Chapter 4

ANALYSES OF DATA

4.1 Introduction

This is an exploratory study to identify the degree of Computer Science journal overlaps in selected Malaysian university libraries. The lack of literature on this matter has resulted in the need to carry out this study. Nevertheless, the rapid scholarly literature growth and escalating journal prices have caused some libraries to reduce their journal budget. In order to maintain a good Computer Science journal collection among local university libraries, there is a need to look into the journal overlapping issue as it would help highlight the importance of a cooperative serials management policy among these libraries.

In this study, 301 journal titles were taken from the *JCR* and checked against the holdings of each selected university libraries' OPAC. The five university libraries involved are Universiti Malaya (UM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM), Universiti Teknologi Malaysia (UTM) and Universiti Kebangsaan Malaysia (UKM). For simplicity, the five libraries are referred to by their university abbreviations in all tables and discussions.

This chapter presents the results of data analysis in two parts. The first part describes the availability of library holdings and level of overlapping. The second part, indicates the costing of the journal overlaps. Some journals however, cover more than one subject.

4.2 Journal availability

4.2.1 According to Institution

The availability of each title was obtained when all 301 Computer Science titles were checked against the five university libraries' OPACs. The full list of journal availability is provided in Appendix 2. Overall, UTM held the most journal titles in this field accounting for 40.20% of the 301 titles. This was followed by UM, with 34.22% and USM with 31.23%. Based on the availability scale of measurement given in Table 2.1, these three university libraries' coverage of Computer Science journals listed by *JCR* was poor. The performance of the five libraries with regard to the *JCR* titles is given in Table 4.1. The results indicate the coverage ranges from poor to very poor. This indicates that the journal collection in the five university libraries lack coverage of high profiled titles in the field of Computer Sciences.

Table 4.1: Journal Availability by university libraries

Libraries	Titles Availability	% of Total
UM	103	34.22%
USM	94	31.23%
UPM	70	23.26%
UTM	121	40.20%
UKM	50	16.61%

4.2.2 According to subject categorisation

The *JCR* provides seven categorisation of the journals under the field of Computer Science. In this section, the analyses of journal availability is also based on the scale of

measurement, presented in Table 4.2. The number of journal availability in each library by subject categorisation is illustrated graphically in Figure 4.1.

Table 4.2: Journal Availability in Selected University Libraries by Subject

CATEGORY	UM	USM	UPM	UTM	UKM
Artificial Intelligences	13	20	13	17	3
Cybernetics	4	1	2	5	1
Hardware and Architecture	23	21	14	24	13
Information Systems	28	20	17	23	16
Interdisciplinary Applications	22	19	11	32	12
Software, Graphics, Programming	26	31	20	34	11
Theory and Method	21	18	17	27	9

*The titles are totaled more under each institution because listed under 2 or more categories

Figure 4.1: Journal Availability in Selected University Libraries

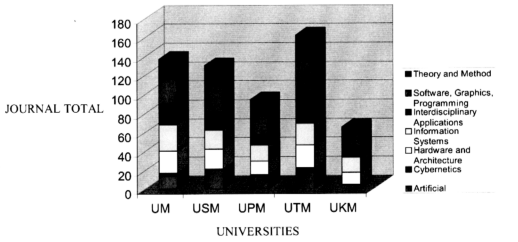
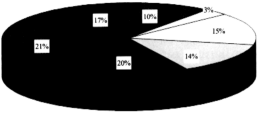
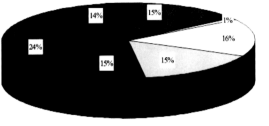


Figure 4.2: Percentage Distribution of Journals by Subject in the Five University Libraries

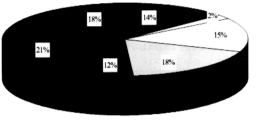
(a) UTML



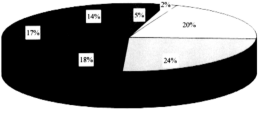
(d) USML



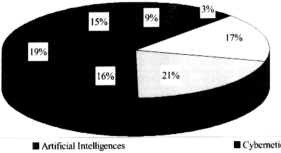
(b) UPML



(e) UKML



(c) UML



■ Artificial Intelligences
□ Hardware and Architecture
■ Interdisciplinary Applications
■ Theory and Method
■ Cybernetics
□ Information Systems
■ Software, Graphics, Programming

4.2.3 Journals in Artificial Intelligence

There are 62 titles under the category of Artificial Intelligence. Based on Table 4.3, USM held the highest number of journals in this category with 20 titles. However, other university libraries such as UM , UPM and UTM have more journal titles of high impact factor compared to those journal subscribed by USM. For example, *Cognitive Brain Research* and *Neural Computation* carried the impact factor of 2.755 and 2.07 respectively. UKM's journal collection in this area is rated very Poor, 4.84% (3/62) according to the availability scale of measurement. The journal *entitled IEEE T Pattern Anal* with impact factor of 1.417 was measured good and held by four university libraries except UKM. UM's holding of this journal was the earliest starting from 1979.

Table 4.3: Journal Availability in Artificial Intelligence

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
1	COGNITIVE BRAIN RES	0926-6410	2.755	2.8	1		1		
2	NEURAL COMPUT	0899-7667	2.071	5.7				1	
3	CHEMOMETR INTELL LAB	0169-7439	1.754	4.8				1	
4	AI MAG	0738-4602	1.62	8					
5	ARTIF INTELL	0004-3702	1.608	8.9	1	1		1	1
6	IEEE T PATTERN ANAL	0162-8828	1.417	8.8	1	1	1	1	
7	NETWORK-COMP NEURAL	0954-898X	1.333	3.9				1	
8	INT J COMPUT VISION	0920-5691	1.294	6.3					
9	IEEE T NEURAL NETWOR	1045-9227	1.28	5.5	1	1	1	1	
10	KNOWL ENG REV	0269-8889	1.27	3.7		1			
11	IEEE T FUZZY SYST	1063-6706	1.239	4.1	1	1			
12	DATA MIN KNOWL DISC	1384-5810	1.235						
13	J ARTIF INTELL RES	1076-9757	1.191	2.9					
14	PATTERN RECOGN	0031-3203	1.118	7.3		1			
15	NEURAL NETWORKS	0893-6080	1.017	6.6		1			
16	ARTIF INTELL MED	0933-3657	1.015	3.7					
17	MACH LEARN	0885-6125	1	6.2			1		
18	IEEE T SYST MAN CY B	1083-4419	0.866	2.4			1		
19	IEEE EXPERT	0885-9000	0.815	5.4	1	1			1
20	ARTIF INTELL REV	0269-2821	0.632			1			
21	INT J APPROX REASON	0888-613X	0.578	6					

