries/employment areas selecting the different specialisations. There is a very highly significant relation (0.0001 level) between the employment area of the applicant and the specialisation selected.

Not surprisingly, those working in libraries tend to select the four library specialisations. Teachers tend to select the school library specialisation. Those in finance and accountancy tend to select corporate information services. They are also interested in knowledge management subjects (knowledge management cluster). Those doing IT-related work selected information systems. People in the “others” category selected document and knowledge management.

Engineers and IT-workers tend *not* to select library specialisations. On the other hand, the Internet specialisation has an even mix of people from all backgrounds.

Educational background

The relation between education area and specialisation is very highly significant – at the 0.0001 level. As can be seen in Table 7, a disproportionately high number of Arts and Social Science graduates selected the library specialisations. Business and accountancy graduates selected corporate and public libraries, and knowledge management. Science and Tech graduates have a higher representation in the information systems and Internet specialisations.

Postgraduate qualification

Table 8 gives the percentage of applicants with postgraduate qualifications selecting the various specialisations. There is a significant relation between postgraduate qualification and specialisation as well as cluster membership (at the 0.01 level), but no significant relation between postgraduate qualification and area of concentration. Overall, 18% of the respondents have some kind of postgraduate qualification. However, 27% of applicants selecting the four library specialisations have a postgraduate qualification.

Table 8. Number of applicants with postgraduate qualifications selecting various specialisations

	Postgraduate Qualification		No Postgraduate Qualification	
	No.	%	No.	%
<i>Specialisation</i>				
Academic Lib.	1	25%	3	75%
Corporate Info. Serv.	1	11%	8	89%
Public Lib.	2	29%	5	71%
School Lib.	6	35%	11	65%
Document/Records Man.	0	0%	7	100%
Info. Systems	5	7%	71	93%
Internet	24	16%	122	84%
Knowledge Man.	16	33%	32	67%
Total	55	18%	259	82%
<i>Area of concentration</i>				
Library Sci.	10	27%	27	73%
Info. Man./Tech.	45	16%	232	84%
Total	55	18%	259	82%
<i>Cluster</i>				
Knowledge Man.	8	30%	19	70%
Digital Lib.	7	19%	30	81%
Lib. Service	5	50%	5	50%
Info. Tech.	37	15%	216	85%
Total	57	17%	270	83%

Most teachers who select the school library specialisation, of course, have at least a postgraduate diploma from the National Institute of Education. More surprisingly, a high proportion of people selecting the knowledge management specialisation (33%) also have a postgraduate qualification.

Multiple regression analysis

Three models were constructed using logistic regression analysis:

- Model 1 included only the personal profile variables (gender, age, race, marital and nationality) to find out which of them are significant even in the presence of the other variables.
- Model 2 included the educational and employment background variables, in addition to the personal profile variables.
- Model 3 is Model 2 with the addition of interaction variables.

The regression models are given in Tables 9 to 11. Each row in a table gives the formula for estimating the log odds of an applicant selecting the specialisation compared to the “reference” specialisation. (The log odds value can be converted

to a probability value.) For example in Table 9, the log odds of an applicant selecting the school library specialisation compared to the Internet specialisation (the “reference” category) is given by the formula:

$$- 6.018 - 2.467*\text{gender} + 0.113*\text{age} + 1.723*\text{Singapore_citizen}$$

The variables in the formula – gender, age and Singapore citizen – were significant at the 0.05 level in contributing towards predicting the dependent variable (in this case, the school library specialisation). Values in the table that are bolded indicate that the associated variables are significant at the 0.01 level.

Somer’s D, given in the last column of the table, is a measure of association that provides an indication of how good the formula is in its prediction. The values range from 0 (no association) to 1 (perfect association).

The regression formula for the reference category (e.g. the Internet specialisation) is also provided in the Table to aid analysis. It estimates the odds of an applicant selecting this category compared with all the other categories combined.

From an examination of the regression results given in Tables 9–11, the following conclusions can be drawn. Model 1 (Table 9) indicates that:

- Women tend to select the school library specialisation.
- Women tend to be interested in digital library subjects (i.e. belong to the digital library cluster) – possibly because of their relevance to school libraries.
- Men tend to be interested in IT subjects (i.e. belong to the IT cluster).
- Older applicants tend to select the school library specialisation.
- Older applicants tend to be interested in the library, digital library and knowledge management subjects (library, digital library and knowledge management clusters).
- Younger applicants tend to be interested in IT subjects (IT cluster).
- Singaporeans are more likely to choose library specialisations.
- Non-Singaporeans tend to be interested in IT subjects (IT cluster).

