Management Information System in Indian Universities: A Comparative Study

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Abstract - The role of IT in development has been acknowledged worldwide and is expected to bring in major social and economic benefits for the mankind. In the present IT era, like every organization, the management of universities is a key challenge particularly in developing countries like India. Effectiveness of university depends upon its ability to maintain itself internally and adapt to new and dynamic environment. Computerization of universities may substantially improve response and efficiency and ensure savings in terms of time, money and other scarce resources. The present study aims to bring out the status of Management Information System in Indian Universities in terms of the adoption of IT in various functional areas, various issues facing the effective utilization of IT and the level of understanding about MIS among service providers in the University system. The study is based on primary data, which has been collected through a well-designed structured questionnaire from two Central Universities and two State Universities. The data so collected was analyzed to test various hypotheses with the help of SPSS software. Based upon the structural analysis inferences have been drawn which will help University administration to re-engineer their services to make them more effective and efficient.

Index Terms - Information technology (IT), Management Information System (MIS), University Administration, Internet, Intranet, Website, AMC.

1. INTRODUCTION

This paper presents analytical framework for the research study. It throws light on the status of Management Information System in Indian Universities in terms of the adoption of IT in various functional areas, various issues facing the effective utilization of IT and the understanding about MIS among service providing personnel of the University system.

2. UNIVERSITY AS AN ORGANIZATION

University is defined as a body of academic people engaged in the pursuit of academic matters. [1] Universities in present day socio-economic milieu have assumed great importance. A university as an organization consists of teachers, researchers, students, administrators and various sub systems such as examination, finance, personnel, stores, maintenance, planning, etc. [Fig. 1]. In a service organization like a university, the organizational structures is made up of inter-related and inter-dependent parts, and one part or subsystem cannot perform effectively without the other. [2]

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3. MANAGEMENT IN UNIVERSITIES

The University authorities have to perform academic as well as management functions. Some of them are of strategic nature and others are routine. Although university organization has men, machines, materials and money, yet the characteristics of their participants differ from other organizations and therefore, their decision making processes are unique or different in some respects. Their effective management is essential for optimal utilization of resources and for providing maximum benefits and satisfaction to its clientele. [3]

The day-to-day operations of a university System, involve handling of vast quantities of information. Multiplicity of functioning leads to information flow that is highly variable in content, format and importance. The present day set up presents manual collection and retrieval of information that is not only in itself a mammoth exercise but also a time consuming affair. Further, the administration is lesser effective and deficient because of the overburdened resources and facilities. To add to the problem, there is a voluminous paper work to be handled which often means non-availability of related data in time. There are delays in getting the data, which cannot be stored and easily analyzed. Therefore, the universities need to be organized and administered in a truly scientific manner utilizing modern management techniques and tools that are being used in other organizations. It has been observed that the educational institutions generally do not utilize managerial tools for decision making such as computers though they are available physically in the institutions. However, they are commonly found in industry and are being used frequently.

4. ADOPTION OF INFORMATION TECHNOLOGY AS A TOOL

Administrative computing is assuming an ever increasing role as the demands being placed on universities escalate, increasing number of students. As computing costs decline and methods change, universities must develop planning strategies to ensure that the new technologies and procedures are employed effectively while, at the same time, meeting the fundamental goals of the institution. Although computers can play a significant role in university administration, yet sometimes there is reluctance to adopt them because of a variety of reasons and misconceptions about computers. Nevertheless the wise and careful use of computers and Information technology can help maintain quality while keeping the costs in control in today's highly competitive environment. The rapid availability of complete information can result in savings in expenses. Therefore, all functional areas should be inter-linked so that data entered into the system from any of these points may be accessible and used by all concerned. Today the computerized MIS has been accepted as an integral part of a modern university system. [4]

The primary reasons that demand the introduction of computers so as to strengthen the information system are: to increase organizational efficiency through reduction in the overall costs; to provide useful, accurate, complete and timely information to meet the requirements of the various departments requiring such data; to improve managerial effectiveness in planning, allocating and controlling the scarce and expensive resources of the organization; to improve and ensure high quality of service at a reasonable cost; improve the management information system and to reduce clerical workload.[5]

5. RESEARCH OBJECTIVES

The objectives of this paper are:

- To study the status of computerization in the Universities.
- To understand the extent of information availability on the website.
- To identify the desired features in a University MIS and
- To study the linkage between various key factors involved in the information collection and dissemination process in the University.

6. RESEARCH METHODOLOGY

The study is based on primary data, which has been collected through a well-designed structured questionnaire. The sample comprise of all the administrative branches of the university, Directorate of Distance Education, University Library and various teaching departments of Central and State Universities. To begin with, a list of branch officers like Heads of the departments/Chairmen, Director, Librarian, Deputy Registrars, Assistant Registrars, and Section officers/Superintendents etc. was prepared and consequently the sample was selected by using Convenience/Purposive sampling technique. The survey was conducted through face-to-face interview method. The data has been put to analysis by using method of percentages. Apart from this, the use of Chi-square test and correlation analysis has been made for measuring the association between various attributes. The study analyses the result from the survey and reveals what is the status of Management Information System in Indian Universities.