Table 4.3: Journal Availability in Artificial Intelligence (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
22	J MATH IMAGING VIS	0924-9907	0.543	4.7					
23	AUTON ROBOT	0929-5593	0.533						
24	IEEE T KNOWL DATA EN	1041-4347	0.513	5.4	1		1	1	
25	COMPUT ARTIF INTELL	0232-0274	0.484					1	
26	MACH VISION APPL	0932-8092	0.471	6.1	1	1		1	
27	COMPUT SPEECH LANG	0885-2308	0.467	6.8					
28	AI EDAM	0890-0604	0.462	4.3					
29	NEUROCOMPUTING	0925-2312	0.453	5.6					
30	REAL-TIME IMAGING	1077-2014	0.452			1			
31	IMAGE VISION COMPUT	0262-8856	0.431	5.6		1			
32	AI COMMUN	0921-7126	0.406						
33	COMPUT INTELL	0824-7935	0.391	5.9					
34	INT J INTELL SYST	0884-8173	0.354	5.6	1	1	1		
35	INT J PATTERN RECOGN	0218-0014	0.348	5.6		1	1	1	
36	PATTERN RECOGN LETT	0167-8655	0.344	5.4		1			
37	APPL INTELL	0924-669X	0.326			1		1	
38	J AUTOM REASONING	0168-7433	0.317	4.4					
39	ANN MATH ARTIF INTEL	1012-2443	0.314	5					
40	MECHATRONICS	0957-4158	0.292						
41	INT J UNCERTAIN FUZZ	0218-4885	0.29						
42	NEURAL PROCESS LETT	1370-4621	0.286					1	
43	AI APPLICATIONS	1051-8266	0.275					1	
44	NEURAL COMPUT APPL	0941-0643	0.261						
45	ENG APPL ARTIF INTEL	0952-1976	0.239		1	1	1		
46	DECIS SUPPORT SYST	0167-9236	0.227	4.7				1	
47	J INTELL MANUF	0956-5515	0.226	4.7					
48	INTEGR COMPUT-AID E	1069-2509	0.209						
49	J INTELL FUZZY SYST	1064-1246	0.208					1	
50	ARTIF INTELL ENG	0954-1810	0.2				1	1	
51	J EXP THEOR ARTIF IN	0952-813X	0.2						
52	EXPERT SYST APPL	0957-4174	0.182	4.7	1				
53	KNOWL-BASED SYST	0950-7051	0.159		1				
54	INT J EXPERT SYST	0894-9077	0.154				1	1	
55	APPL ARTIF INTELL	0883-9514	0.133	5.1					
56	J INTELL ROBOT SYST	0921-0296	0.104				1		
57	INT J SOFTW ENG KNOW	0218-1940	0.096			1	1		
58	MIND MACH	0924-6495	0.094			1			
59	DATA KNOWL ENG	0169-023X	0.048		1	1			
60	EXPERT SYST	0266-4720	0.039	7.4					
61	ENG INTELL SYST ELEC	0969-1170	0						
62	J COMPUT SYS SC INT+	1064-2307	0						1
TOTAL					13	20	13	17	3
(%)					20.97%	32.26%	20.97%	27.42%	4.84%

4.2.4 Journals in Cybernetics

The *JCR* listed 16 titles under Cybernetics and the result of its journal availability is indicated in Table 4.4. All university libraries performed very poorly on the journal availability scale in this field. The journal with the highest impact factor under this category is *Biol Cybern* (If = 1.089) and is currently available only in UM in the form of online edition. UTM held the most titles in this category with 5 titles out of 16 journal titles listed (31.25%).

Table 4.4: Journal Availability in Cybernetics

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
1	BIOL CYBERN	0340-1200	1.089	99.9	1				
2	IEEE T SYST MAN CY B	1083-4419	0.866	2.4			1		
3	PRESENCE-TELEOP VIRT	1054-7460	0.841	4.3				1	
4	HUM-COMPUT INTERACT	0737-0024	0.76						
5	INT J HUM-COMPUT ST	1071-5819	0.685	3.4	1			1	
6	USER MODEL USER-ADAP	0924-1868	0.571					1	
7	IEEE T SYST MAN CY A	1083-4427	0.494						
8	MACH VISION APPL	0932-8092	0.471	6.1	1	1			
9	CYBERNET SYST	0196-9722	0.378	5.3					
10	INT J HUM-COMPUT INT	1044-7318	0.267						
11	KYBERNETES	0368-492X	0.231	5.5	1		1		
12	BEHAV INFORM TECHNOL	0144-929X	0.169	7.2				1	1
13	MODEL IDENT CONTROL	0332-7353	0.094					1	
14	KYBERNETIKA	0023-5954	0.08	8.3					
15	CYBERN SYST ANAL+	1060-0396	0.005	99.9					
16	J COMPUT SYS SC INT+	1064-2307	0						
TOTAL					4	1	2	5	1
(%)					25.00%	6.25%	12.50%	31.25%	6.25%

4.2.5 Journals in Hardware and Architecture

In the subject category of Hardware and Architecture, JCR listed 47 titles. Generally, Table 4.5 showed that the percentage of journal availability in this category is good

compared to the other categories. UTM's holding of journal titles under this category is also measured as Good, (48.0%, 24 titles out of 47titles).

In fact, UM, USM and UTM have the top three impact factor journals, i.e., *J ACM, Commun ACM and IEEE T Neural Network* with If 1.703, 1.698, 1.28 respectively. UM's library journal holdings in this category is commendable, having almost all the top ten journals in this category (online edition). UM's journal availability in this category is considered equal to UTM with the journal availability measuring Good with 46.0% (23 titles out of 47).

Table 4.5: Journal Availability in Hardware and Architecture

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
1	J ACM	0004-5411	1.703	99.9	1	1		1	
2	COMMUN ACM	0001-0782	1.698	99.9	1	1	1	1	
3	IEEE T NEURAL NETWOR	1045-9227	1.28	5.5	1	1	1	1	
4	IEEE ACM T NETWORK	1063-6692	1.264	4.1	1				
5	IEEE NETWORK	0890-8044	1.159	4.2	1			1	1
6	IEEE MICRO	0272-1732	0.992	3.5	1	1		1	1
7	IEEE T COMPUT	0018-9340	0.958	99.9	1	1	1		1
8	IBM J RES DEV	0018-8646	0.93	99.9	1	1		1	
9	IEEE T VLSI SYST	1063-8210	0.733	4.2	1	1			
10	PERFORM EVALUATION	0166-5316	0.718	5.7	1	1	1	1	1
11	COMPUTER	0018-9162	0.687	5.7	1	1		1	
12	MICROPROC MICROPROG	0165-6074	0.667		1			1	
13	OBJECT ORIENTED SYST	0969-9767	0.667		1		1		
14	INT J SUPERCOMPUT AP	1078-3482	0.659	5.2					
15	J COMPUT SYST SCI	0022-0000	0.577	99.9		1		1	1
16	IEEE T COMPUT AID D	0278-0070	0.571	7	1	1	1	1	1
17	J SUPERCOMPUT	0920-8542	0.441						
18	AT&T TECH J	8756-2324	0.438	99.9	1	1		1	1
19	DISPLAYS	0141-9382	0.375						
20	ANALOG INTEGR CIRC S	0925-1030	0.345	4.2					
21	NETWORKS	0028-3045	0.317	99.9	1	1			
22	J HIGH SPEED NETW	0926-6801	0.302					1	
23	IEEE DES TEST COMPUT	0740-7475	0.299	5.6	1				

Table 4.5: Journal Availability in Hardware and Architecture (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
24	INTEGRATION	0167-9260	0.277						
25	IEEE T RELIAB	0018-9529	0.255	99.9	1		1	1	
26	COMPUT J	0010-4620	0.242	99.9	1	1	1		1
27	IEICE T FUND ELECTR	0916-8508	0.207	3.4					
28	NEW GENERAT COMPUT	0288-3635	0.188	7.5		1			
29	IEE P-COMPUT DIG T	1350-2387	0.181	5.6	1	1		1	1
30	AUST COMPUT J	0004-8917	0.172						
31	COMPUT COMMUN	0140-3664	0.167	4.1			1	1	
32	COMP STAND INTER	0920-5489	0.157					1	
33	SUPERCOMPUTER	0168-7875	0.154						
34	J NETW COMPUT APPL	1084-8045	0.137					1	
35	BYTE	0360-5280	0.126	5.4	1	1	1	1	1
36	J CIRCUIT SYST COMP	0218-1266	0.105				1		
37	COMPUT SYST SCI ENG	0267-6192	0.091						
38	COMPUT ELECTR ENG	0045-7906	0.085					1	
39	MICROPROCESS MICROSY	0141-9331	0.08			1	1	1	1
40	DATAMATION	0011-6963	0.079	6.2	1	1	1	1	1
41	HEWLETT-PACKARD J	0018-1153	0.038			1		1	
42	VLSI DES	1065-514X	0.038						1
43	J SYST ARCHITECT	1383-7621	0.029		1				
44	CAN J ELECT COMPUT E	0840-8688	0.023						
45	COMPUT DES	0010-4566	0.022			1	1	1	
46	SHARP TECH J	0285-0362	0.01						
47	INT J HIGH PERFORM C	1094-3420							
TOTAL					23	21	14	24	13
(%)					46.00%	42.00%	28.00%	48.00%	26.00%

4.2.6 Interdisciplinary Applications

In the category of Interdisciplinary Applications *JCR* listed 71 titles (Table 4.6). The highest ranking impact factor journal titles in Computer Science is listed in this category, i.e., *J Mol Graph Model* with an If of 4.938. This title is available in UKM library even though UKM's measurement of titles available in this category is Poor with 16.90%. UTM's journal availability remains Good with 45.07% indicating that the library have the most number of titles in this category. UPM library have the least journal titles , 15.49% (11 titles out of 71) in this category.