The significant variables in Model 2 indicate that:

Table 9. Regression model 1 using personal profile variables

Dependent variable	Intercept	Gender	Age	Singapore citizen	Malaysian citizen	Indian citizen	PRC citizen	Somers' D
<i>Area of concentration</i>								
Library Sci. The reference category is <i>Info. Man./Tech.</i>	-5.448	-1.470	0.081	2.181		1.855		0.591
<i>Specialisation</i>								
Public/Acad/Corp Lib.	-3.970			2.486	2.266			0.345
School Lib.	-6.018	-2.467	0.113	1.723				0.711
Doc/Records Man.								
Info. Systems	1.183	-0.068						0.164
Knowledge Man.	-1.594			0.773				0.178
Internet	-0.308						0.778	0.082
Reference category is <i>Internet</i>								
<i>Cluster</i>								
Knowledge Man.	-4.539		0.08					0.209
Digital Lib.	-5.012	-1.933	0.090	1.776				0.617
Lib. Service	-5.578	-2.093	0.111					0.519
Info. Tech.	3.662	0.970	-0.081	-0.923				0.409
The reference category is <i>Info. Tech.</i>								

Note: Values in bold indicate that the variable is significant at the 0.01 level.

Table 10. Regression model 2, using applicants' educational and employment background

Dependent variables	Intercept	Gender	Age	Education Area				Employment Area			Postgraduate Country		Somers' D	
				Singapore citizen	PR China citizen	Arts	Management	Arts & Social Science	Technology	Education	Finance & Accountancy	Library		Singapore
<i>Area of concentration</i>														
Library Sci. The reference category is <i>Info. Man./Tech.</i>	-3.912			1.129		0.973				2.196	1.654	2.752		0.650
<i>Specialisation</i>														
Public/Acad/Corp Lib.	-3.238			1.415								2.254		0.436
School Lib.	-4.422					2.890				3.612				0.782
Doc/Records Man.														
Info. Systems	1.183		-0.068											0.164
Knowledge Man.	-0.987												1.643	0.333
Internet	-0.201				0.696			-0.956						0.159
Reference category is <i>Internet</i>														
<i>Cluster</i>														
Knowledge Man.	-5.870		0.110			1.619	3.503			1.259	2.037			0.517
Digital Lib.	-5.722	-1.027	0.076	1.182				2.258		1.955	3.210			0.860
Lib. Service	-5.256									3.285	4.994		2.613	0.749
Info. Tech.	4.279		-0.075					-2.880	-1.931	-1.773	-3.372			0.668
The reference category is <i>Info. Tech.</i>														

Table 11. Regression model 3: complete model including interaction variables

Dependent variables	Education				Employment area											
	Intercept	Gender	Age	Arts	Social Science	Education	Finance & Accountancy	Library	Gender * Educ.: Business/Man./Acct.	Gender * Postgrad. Qualifi.	Employ.:Library* Educ.:Arts & Soc. Sc.	Employ.:Library* Educ.:Technology	Employ.:Library* Singapore	Educ.:Technology* Full-time	Singapore * Postgrad. Qualification	Somer's D
<i>Area of concentration</i>																
Library Sci.	-3.308			1.713		2.325	1.744	4.406			-4.200					0.652
The reference category is <i>Info. Man./Tech.</i>																
<i>Specialisation</i>																
Public/Acad/Corp Lib.	-2.259							2.441								0.264
School Lib.	-5.252			3.497		4.378						5.252				0.849
Doc/Records Man.	Sample size too small															--
Info. Systems	No factor was significant															--
Knowledge Man.	-1.668								1.533						1.836	0.360
Internet	-0.339													1.073		0.110
Reference category is <i>Internet</i>																
<i>Cluster</i>																
Knowledge Man.	-2.423									1.420						0.194
Digital Lib.	-3.362				2.251	2.634		3.913								0.728
Lib. Service	-4.678					3.068		5.371								0.738
Info. Tech.	4.324		-0.078		-2.057	-1.696	-2.880						-4.12			0.651
The reference category is <i>Info. Tech.</i>																