7. DATA ANALYSIS

The following results were revealed after analyzing data

7.1 General Analysis

7.1.1 Status of Computerization

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	154	77.8	78.2	78.2
	No	43	21.7	21.8	100.0
	Total	197	99.5	100.0	
Missing	0	1	.5		
Total		198	100.0		

If Yes, Functioning Has Improved By Using Computers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	155	78.3	100.0	100.0
Missing	0	43	21.7		
Total		198	100.0		

If No, Can Functioning Improved By Using Computers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	42	21.2	97.7	97.7
	No	1	.5	2.3	100.0
	Total	43	21.7	100.0	
Missing	0	155	78.3		
Total		198	100.0		

Table 1: Working On Computer in the Section/Department

A reasonably high, 78% respondents indicate that they make use of computers for performing their work while 22% says they do not use computers. However there is a complete unanimity among all the respondents that computer has and can improve the administrative functioning and improve the work performance.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MS Office	136	68.7	87.7	87.7
	Others	2	1.0	1.3	89.0
	MS Office and Others	17	8.6	11.0	100.0
	Total	155	78.3	100.0	
Missing	0	43	21.7		
Total		198	100.0		

Table 2: Type of Licensed Software

The only licensed software available with the institutions is MS Office, which is loaded in all computers. There is almost no other application software available for serving various specific tasks in the universities.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Stand alone mode	116	58.6	74.8	74.8
	Network	34	17.2	21.9	96.8
	Stand alone mode and Network	5	2.5	3.2	100.0
	Total	155	78.3	100.0	
Missing	0	43	21.7		
Total		198	100.0		

Table 3: Is Computer Connected

About 75% respondents working on stand-alone mode while 22% respondents say that their computers are part of the network.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	27	13.6	20.0	20.0
	No	108	54.5	80.0	100.0
	Total	135	68.2	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
Missing	0	63	31.8		
Total		198	100.0		

Table 4: Using Customize Software In The Working

A high, 80% respondents are not using customized software in educational institutions while just 20% are using customized softwares which is very low. The restricted access appears to be mainly on account of high cost of customized software and lack of awareness of available customizes software in education sector.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	129	65.2	85.4	85.4
	No	22	11.1	14.6	100.0
	Total	151	76.3	100.	
Missing	0	47	23.7		
Total		198	100.0		

Table 5: Requirement of Computer Skilled Manpower

About 86% respondents required computer skilled person so that working of their branch will be more effective and they can use resources efficiently while 15% respondents doesn't require computer skilled person which seems to be on account of natural human tendency i.e. fear of loss of power.

7.1.2 Availability of information on Internet

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	70	35.4	36.8	36.8
	No	120	60.6	63.2	100.0
	Total	190	96.0	100.0	
Missing	0	8	4.0		
Total		198	100.0		

Frequency of Website Up-dation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	As And When It Is Required	45	22.7	70.3	70.3
	With In A Week	4	2.0	6.3	76.6
	With In A Month	4	2.0	6.3	82.8
	More Than A Month	11	5.6	17.2	100.0
	Total	64	32.3	100.0	
Missing	0	134	67.7		
Total		198	100.0		

Is Information on Internet Beneficial

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Highly Beneficial	65	32.8	56.5	56.5
	Moderately Beneficial	36	18.2	31.3	87.8
	Not Beneficial	14	7.1	12.2	100.0
	Total	115	58.1	100.0	
Missing	0	83	41.9		
Total		198	100.0		

Table 6: Availability of Information on Internet

Majority of the respondents (63%) say that information is not available on university website however, 37% respondents accept they get some of the information from university website. Among respondents who says information is available on Internet 70% respondents say it is updated whenever new information is there while 30% says it is updated quite late even after more than a month. The respondents who say they are not able to get information from Internet among them, a large number of respondents i.e. 57% agree on the issue that information is beneficial if it is available on Internet, as it would save their time and energy.

7.1.3 Efficiency and Effectiveness expected from a computerized MIS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	166	83.8	89.2	89.2
	To Some Extent	18	9.1	9.7	98.9
	No	2	1.0	1.1	100.0
	Total	186	93.9	100.0	
Missing	0	12	6.1		
Total		198	100.0		

Computerized MIS Will Reduced University Expenditure

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	149	75.3	78.4	78.4
	To Some Extent	34	17.2	17.9	96.3
	No	7	3.5	3.7	100.0
	Total	190	96.0	100.0	
Missing	0	8	4.0		
Total		198	100.0		

Faster Decision-Making through Computerized MIS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	153	77.3	79.7	79.7
	To Some Extent	35	17.7	18.2	97.9
	No	4	2.0	2.1	100.0
	Total	192	97.0	100.0	
Missing	0	6	3.0		
Total		198	100.0		

Table 7: Computerized MIS Will Streamline University Functioning

There is a high level of agreement among respondents regarding the positive effects of computerized MIS. The table 7 reveals very emphatically that a computerized MIS would streamline University functioning, reduce expenditure, ensure better and faster decision-making as well as help in checking mal-practices.