Table 4.6: Journal Availability in Interdisciplinary Applications

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
1	J MOL GRAPH MODEL	1093-3263	4.938	6					1
2	COMPUT APPL BIOSCI	0266-7061	2.898	4.9				1	
3	J COMPUT AID MOL DES	0920-654X	2.612	5					
4	J CHEM INF COMP SCI	0095-2338	2.609	4.1	1				1
5	J AM MED INFORM ASSN	1067-5027	2.462	3.1					
6	MED INFORM	0307-7640	1.614	4.3	1				
7	COMPUT CHEM	0097-8485	1.566	6.6		1		1	1
8	J COMPUT PHYS	0021-9991	1.377	99.9	1			1	1
9	COMPUT PHYS COMMUN	0010-4655	1.302	7.4	1	1		1	
10	M D COMPUT	0724-6811	1.033	5.1					
11	INT J MOD PHYS C	0129-1831	0.962	3.1	1			1	
12	COMPUT METHOD APPL M	0045-7825	0.933	8.5	1		1	1	1
13	MED BIOL ENG COMPUT	0140-0118	0.856	9.1	1	1			
14	COMPUT BIOMED RES	0010-4809	0.836	8.6					
15	J MOL MODEL	0948-5023	0.809					1	
16	SCIENTOMETRICS	0138-9130	0.71	5.1	1		1	1	1
17	INTERACT COMPUT	0953-5438	0.688						
18	COMPUT METH PROG BIO	0169-2607	0.664	7.7	1	1			
19	INT J SUPERCOMPUT AP	1078-3482	0.659	5.2					
20	METHOD INFORM MED	0026-1270	0.651	5.2	1				
21	IEEE T COMPUT AID D	0278-0070	0.571	7	1	1	1	1	1
22	ENG COMPUT	0177-0667	0.568	7.5			1		
23	COMPUT CHEM ENG	0098-1354	0.54	6.4	1	1		1	
24	INT J NUMER METH FL	0271-2091	0.518	6.1		1			
25	COMPUT FLUIDS	0045-7930	0.5	7.3				1	1
26	AI EDAM	0890-0604	0.462	4.3					
27	COMPUT MUSIC J	0148-9267	0.455	7.8			1	1	
28	QUEUEING SYST	0257-0130	0.444	7.1					
29	SPEECH COMMUN	0167-6393	0.442	5.8				1	
30	INT J COMP INTEG M	0951-192X	0.434	5					
31	COMPUT BIOL MED	0010-4825	0.422	8.1	1		1		
32	J VISUAL COMP ANIMAT	1049-8907	0.414						
33	COMPUT GEOSCI	0098-3004	0.412	6.3	1			1	
34	INT J BIOMED COMPUT	0020-7101	0.403	5		1			
35	COMPUT EDUC	0360-1315	0.402	5.1			1	1	1
36	COMPUT ELECTRON AGR	0168-1699	0.347				1		
37	SOC SCI COMPUT REV	0894-4393	0.324		1				
38	INT J MICROWAVE MILL	1050-1827	0.321	4.7					
39	MATCH-COMMUN MATH CH	0340-6253	0.319	6.3					
40	COMPUT MATH APPL	0898-1221	0.3	5.4	1			1	
41	T SOC COMPUT SIMUL	0740-6797	0.294						
42	COMPUT LINGUIST	0891-2017	0.273			1			1

Table 4.6: Journal Availability in Interdisciplinary Applications (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
43	COMPUT INTEGR MANUF	0951-5240	0.267				1		
44	J COMB OPTIM	1382-6905	0.267						
45	MATH COMPUT MODEL	0895-7177	0.251	5.2		1		1	
46	COMPUT OPER RES	0305-0548	0.246	6		1			
47	ADV ENG SOFTW	0965-9978	0.243	5.9				1	
48	COMPUT IND	0166-3615	0.239	5.5				1	
49	SIMULATION	0037-5497	0.221	7.6					1
50	COMPEL		0.214					1	
51	INTEGR COMPUT-AID E	1069-2509	0.209						
52	J NEW MUSIC RES	0929-8215	0.2						
53	ENG COMPUTATION	0264-4401	0.195			1		1	
54	IEEE COMPUT APPL POW	0895-0156	0.194		1	1		1	
55	APPL ALGEBR ENG COMM	0938-1279	0.187					1	
56	J COMPUT CIVIL ENG	0887-3801	0.181		1	1	1	1	
57	ENVIRON MODELL SOFTW	1364-8152	0.176			1			
58	COMPUT STRUCT	0045-7949	0.166	8.4		1	1	1	
59	COMPUT HUMANITIES	0010-4817	0.148		1	1		1	
60	J NETW COMPUT APPL	1084-8045	0.137					1	
61	COMPUT GEOTECH	0266-352X	0.134						
62	MATH COMPUT SIMULAT	0378-4754	0.116	5.9	1			1	
63	COMPUT IND ENG	0360-8352	0.105	5.4				1	
64	COMPUT ELECTR ENG	0045-7906	0.085					1	
65	IND MANAGE DATA SYST	0263-5577	0.078		1	1		1	1
66	BIOTECHNOL SOFTW I J	1088-4270	0.071						
67	ROBOT CIM-INT MANUF	0736-5845	0.068		1	1		1	
68	STRUCT OPTIMIZATION	0934-4373	0.031						
69	INT J COMPUT APPL T	0952-8091	0.015						
70	BIOINFORMATICS	1367-4803							
71	INT J HIGH PERFORM C	1094-3420							
TOTAL					22	19	11	32	12
(%)					30.99%	26.76%	15.49%	45.07%	16.90%

4.2.7 Information systems

Within the category of Information Systems, *JCR* listed 59 titles. When all titles were checked against the five university's OPAC systems, UM achieved the highest journal availability, with 47.46% measuring within the 'Good' scale. Table 4.7 indicates that UM library covered almost all the top five ranking impact factor journal titles in this category. They are *J Chem Inf Comp Sc* (If 2.609), *IEEE T Inform Theor* (If 2.083), and

J ACM (If 1.703). Generally, the percentage of titles availability under this category in all selected university libraries are slightly better compared to the other categories. According to this table, the top ranking journal with the highest impact factor of 2.609 is available both in UM and UKM even though the latter held the least collection of journals in this category. The measurement scale ranges from Good to Poor, i.e., UTM (38.98%), USM (33.90%) and the least are UPM and UKM (28.81% and 27.11%).