- Applicants with a management education subjects tend to be interested in knowledge management subjects (knowledge management cluster).
- Arts graduate tend to select the school library specialisation.
- Arts & social science graduates are interested in digital library subjects (digital library cluster), but less so in IT subjects.
- Applicants currently working in libraries are interested in the public/academic/corporate library specialisations.
- Applicants working in the education area (probably teachers) are interested in the school library specialisation.
- Applicants currently working in library service and education are interested in library and digital library subjects, and are less interested in IT subjects.
- Applicants with a postgraduate qualification from Singapore are interested in the knowledge management specialisation. Applicants with a postgraduate qualification from outside Singapore are interested in library subjects (library service cluster). This is puzzling and needs further investigation.
- Male business/accountancy graduates tend to select the knowledge management specialisation.
- Singaporean postgraduates tend to select the knowledge management specialisation.
- Science & Tech graduates who apply to the full-time MSc programme tend to select the Internet specialisation.
- Male postgraduates are interested in knowledge management subjects (knowledge management cluster). It is not clear yet why this is so.
- Singaporeans working in libraries are not mainly interested in IT subjects (i.e. not in the IT cluster). Most applicants who were working in libraries were Singaporeans. Comparatively, the “non-technical” applicants tend to be Singaporean librarians.

Model 3 included the following interaction effects (i.e. combination of variables):

Model 3 also indicates an interaction between current employment in a library and arts & social science education on the selected area of concentration (library science versus information management & technology concentrations). Table 11 shows the proportion of applicants selecting the library science concentration for different combinations of current employment area (library versus non-library) and undergraduate education area (arts & social science versus non-arts & so-

Table 12. Proportion of applicants selecting the library science concentration for different combinations of current employment area and area of undergraduate education

		Undergraduate Education		Overall
		Not Arts & Social Science	Arts & Social Science	
Employment Area	Non-library	0.07	0.34	0.11
	Library	0.75	0.20	0.54
	Overall	0.10	0.32	0.12

Table 13. Proportion of applicants selecting the school library specialisation for different combinations of current employment area and area of undergraduate education

		Undergraduate Education		Overall
		Not Technology	Technology	
Employment Area	Non-library	0.12	0.02	0.05
	Library	0.00	0.20 (N=5)	0.08
	Overall	0.11	0.03	0.06

cial science). 54% of applicants currently working in a library selected the library science concentration, compared to 11% for applicants not currently working in a library. 32% of arts & social science graduates selected the library science concentration, compared to 10% for non-arts & social science graduates. Surprisingly, non-arts & social science graduates working in a library have the highest proportion (75%) selecting library science. However, since only 8 people have this combination of background attributes, it might be a chance occurrence.

Conclusion and discussion

An in-depth analysis of questionnaire data from a survey of applicants to the MSc (Information Studies) programme at the Nanyang Technological University has given us an understanding of the background and profile of applicants interested in the different specialisations. Much of the results are not surprising, but they nevertheless raise several questions to be investigated in the future.

There is a close correspondence between applicants' employment background or industry and the specialisation they select: teachers tend to select school libraries, people in finance and accountancy tend to select corporate information services and knowledge management, and IT workers tend to select information systems. The Internet specialisation is an exception: people from every industry are interested in the Internet!

Applicants with certain types of education background tend to select particular specialisations. Arts & social sciences graduates prefer the

library specialisations, business and accountancy graduates prefer corporate and public libraries and knowledge management, and science and technology graduates prefer information systems and Internet specialisations.

Gender and age differences were found in the analysis. The public library and school library professions still suffer from an image of being a female and Arts & social sciences kind of profession. Also, applicants selecting the library specialisations as well as those interested in library-related subjects tend to be older than people selecting the information systems and Internet specialisations. Men and younger applicants tend to be more interested in IT subjects.

Since knowledge management is an emerging profession, the profile of applicants selecting this specialisation is of particular interest. Knowledge management seems to be attracting slightly older applicants, male business/accountancy graduates, and male Singaporeans with a postgraduate qualification.

From a marketing perspective, it is interesting to find a lack of appreciation of knowledge management and library specialisations among non-Singapore citizens. Non-Singaporeans tend to be interested primarily in IT subjects. This suggests that the knowledge management specialisation is not likely to attract international students from the region – although this may change in the near future.

Students with a particular background bring with them a particular set of knowledge, skills, perspectives and attitudes. These are likely to influence classroom dynamics, group discussions

and the students' learning experience. It will also have an impact on the type of graduates produced for each specialisation. We feel that a good mix of students from a variety of backgrounds is desirable for each specialisation. In particular, it is not desirable for library science students to be predominantly female and Arts & social sciences graduates. Something should be done to encourage male students from other educational backgrounds to join the library profession.

However, the mix of student backgrounds in a particular class can also limit what the class can accomplish and what teaching methods can be employed. For example, it is difficult to pitch an IT-related course at a level that can be handled by students with an arts and social science background and at the same time satisfy the needs of students with a technical background. Students from a non-technical background need more guidance and step-by-step instructions in programming/scripting and use of software. On the other hand, students with a technical background tend to be younger and have less working experience. In non-technical courses, they tend to be quieter and have more difficulty engaging in discussion at a high level. Students in the knowledge management specialisation also tend to be older, have a business background and are more likely to have an advanced degree.

Partly as a result of this, the Division of Information Studies started a separate MSc in Knowledge Management programme in 2002. Classes are being run more like an "executive programme" in a seminar style, with more class discussions as well as online discussion on an e-learning system. A separate MSc in Information Systems programme is being planned for 2005, which will cover more advanced information technology and be more focused on systems development. Students in the Information Studies programme can cross over and take two courses in the other programmes.

However, the survey of applicants to the MSc programme gives only part of the picture. We are planning a follow-up study to find out how students in various specialisations and backgrounds perform in the programme, and to what extent students change specialisations in the course of the programme.

Our statistical analysis has uncovered certain trends in the applicants' choice of specialisations

and subjects. Another follow-up study can examine exceptions to the trends – students who buck the trend, e.g. arts & social science graduates or teachers who opt for the Internet or knowledge management specialisation, male Science & Tech graduates who select a library specialisation, etc. From such studies, we may be able to identify how such movements against the trend can be facilitated and how problems encountered by such students can be reduced.

Finally, the results of the study reflect only the situation in Singapore. It would be interesting to see to if similar trends are found in other countries.

References

- Aldenderfer, M. S. & R. K. Blashfield. 1984. *Cluster analysis* (Quantitative applications in the social sciences, no. 44). Beverly Hills, CA: SAGE Publications.
- Chaudhry, A. S. and S. Higgins. 2003. On the need for a multidisciplinary approach to education for knowledge management. *Library Review* 52(2): 65–69.
- Corbin, RA. 1992. *Gender differences in the library computing specialties*. Master's thesis, San Jose State University, San Jose, CA.
- Cox, R. J. & E. Rasmussen. 1997. Reinventing the information professions and the argument for specialization in LIS education: Case studies in archives and information technology. *Journal of Education for Library and Information Science* 38(4): 255–67.
- Higgins, S.E. & A. S. Chaudhry. 2003. Articulating the unarticulated elements of the information science paradigm. *Journal of education for library and information science* 44 (1): 2–16.
- Higgins, S. E. & C. Khoo. 2000. Exploring cross-cultural issues in information studies education in Southeast Asia and the Pacific. In: 66th IFLA Council and General Conference: Conference programme and proceedings [Online]. The Hague: International Federation of Library Associations. Available: <http://www.ifla.org/IV/ifla66/66cp.htm> [viewed May 15, 2004].
- Hildenbrand, S. 1999. The information age versus gender equity? Technology and values in education for Library and Information Science. *Library trends* 47(4): 669–85.
- Hosmer, D. W. & S. Lemeshow. 1989. *Applied logistic regression*. New York: Wiley.
- Khoo, C., S. Higgins, S. Foo, & S. P. Lim. 2001. Cluster analysis of LIS students based on their choice of subjects. Presented at the 2001 ALISE Annual Conference, Jan 9–12, 2001 (Washington, D.C.).

- Menard, S. 1995. *Applied logistic regression analysis*. Thousand Oaks, CA: Sage Publications.
- Murphy, K. 1997. Moving card catalogue to the Internet. *New York Times* Jan 6, pD5.
- Myburgh, S. 2000. Education for Library and Information Science, a means to an end, not an end in itself. *Singapore Journal of Library & Information Management* 29: 16–30.
- Pors, N. O. 1994. The changing labour market of the information professional: Challenges for library school education. *Librarian Career Development* 2(3): 14–21.
- Rehman, S. 2000. Preparation of Information Professionals: Strategies and directions. *Singapore Journal of Library & Information Management* 29: 1–15.
- White, H. S. 1988. Generalization versus specialization in the MLS. *Library journal* 113: 148–9.
- White, H. S. & S. L. Mort. 1990. The accredited library education program as preparation for professional library work. *Library quarterly* 60(3): 187–215.
- Williams, C. L. 1995. *Still a man's world: Men who do "women's work."* Berkeley: University of California Press.
- Williams, R. V. & M. J. K. Zachert. 1986. Specialization in library education: A review of trends and issues. *Journal of education for library and information science* 26: 215–32.
- Williams, W. W. 1994. LJ Career survey, pt. 3: alternative careers: you can take your MLS out of the library. *Library journal* 119 (19): 43–46.

Editorial history:

paper received 27 October 2003;

final version received 5 April 2004;

accepted 14 April 2004.