Table 4.7: Journal Availability in Information Systems

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
1	J CHEM INF COMP SCI	0095-2338	2.609	4.1	1				1
2	J AM MED INFORM ASSN	1067-5027	2.462	3.1					
3	IEEE T INFORM THEOR	0018-9448	2.083	9.9	1	1	1	1	
4	J ACM	0004-5411	1.703	99.9	1	1		1	
5	MED INFORM	0307-7640	1.614	4.3	1				
6	MIS QUART	0276-7783	1.548	9.1	1	1	1	1	
7	INFORM SYST	0306-4379	1.547	6.8	1			1	1
8	J AM SOC INFORM SCI	0002-8231	1.35	6.6	1	1	1	1	
9	IEEE ACM T NETWORK	1063-6692	1.264	4.1	1				
10	ANNU REV INFORM SCI	0066-4200	1.25	7.5		1	1		1
11	DATA MIN KNOWL DISC	1384-5810	1.235						
12	IEEE NETWORK	0890-8044	1.159	4.2	1			1	1
13	ACM T DATABASE SYST	0362-5915	1.125	99.9	1	1			
14	IEEE MULTIMEDIA	1070-986X	0.95	3.5	1				
15	ACM T INFORM SYST	1046-8188	0.931	8.3					
16	MULTIMEDIA SYST	0942-4962	0.767	3.5				1	
17	INFORM COMPUT	0890-5401	0.731	99.9	1				
18	IBM SYST J	0018-8670	0.71	5.7	1	1	1	1	
19	INFORM MANAGE	0378-7206	0.674	6.1	1	1	1	1	1
20	INTERNET RES	1066-2243	0.646				1		
21	J VIS COMMUN IMAGE R	1047-3203	0.635	4.7					
22	J INFORM SCI	0165-5515	0.634	6.2	1			1	1
23	EUR J INFORM SYST	0960-085X	0.6		1			1	
24	IEEE T KNOWL DATA EN	1041-4347	0.513	5.4	1		1	1	
25	INT J COOP INF SYST	0218-8430	0.5						
26	ACTA INFORM	0001-5903	0.468	99.9		1	1	1	1
27	J VLSI SIGNAL PROC	0922-5773	0.466	4.2					
28	J INFORM TECHNOL	0268-3962	0.442	4.4			1	1	1
29	PROGRAM-ELECTRON LIB	0033-0337	0.438						

Table 4.7: Journal Availability in Information Systems (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
30	INT J MED INFORM	1386-5056	0.375		1				
31	LIBR SOFTWARE REV	0742-5759	0.375			1		1	
32	INFORM PROCESS MANAG	0306-4573	0.366	6.8	1	1			1
33	COMPUT NETWORKS ISDN	0169-7552	0.352	4.9	1	1	1	1	
34	BELL LABS TECH J	1089-7089	0.329		1	1		1	1
35	ONLINE CDROM REV	1353-2642	0.311			1			
36	J HIGH SPEED NETW	0926-6801	0.302					1	
37	INFOR	0315-5986	0.293	8.9					
38	ASLIB PROC	0001-253X	0.28		1	1	1		1
39	MULTIMED TOOLS APPL	1380-7501	0.268				1		
40	COMPUT J	0010-4620	0.242	99.9	1	1	1		1
41	DISTRIB PARALLEL DAT	0926-8782	0.231						
42	DECIS SUPPORT SYST	0167-9236	0.227	4.7				1	
43	IEICE T FUND ELECTR	0916-8508	0.207	3.4					
44	INFORM PROCESS LETT	0020-0190	0.196	7.5			1		1
45	INFORM SOFTWARE TECH	0950-5849	0.174	5.5	1	1		1	1
46	RAIRO-INF THEOR APPL	0988-3754	0.17						
47	INFORM SCIENCES	0020-0255	0.169	99.9	1				
48	COMPUT COMMUN	0140-3664	0.167	4.1			1	1	
49	INFORM TECHNOL LIBR	0730-9295	0.167		1	1	1	1	1
50	WIRTSCHAFTSINF	0937-6429	0.148						
51	INFORM SYST MANAGE	1058-0530	0.134					1	
52	COMPUT SECUR	0167-4048	0.128		1				
53	DATA BASE ADV INF SY	0095-0033	0.128						
54	J STRATEGIC INF SYST	0963-8687	0.069			1			1
55	J COMPUT INFORM SYST	0887-4417	0.05						
56	DATA KNOWL ENG	0169-023X	0.048		1	1			
57	INT J MICROGR OPT T	0958-9961	0.026						
58	IEICE T INF SYST	0916-8532	0.016						
59	P ASIS ANNU MEET	0044-7870	0.014						
TOTAL					28	20	17	23	16
(%)					47.46%	33.90%	28.81%	38.98%	27.12%

4.2.8 Software, Graphics and Programming

The *JCR* listed 68 titles under the category of Software, Graphics, and Programming. When the 68 titles were checked against the five university library holdings, it was observed that UTM again tops the list of journal availability measuring 'Good' with 50.00%. This means that UTM have half of the journals listed by *JCR* in this field. This

was followed closely by USM with 45.59% (31 titles out of 68). USM's journal availability measure is considered good, with 5 titles out of 31. The titles indicated are *J ACM* (If 1.703), *Commum ACM* (If 1.698), *IEEE T Image Process* (If 1.364), *IEEE T Software Eng* (If 1.153) and *ACM T Database Syst* (If 1.125). In UM library, the range of journal availability comprise the top five high ranking impact factor titles in this field. There are 26 titles held by UM library in this field. UKM has the least title availability in this category with 11.76%. The results also indicate that *Byte* (If 0.126) is available in all university libraries.

Table 4.8: Journal Availability in Software, Graphic, Programming

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
1	J ACM	0004-5411	1.703	99.9	1	1		1	
2	COMMUN ACM	0001-0782	1.698	99.9	1	1	1	1	
3	IEEE T IMAGE PROCESS	1057-7149	1.364	3.8	1	1	1	1	
4	IEEE T SOFTWARE ENG	0098-5589	1.153	9.3	1	1	1	1	
5	ACM T DATABASE SYST	0362-5915	1.125	99.9	1	1			
6	ACM T GRAPHIC	0730-0301	1.069	8.4		1			
7	MATH PROGRAM	0025-5610	1.052	9.3	1		1	1	1
8	ACM T MATH SOFTWARE	0098-3500	1.032	99.9	1	1			
9	IEEE MICRO	0272-1732	0.992	3.5	1	1		1	1
10	COMPUT AIDED DESIGN	0010-4485	0.854	6.7		1	1		1
11	PRESENCE-TELEOP VIRT	1054-7460	0.841	4.3				1	
12	ACM T PROGR LANG SYS	0164-0925	0.839	8.9	1	1	1		
13	IEEE SOFTWARE	0740-7459	0.82	6	1	1		1	
14	IEEE T VIS COMPUT GR	1077-2626	0.759		1				
15	COMPUT VIS IMAGE UND	1077-3142	0.753	2.9				1	
16	J SOFTW MAINT-RES PR	1040-550X	0.711			1			
17	IBM SYST J	0018-8670	0.71	5.7	1	1	1	1	
18	COMPUTER	0018-9162	0.687	5.7	1	1		1	
19	GRAPH MODEL IM PROC	1077-3169	0.674	2.9		1		1	
20	OBJECT ORIENTED SYST	0969-9767	0.667				1		
21	J VIS COMMUN IMAGE R	1047-3203	0.635	4.7					
22	BIT	0006-3835	0.623	9.9		1	1		
23	J VISUAL LANG COMPUT	1045-926X	0.545						
24	J MATH IMAGING VIS	0924-9907	0.543	4.7					
25	ALGORITHMICA	0178-4617	0.517	6.6				1	

Table 4.8: Journal Availability in Software, Graphic, Programming (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
26	COMPUT AIDED GEOM D	0167-8396	0.513	5.3	1	1			1
27	RANDOM STRUCT ALGOR	1042-9832	0.464	4.3					
28	REAL-TIME IMAGING	1077-2014	0.452			1			
29	SOFTWARE-CONC TOOL	0945-8115	0.452					1	
30	IMAGE VISION COMPUT	0262-8856	0.431	5.6		1			
31	IEEE COMPUT GRAPH	0272-1716	0.426	7.2	1	1		1	1
32	COMPUT GRAPH	0097-8493	0.42	8.9					
33	J VISUAL COMP ANIMAT	1049-8907	0.414						
34	SOFTWARE PRACT EXPER	0038-0644	0.396	7.6	1	1	1	1	
35	ICCA J	0920-234X	0.395						
36	VISUAL COMPUT	0178-2789	0.382	7.1				1	
37	LIBR SOFTWARE REV	0742-5759	0.375			1		1	
38	CONCURRENCY-PRACT EX	1040-3108	0.308	4.5					
39	T SOC COMPUT SIMUL	0740-6797	0.294						
40	MULTIMED TOOLS APPL	1380-7501	0.268				1		
41	IEEE T RELIAB	0018-9529	0.255	99.9	1		1	1	
42	MATH COMPUT MODEL	0895-7177	0.251	5.2		1		1	
43	ADV ENG SOFTW	0965-9978	0.243	5.9				1	
44	COMPUT J	0010-4620	0.242	99.9	1	1	1		1
45	ENVIRON SOFTW	0266-9838	0.235			1			
46	SCI COMPUT PROGRAM	0167-6423	0.235	9	1			1	
47	SIMULATION	0037-5497	0.221	7.6					1
48	J PROGRAM LANG	0963-9306	0.2				1		
49	J SYST SOFTWARE	0164-1212	0.184	5.7	1			1	
50	ENVIRON MODELL SOFTW	1364-8152	0.176			1			
51	INFORM SOFTWARE TECH	0950-5849	0.174	5.5	1	1		1	1
52	COMPUT COMMUN	0140-3664	0.167	4.1			1	1	
53	COMPUT LANG	0096-0551	0.16					1	1
54	OPTIM METHOD SOFTW	1055-6788	0.16		1				
55	COMP STAND INTER	0920-5489	0.157					1	
56	MAPLETECH	1061-5733	0.149		1				
57	ACM SIGPLAN NOTICES	0362-1340	0.145	7.6		1			
58	J NETW COMPUT APPL	1084-8045	0.137					1	
59	BYTE	0360-5280	0.126	5.4	1	1	1	1	1
60	MATH COMPUT SIMULAT	0378-4754	0.116	5.9	1			1	
61	J OBJECT-ORIENT PROG	0896-8438	0.115	5.6					
62	COMPUT GRAPH FORUM	0167-7055	0.112						
63	SOFTWARE QUAL J	0963-9314	0.1				1		
64	DR DOBBS J	1044-789X	0.097					1	
65	INT J SOFTW ENG KNOW	0218-1940	0.096			1	1		
66	DATAMATION	0011-6963	0.079	6.2	1	1	1	1	1

Table 4.8: Journal Availability in Software, Graphic, Programming (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
67	COMPUT GRAPH WORLD	0271-4159	0.036				1	1	
68	PROGRAM COMPUT SOFT+	0361-7688	0					1	
TOTAL					26	31	20	34	11
(%)					38.24%	45.59%	29.41%	50.00%	16.18%

4.2.9 Theory and Methods

There are 64 titles listed by *JCR* under the category of Theory and Methods. The highest percentage of journal availability was achieved by UTM, which held 42.19%. UM comes in second in the list with 21 out of 64 titles (32.81%). UM also has the top three journal titles with the highest impact factor such as *IEEE Parall Distrib* (If 1.727), *J ACM* (If 1.703), *Commun ACM* (If 1.698). These titles are also available in USM and UTM. The journal availability from the most to least in this category are UTM, UM, USM, UPM and UKM. All the journal availability percentages are in the range of Poor (UTM and UM) to Very Poor (USM, UPM and UKM). UKM's journal availability was 12.4%, less than that achieved by UPM indicating that UKM has not developed their collection in this category.

Table 4.9: Journal Availability in Theory and Methods

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
1	IEEE PARALL DISTRIB	1063-6552	1.727	3.9	1				
2	J ACM	0004-5411	1.703	99.9	1	1		1	
3	COMMUN ACM	0001-0782	1.698	99.9	1	1	1	1	
4	IEEE T IMAGE PROCESS	1057-7149	1.364	3.8	1	1	1	1	
5	IEEE T NEURAL NETWOR	1045-9227	1.28	5.5	1	1	1	1	
6	SIAM J COMPUT	0097-5397	0.958	99.9	1	1		1	
7	IEEE MULTIMEDIA	1070-986X	0.95	3.5	1				
8	MULTIMEDIA SYST	0942-4962	0.767	3.5				1	
9	IEEE T PARALL DISTR	1045-9219	0.766	4.9	1	1	1	1	

Table 4.9: Journal Availability in Theory and Methods (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
10	HUM-COMPUT INTERACT	0737-0024	0.76						
11	PERFORM EVALUATION	0166-5316	0.718	5.7	1	1	1	1	1
12	IBM SYST J	0018-8670	0.71	5.7	1	1	1	1	
13	J LOGIC PROGRAM	0743-1066	0.675	5.7	1	1			
14	FORM METHOD SYST DES	0925-9856	0.667						
15	OBJECT ORIENTED SYST	0969-9767	0.667				1		
16	STAT COMPUT	0960-3174	0.667	4.3			1		
17	COMPUT METH PROG BIO	0169-2607	0.664	7.7	1	1			
18	J ALGORITHM	0196-6774	0.631	8.2					
19	REAL-TIME SYST	0922-6443	0.578	5.7					
20	J COMPUT SYST SCI	0022-0000	0.577	99.9		1		1	1
21	J PARALLEL DISTR COM	0743-7315	0.576	5.6					
22	IEEE CONCURR	1092-3063	0.56						
23	COMPUTING	0010-485X	0.543	9.2			1	1	1
24	J SYMB COMPUT	0747-7171	0.539	7.7	1				
25	DISTRIB COMPUT	0178-2770	0.522	7.7				1	
26	IEEE T SYST MAN CY A	1083-4427	0.494						
27	PARALLEL COMPUT	0167-8191	0.493	5.4			1		
28	ACM COMPUT SURV	0360-0300	0.484	9.6	1	1	1	1	
29	DISCRETE COMPUT GEOM	0179-5376	0.475	7.1				1	
30	REAL-TIME IMAGING	1077-2014	0.452			1			
31	SOFTWARE-CONC TOOL	0945-8115	0.452					1	
32	ACM T COMPUT SYST	0734-2071	0.444	9.7			1		
33	J SUPERCOMPUT	0920-8542	0.441						
34	IMAGE VISION COMPUT	0262-8856	0.431	5.6		1			
35	IEEE COMPUT SCI ENG	1070-9924	0.414		1				
36	INT J BIOMED COMPUT	0020-7101	0.403	5		1			
37	J LOGIC COMPUT	0955-792X	0.394	5					
38	THEOR COMPUT SCI	0304-3975	0.349	6.7					1
39	FUZZY SET SYST	0165-0114	0.331	7.9				1	
40	COMPUT SYST	0895-6340	0.312						
41	MATH SYST THEORY	0025-5661	0.306	99.9	1			1	
42	INT J SYST SCI	0020-7721	0.303	7.5			1	1	1
43	J CRYPTOL	0933-2790	0.3	6.9				1	
44	INT J COMPUT GEOM AP	0218-1959	0.27				1		
45	MULTIMED TOOLS APPL	1380-7501	0.268				1		
46	INT J PARALLEL PROG	0885-7458	0.263		1				1
47	DISTRIB PARALLEL DAT	0926-8782	0.231						
48	NEW GENERAT COMPUT	0288-3635	0.188	7.5		1			
49	APPL ALGEBR ENG COMM	0938-1279	0.187					1	
50	J SYST SOFTWARE	0164-1212	0.184	5.7	1			1	
51	IEE P-COMPUT DIG T	1350-2387	0.181	5.6	1	1		1	1
52	INT J GEN SYST	0308-1079	0.175	8.7				1	
53	INT J HIGH SPEED COM	0129-0533	0.154					1	

Table 4.9: Journal Availability in Theory and Methods (Cont'd)

RANK	TITLES	ISSN NO.	IMPACT FACTOR	CITED HALF LIFE	HOLDINGS				
					UM	USM	UPM	UTM	UKM
54	SUPERCOMPUTER	0168-7875	0.154						
55	MULTIDIM SYST SIGN P	0923-6082	0.135						
56	THEOR COMPUT SYST	1432-4350	0.125		1			1	
57	J OBJECT-ORIENT PROG	0896-8438	0.115	5.6					
58	COMPUT SYST SCI ENG	0267-6192	0.091						
59	MICROPROCESS MICROSY	0141-9331	0.08			1	1	1	1
60	EXPERT SYST	0266-4720	0.039	7.4					
61	FUTURE GENER COMP SY	0167-739X	0.019		1		1		
62	COMPUT COMPLEX	1016-3328	0					1	
63	J COMPUT SYS SC INT+	1064-2307	0						1
64	INT J HIGH PERFORM C	1094-3420							
TOTAL					21	18	17	27	9
(%)					32.81%	28.13%	26.56%	42.19%	14.10%

Generally, in all seven categories of Computer Sciences, it is observed that UTM averaged strongly in all categories. It may be because most programmes offered in UTM are based on science, technology and engineering. USM's journal availability rating was quite close to UM and UTM because it is one of the university in northern Malaysia that offers Computer Science programme.

Generally, UTM, UM and USM have better coverage of journal availabilty in the field of Computer Science. Comparisons among the five university libraries holdings of journal, indicated that UKM always has the least journal availability in all seven categories. UKM's Computer Science journal collection is small in size.

4.3 Overlaps / Duplicates

In this study, overlap means two libraries acquiring the same journal titles. For the simplicity of this exploratory study the terms overlap and duplicate carry the same

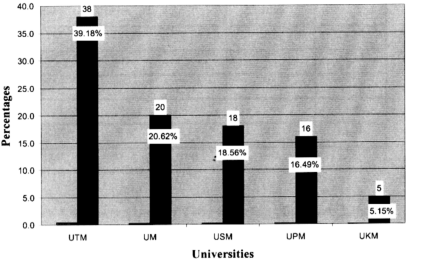
meaning when comparing among the universities. Comparison of the 301 journals from the *JCR* against selected university libraries revealed that there are 38.20% or 115 of title overlaps among the libraries. Of the 301 journal titles, some 32.23%, or 97 titles represent unique titles among the libraries and 29.57% or 89 titles have not been subscribed (Table 4.10). Out of 301 listed titles by *JCR*, 70.43% (212 titles) are available among the five selected university libraries.

Table 4.10: Summary of Overall Computer Science Journal Titles

TYPES OF TITLE	TOTAL	PERCENTAGES
Unique	97	32.23 %
Overlap	115	38.20%
Not subscribed	89	29.57%
Total	301	100 %

The percentage of unique titles is high for UM and UTM libraries which constitute 60.41 % of total unique titles especially UTM, which has taken 38 titles, that is about a quarter of the overall unique titles. This is clearly illustrated in Figure 4.3. Comparison among the libraries revealed that the higher the percentage of journal availability in university library, the higher the percentage of unique titles was also achieved. This findings is similar to Altman (1972) who found that libraries which have high percentage of unique titles are also those with large homogenous collection. Even though UKM library's journal availability percentage was low, it held some unique title, which accounts for 5.21% of the total unique titles. This result is agreeable with Altman's findings that any small library collection also has some unique titles to offer for library cooperation measures.

Figure 4.3 Percentage of Unique Titles Held by Each Library

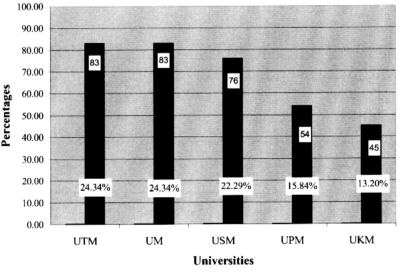


The percentage of overlaps was much higher compared to unique titles in this study for all the university libraries even though in general, the average measurement of journal availability was 'good'. The results indicate that the five university libraries in Malaysia hold many similar journal titles in Computer Science. UM and UTM have the same number of overlaps titles and together, the overlaps is about 48.54% for these two libraries. Overlap titles in UKM is also quite high with 45 titles out of only 50 titles available in the collection. Generally, the overlapping rate was high in all selected university libraries with regard to journal in computer science. This is indicated in Table 4.11 and graphically in Figure 4.4.

Table 4.11: Summary Table of Unique and Overlap Titles

Library	Unique titles	% of total	Overlap titles	% of total
UTM	38	39.18	83	24.34
UM	20	20.62	83	24.34
USM	18	18.56	76	22.29
UPM	16	16.49	54	15.84
UKM	5	5.15	45	13.20
Total	97	100	341	100

Figure 4.4: Percentage of Title Overlaps by Each Library



Of the 212 titles identified in this analysis by matching the ISSN number and the titles, 45.75% represent unique titles held at only one of the participating libraries. About 21.70% are held by more than one library, and 15.57% are held by three libraries (Table 4.12). Overlapping journal titles represent 54.25% out of the identified titles in this analysis. The percentage difference between unique titles and overlapping titles, is small (8.50%). This results is similar to the other researches on monograph overlap

carried out by Cooper, Thompson and Weeks (1975) at the University of California (UC). Their study compared two large libraries (UC Berkeley and UC Los Angeles) to ascertain the degree of overlaps. The study found that 52.9% of UC Los Angeles and 45.5% of UC Berkeley holdings consisted of overlap titles. Potter's (1986) study also found that overlap percentage ranged from 0.5% to 70.5% in any pair of libraries compared. Stroyan (1985) also found similar overlap percentages.

Table 4.12: Overlap of Journal Titles held at Different Libraries

Journal Titles held at Different University Libraries		
Number of Libraries	Titles	% of Total
Unique holdings	97	45.71%
Titles held by 2 libraries	46	21.90%
Titles held by 3 libraries	33	15.24%
Titles held by 4 libraries	30	14.29%
Titles held by 5 libraries	6	2.86%
Total	212	100.00%

Table 4.13a presents the absolute number of overlap titles on a library by library basis. The numbers in bold and italics represent the total number of serials taken by that library. For example, UTM has 83 serial titles. It shares 58 of these titles in common with UM library, 50 titles with USM, 39 titles with UPM and 32 titles with UKM. Table 4.13b shows the same data which has been converted to percentages. The 50 titles that UTM holds in common with USM represents 60.24% of UTM's collection, but 64.94% of USM's collection. Similarly, the 57 titles held in common between UM and USM

represents 68.67% overlap of UM's collection, but 74.03% overlap of USM's collection.

Table 4.13a: Overlap of Serial Titles (Total numbers)

	UTM	UM	USM	UPM	UKM
UTM	*83*	58	50	39	32
UM	58	*83*	57	35	29
USM	50	57	*76*	35	28
UPM	39	35	35	*54*	21
UKM	32	29	28	21	*45*

Table 4.13b: Number of Serials Overlap by Library (Percentage)

	UTM	UM	USM	UPM	UKM
UTM		69.88%	60.24%	46.99%	38.55%
UM	69.88%		68.67%	42.17%	34.94%
USM	64.94%	74.03%		45.45%	36.36%
UPM	72.22%	64.81%	64.81%		38.89%
UKM	71.11%	64.44%	62.22%	46.67%	

In this study, overlap or duplicate comparison of data was also carried out for different categories of Computer Science as presented in Table 4.14. Hardware and Architecture category showed the most duplication of titles, with 75.75% of titles overlaps in two or more libraries. This is followed by Interdisplinary Applications with 66.65%, Information Systems with 65.84%, and Software, Graphics, Programming category with 61.53%. These four categories reveal the highest degree of overlap titles compared to the other three categories which indicated overlap percentage of 50% and below. Titles

in Theory and Methods have 50% overlap, followed by Artifiial Intelligences with 42.1% and finally Cybernetics with 40.0%. Journal titles in Cybernetics indicated low percentage of overlaps and high unique titles because of their small number of titles (16). This subject category is a new addition under Computer Science and it was included for the first time in *JCR* in 1998.

Table 4.14: Comparison Among the Selected Libraries by Subject Categories

Categories	Titles	% of total
Artificial Intelligences Titles Held		
In one library	22	57.90
In two libraries	7	18.42
In three libraries	6	15.79
In four libraries	3	7.89
In five libraries	-	-
Total	38	100
Cybernetics Titles Held		
In one library	6	60.00
In two libraries	4	40.00
In three libraries	-	-
In four libraries	-	-
In five libraries	-	-
Total	10	100
Hardware and Architecture Titles Held		
In one library	8	24.24
In two libraries	6	18.18
In three libraries	7	21.21
In four libraries	8	24.24
In five libraries	4	12.12
Total	33	99.99
Interdisciplinary Applications Titles Held		
In one library	13	33.33
In two libraries	12	30.76
In three libraries	9	23.08
In four libraries	4	10.25
In five libraries	1	2.56
Total	39	100

Table 4.14: Comparison Among the Selected Libraries by Subject Categories

(Cont'd)

Categories	Titles	% of total
Information Systems Titles Held		
In one library	14	34.15
In two libraries	7	17.07
In three libraries	8	19.51
In four libraries	10	24.39
In five libraries	2	4.87
Total	41	99.99
Software, Graphics, Programming Title Held		
In one library	19	36.54
In two libraries	13	25.00
In three libraries	8	15.38
In four libraries	10	19.23
In five libraries	2	3.85
Total	52	100
Theory and Methods Title Held		
In one library	24	50.00
In two libraries	6	12.50
In three libraries	5	10.42
In four libraries	8	16.66
In five libraries	5	10.42
Total	48	100

Based on Table 4.14, the degree of overlap in all categories is noticeably higher than percentage of titles held in one library except for titles in the category of Cybernetics, Artificial Intelligences and Theory and Methods. The average percentage of overlaps among the seven categories of Computer Science is 57.41%.

4.4 Overlaps / Duplicate Costs

Hooper (1990) had reported that the rise in the cost of journal purchases was the result from the fall of currency value in the international currency markets. As such, libraries would face problems in its ability to meet the current rate of increase in journal prices

without bringing damage to the entire journal collections. A list of price differences between journal titles listed from the *JCR* was compiled in comparison to prices for the period 1999/2000 in the seven subject categories. The results show that most journal had increased their prices for about more than 50% (See Appendix 3).

Table 4.15, further proves that the journals price increase had caused the library budget for the same subscriptions of journals to increase too. For each library, the cost and percentage increase for journal subscriptions over the previous year were calculated. The percentage of increase among the titles that are still available ranged from 14.60% to 19.60%, with average percentage of 16.90%. In this study, the price of journals includes journal in the form of in-print and electronic edition such as CD-ROM and online.

Table 4.15 : Journal Cost Data for Each University Libraries in Computer Science

Universities	Titles availability	% of total	Previous 1999 ($ USD)	Current 2000 ($ USD)	Difference ($ USD)	% Increase
UTM	121	40	87,721.67	109,102.70	21,381.03	19.60%
UM	103	34	79,378.82	92,948.87	13,570.05	14.60%
USM	94	31	67,386.08	79,890.76	12,504.68	15.65%
UPM	70	23	47,955.24	57,401.61	9,446.37	16.46%
UKM	50	17	40,098.97	49,039.08	8,940.11	18.23%
TOTAL	438		322,540.78	388,383.02	65,842.24	

In order to study the cost of overlaps which occurred in the journal collection in Computer Science, the UM library's overlap journal titles will be taken as a case study. The summary of information collected is presented in Table 4.16. The sample of 83

journal titles represent UM's journal titles overlap list. The titles held were overlapped in more than two libraries. The costs of overlaps were calculated according to the cost of overlapping for two, three, four and five libraries.

Table 4.16: Journal Overlapping Costs in UM Library (UML)

Rank	Titles	Impact factor	Subscription cost ($ USD)
1	COGNITIVE BRAIN RES	2.755	646.00
2	J CHEM INF COMP SCI	2.609	444.00
3	IEEE T INFORM THEOR	2.083	470.00
4	J ACM	1.703	200.00
5	COMMUN ACM	1.698	114.00
6	ARTIF INTELL	1.608	1,895.00
7	MIS QUART	1.548	90.00
8	INFORM SYST	1.547	1,194.00
9	IEEE T PATTERN ANAL	1.417	870.00
10	J COMPUT PHYS	1.377	3,674.00
11	IEEE T IMAGE PROCESS	1.364	650.00
12	J AM SOC INFORM SCI	1.35	1,518.00
13	COMPUT PHYS COMMUN	1.302	4,269.00
14	IEEE T NEURAL NETWOR	1.28	550.00
15	IEEE T FUZZY SYST	1.239	350.00
16	IEEE NETWORK	1.159	185.00
17	IEEE T SOFTWARE ENG	1.153	860.00
18	ACM T DATABASE SYST	1.125	149.00
19	MATH PROGRAM	1.052	415.30
20	ACM T MATH SOFTWARE	1.032	124.00
21	IEEE MICRO	0.992	480.00
22	INT J MOD PHYS C	0.962	481.00
23	IEEE T COMPUT	0.958	935.00
24	SIAM J COMPUT	0.958	448.00
25	COMPUT METHOD APPL M	0.933	5,964.00
26	IBM J RES DEV	0.93	205.00
27	MED BIOL ENG COMPUT	0.856	396.00
28	ACM T PROGR LANG SYS	0.839	105.00
29	IEEE SOFTWARE	0.82	520.00
30	IEEE EXPERT	0.815	480.00
31	IEEE T PARALL DISTR	0.766	750.00
32	IEEE T VLSI SYST	0.733	450.00
33	PERFORM EVALUATION	0.718	1,225.00
34	IBM SYST J	0.71	90.00
35	SCIENTOMETRICS	0.71	1,157.00
36	COMPUTER	0.687	785.00

Table 4.16: Journal Overlapping Costs in UM Library (UML) (Cont'd)

Rank	Titles	Impact factor	Subscription cost ($ USD)
37	INT J HUM-COMPUT ST	0.685	1,343.00
38	J LOGIC PROGRAM	0.675	1,047.00
39	INFORM MANAGE	0.674	382.00
40	MICROPROC MICROPROG	0.667	997.00
41	COMPUT METH PROG BIO	0.664	1,138.00
42	J INFORM SCI	0.634	233.00
43	EUR J INFORM SYST	0.6	190.00
44	IEEE T COMPUT AID D	0.571	525.00
45	COMPUT CHEM ENG	0.54	1,913.00
46	COMPUT AIDED GEOM D	0.513	541.00
47	IEEE T KNOWL DATA EN	0.513	660.00
48	ACM COMPUT SURV	0.484	100.00
49	MACH VISION APPL	0.471	276.85
50	AT&T TECH J	0.438	84.00
51	IEEE COMPUT GRAPH	0.426	510.00
52	COMPUT BIOL MED	0.422	1,081.00
53	COMPUT GEOSCI	0.412	1,563.00
54	SOFTWARE PRACT EXPER	0.396	1,970.00
55	INFORM PROCESS MANAG	0.366	919.00
56	INT J INTELL SYST	0.354	1,771.00
57	COMPUT NETWORKS ISDN	0.352	1,328.00
58	BELL LABS TECH J	0.329	84.00
59	NETWORKS	0.317	1,238.00
60	MATH SYST THEORY	0.306	339.00
61	COMPUT MATH APPL	0.3	3,010.00
62	ASLIB PROC	0.28	252.00
63	INT J PARALLEL PROG	0.263	984.00
64	IEEE T RELIAB	0.255	225.00
65	COMPUT J	0.242	655.00
66	ENG APPL ARTIF INTEL	0.239	872.00
67	SCI COMPUT PROGRAM	0.235	867.00
68	KYBERNETES	0.231	5,368.65
69	IEEE COMPUT APPL POW	0.194	155.00
70	J SYST SOFTWARE	0.184	1,254.00
71	IEE P-COMPUT DIG T	0.181	822.00
72	J COMPUT CIVIL ENG	0.181	205.00
73	INFORM SOFTWARE TECH	0.174	681.00
74	INFORM TECHNOL LIBR	0.167	60.00
75	COMPUT HUMANITIES	0.148	192.60
76	BYTE	0.126	FREE
77	THEOR COMPUT SYST	0.125	301.00
78	MATH COMPUT SIMULAT	0.116	2,418.00
79	DATAMATION	0.079	75.00

Table 4.16: Journal Overlapping Costs in UM Library (UML) (Cont'd)

Rank	Titles	Impact factor	Subscription cost ($ USD)
80	IND MANAGE DATA SYST	0.078	5,224.00
81	ROBOT CIM-INT MANUF	0.068	843.00
82	DATA KNOWL ENG	0.048	1,154.00
83	FUTURE GENER COMP SY	0.019	661.00
TOTAL ($ USD)			79,650.40

Table 4.16 indicates that the total cost of overlap for UM Library is $79,650.40. It is taken that if two libraries subscribe the same titles the cost will be doubled to $159,300.80 and the cost will go on as libraries triplicate or quadruplicate the same 83 titles. From the 83 sampled titles, there were 27 titles held in two libraries, 22 titles held in three libraries and 28 journal titles actually overlapped in four libraries and 6 titles held by five libraries. The twenty-seven titles overlap costs about US$56,541.00. The twenty-two titles overlaps cost each library US$20,876.60, resulting in overlap costs of US$62,629.8. The twenty-eight titles overlaps, will cost the four libraries each US$112,105.20. Overall, the cost of overlaps will cost US$163,170.60. This cost of US$163,170.60 can be reduced if the libraries cooperate in an agreed acquisition programme to battle escalating journal prices. If each library only purchase one title from the sample list, the total sum saved would be US$79,440.40 that is equivalent to RM 301,873.52. It is noticeable that through cooperative acquisition, the cost saved is about 48.69%. Moreover, the saved cost of overlapping, US$79,440.40 can be used to purchase unsubscribe titles by any of the university libraries as listed in Table 4.17.

Table 4.17: Total Costs of Unsubscribed Titles by UM Library

Rank	Titles	Subscription cost ($ USD)
4	J COMPUT AID MOL DES	1,333.00
6	J AM MED INFORM ASSN	225.00
13	AI MAG	68.00
25	INT J COMPUT VISION	1,195.00
31	DATA MIN KNOWL DISC	381.00
32	J ARTIF INTELL RES	75.00
40	M D COMPUT	148.00
43	ARTIF INTELL MED	535.00
51	ACM T INFORM SYST	150.00
58	COMPUT BIOMED RES	454.00
64	HUM-COMPUT INTERACT	350.00
73	INTERACT COMPUT	598.00
79	FORM METHOD SYST DES	524.00
84	INT J SUPERCOMPUT AP	379.00
87	J VIS COMMUN IMAGE R	381.00
90	J ALGORITHM	616.00
93	REAL-TIME SYST	550.00
94	INT J APPROX REASON	745.00
96	J PARALLEL DISTR COM	787.00
100	IEEE CONCURR	415.00
101	J VISUAL LANG COMPUT	304.80
102	J MATH IMAGING VIS	622.22
106	AUTON ROBOT	493.00
114	IEEE T SYST MAN CY A	250.00
121	COMPUT SPEECH LANG	275.76
122	J VLSI SIGNAL PROC	800.00
123	RANDOM STRUCT ALGOR	798.00
124	AI EDAM	299.00
126	NEUROCOMPUTING	1,494.00
133	J SUPERCOMPUT	729.00
135	PROGRAM-ELECTRON LIB	214.00
136	INT J COMP INTEG M	729.00
140	COMPUT GRAPH	1,353.00
142	J VISUAL COMP ANIMAT	760.00
144	AI COMMUN	222.00
148	ICCA J	144.00
149	J LOGIC COMPUT	470.00
150	COMPUT INTELL	413.00
152	CYBERNET SYST	1,075.00
153	DISPLAYS	490.00
162	ANALOG INTEGR CIRC S	943.00
168	INT J MICROWAVE MILL	871.00
169	MATCH-COMMUN MATH CH	88.00

Table 4.17: Total Costs of Unsubscribed Titles by UM Library (Cont'd)

Rank	Titles	Subscription cost ($ USD)
170	J AUTOM REASONING	552.00
172	ANN MATH ARTIF INTEL	661.54
173	COMPUT SYST	ceased
175	CONCURRENCY-PRACT EX	1,820.00
182	T SOC COMPUT SIMUL	165.00
183	INFOR	80.00
184	MECHATRONICS	854.00
185	INT J UNCERTAIN FUZZ	180.00
188	INTEGRATION	585.00
193	J COMB OPTIM	843.00
194	INT J HUM-COMPUT INT	240.00
197	NEURAL COMPUT APPL	232.00
207	DISTRIB PARALLEL DAT	343.00
210	J INTELL MANUF	662.00
213	INTEGR COMPUT-AID E	100.00
215	IEICE T FUND ELECTR	195.00
217	J EXP THEOR ARTIF IN	441.00
218	J NEW MUSIC RES	384.00
232	AUST COMPUT J	33.68
233	RAIRO-INF THEOR APPL	276.81
245	SUPERCOMPUTER	310.00
248	WIRTSCHAFTSINF	192.60
252	COMPUT GEOTECH	1,006.00
254	APPL ARTIF INTELL	720.00
256	DATA BASE ADV INF SY	25.00
260	J OBJECT-ORIENT PROG	104.00
261	COMPUT GRAPH FORUM	500.73
270	COMPUT SYST SCI ENG	333.82
272	KYBERNETIKA	98.61
276	BIOTECHNOL SOFTW I J	293.00
279	J COMPUT INFORM SYST	125.00
281	EXPERT SYST	283.00
285	STRUCT OPTIMIZATION	730.55
287	INT J MICROGR OPT T	411.00
288	CAN J ELECT COMPUT E	90.00
291	IEICE T INF SYST	195.00
292	INT J COMPUT APPL T	360.00
295	CYBERN SYST ANAL+	2,055.00
297	ENG INTELL SYST ELEC	203.20
300	BIOINFORMATICS	630.00
301	INT J HIGH PERFORM C	379.00
Total = 84 titles		US$ 41,440.32

The listed example of unsubscribed journal titles as shown in Table 4.17 costs US$41,440.32 only represented half of the saved cost of US$79,440.40. This indicates that all 84 unsubscribed titles can be purchased by saving cost of eighty-three overlapping journals if all five libraries embarked on a cooperative venture. If this is undertaken, subscription cost could be saved and a more complete coverage of journal titles in the field of Computer Science can be achieved among the five local university libraries.

The distribution of titles by price range of journals is provided in Table 4.18 on the possibility that the prices of overlap or duplicate titles are higher than the unique titles. The results indicated that 68.75% of the overlap titles cost less than US$1000 compared to 75.00% of the unique titles. The overlap titles covered are priced within the range of below US$400 and US$5000. This results show that local university libraries maintain overlap titles of both low and expensively priced journals. It is also observed that local university libraries purchase many titles below US$2000. The percentage of titles priced higher than US$2000 is low (9.82%).

Table 4.18: Frequency of Journal Price

Price Range $ USD	Overlap Titles		Unique Titles	
	Count	%	Count	%
0 - 199	20	17.86%	8	8.70%
200 - 399	20	17.86%	23	25.00%
400 - 599	19	16.96%	16	17.39%
600 - 999	18	16.07%	22	23.91%
1000 - 1499	17	15.18%	10	10.87%
1500 - 1999	7	6.25%	8	8.70%
2000 – 2499	4	3.57%	0	0.00%
2500 – 2999	1	0.89%	3	3.26%

Table 4.18: Frequency of Journal Price (Cont'd)

Price Range $ USD	Overlap Titles		Unique Titles	
	Count	%	Count	%
3000 – 3499	0	0.00%	1	1.09%
3500 – 3999	1	0.89%	0	0.00%
4000 – 4499	2	1.79%	1	1.09%
4500 – 4999	0	0.00%	0	0.00%
5000 and above	3	2.68%	0	0.00%
Free	0		1	
Missing*	2		3	
Total	112	100.00%	92	100.00%

* Data on these titles cannot be ascertained and has been excluded from the calculations.

The discussion on cooperative measurement will be further expounded in the Discussion and Conclusion Chapter. In that chapter, the measurement of preventing journals from cancellation due to overlapping and price increase will be discussed in greater detail.