8. STATISTICAL ANALYSIS

8.1 Cross Tabulation

8.1.1 The null hypothesis that working on computer and University type are disassociated.

			University		
			State University	Central University	Total
Working On Computer In The Branch	Yes	Count	61	93	154
		%	58.7%	100.0%	78.2%
	No	Count	43	0	43
		%	41.3%	.0%	21.8%
Total		Count	104	93	197
		%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	49.188	1	.000		
Continuity Correction	46.795	1	.000		
Likelihood Ratio	65.694	1	000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	48.939	1	.000		
N of Valid Cases	197				

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	-.500	.000
	Cramer's V	.500	.000
N of Valid Cases		197	

Table 8: Working On Computer in the Branch

Applying Pearson Chi-Square test, the value of asymptotic significance (2-sided) with 1 degree of freedom is 0.000 which is less than 0.01(at 99% level of significance), so null hypothesis is rejected means there is significant association between the variables. In the symmetric table Cramer's V is 0.500, which shows these variables have a strong association. It is evident from the table 8 that only 58.7% respondents from State Universities are using computers for their work as compare to 100% respondents of Central Universities.

8.1.2 The null hypothesis that the variables Qualification of the respondents and Knowledge about the term MIS are disassociated.

			Qualification			
			Graduate	Post Graduate	Ph.D	Total
Knowledge About The Term MIS	Yes	Count	25	65	30	120
		% within Qualification	20.8%	54.2%	25.0%	100.0%
		% within Qualification	53.2%	70.7%	76.9%	67.4%
	No	Count	22	27	9	58
		% within Knowledge About The Term MIS	37.9%	46.6%	15.5%	100.0%
		% within Qualification	46.8%	29.3%	23.1%	32.6%
Total		Count	47	92	39	178
		% within Knowledge About The Term MIS	26.4%	51.7%	21.9%	100.0%
		% within Qualification	100.0%	100.0%	100.0 %	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.372	2	.041
Likelihood Ratio	6.242	2	.044
Linear-by-Linear Association	5.710	1	.017
N of Valid Cases	178		

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.189	.041
	Cramer's V	.189	.041
N of Valid Cases		178	

Table 9: Knowledge About the Term MIS vs Qualification

Applying Pearson Chi-Square test, the value of asymptotic significance (2-sided) with 2 degree of freedom is 0.041 which is less than 0.05 (at 95% level of significance), so null hypothesis is rejected hence the variables are associated. It means qualifications of the respondents make difference about the knowledge of the term MIS in Central and State University. It is apparent from the table that Cramer's V is 0.189 which shows these variables have a weak association.

However at 99% level of significance the null hypothesis is accepted because the value of significance is 0.041, which is grater than 0.01.

8.1.3 The null hypothesis that there exists no association between Qualification and level of understanding of the term MIS.

	Qualification			
	Grad	Post	Ph,D	Total

			Qualification			
			uate	Graduate		
Level of Understanding	Very Good	Count	1	20	7	28
		% within Level of Understanding	3.6%	71.4%	25.0%	100.0%
		% within Qualification	4.0%	30.8%	23.3%	23.3%
	Good	Count	8	23	10	41
		% within Level of Understanding	19.5%	56.1%	24.4%	100.0%
		% within Qualification	32.0%	35.4%	33.3%	34.2%
	Medium	Count	15	20	8	43
		% within Level of Understanding	34.9%	46.5%	18.6%	100.0%
		% within Qualification	60.0%	30.8%	26.7%	35.8%
	Low	Count	1	2	5	8
		% within Level of Understanding	12.5%	25.0%	62.5%	100.0%
		% within Qualification	4.0%	3.1%	16.7%	6.7%
Total		Count	25	65	30	120
		% within Level of Understanding	20.8%	54.2%	25.0%	100.0%
		% within Qualification	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp Sig. (2-sided)
Pearson Chi-Square	16.880	6	.010
Likelihood Ratio	17.29	6	.008
Linear-by-Linear Association	.905	1	.341
N of Valid Cases	120		

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.375	.010
	Cramer's V	.265	.010
N of Valid Cases		120	

Table 10: Level of Understanding Vs. Qualification

Applying Pearson Chi-Square test, the value of asymptotic significance (2-sided) with 6 degree of freedom is 0.01 which is less than 0.05 (at 95% level of significance), so null hypothesis is rejected means there is significant association between the variables. In the symmetric table Cramer's V is 0.265, which shows these variables have a weak association. Among respondents about 71% postgraduate respondents having very good understanding of the term MIS while 60% of graduate respondents having a medium level of understanding.

8.1.4 The null hypothesis Qualification of the respondents and level of satisfaction from maintenance arrangement has no relationship.

			Qualification			
			Graduate	Post Graduate	Ph.D	Total
Level of Satisfaction From Maintenance Arrangement	Yes	Count	18	41	14	73
		% within Level of Satisfaction From Maintenance Arrangement	24.7%	56.2%	19.2%	100.0%
		% within Qualification	46.2%	55.4%	36.8%	48.3%
	No	Count	21	33	24	78
		% within Level of Satisfaction From Maintenance Arrangement	26.9%	42.3%	30.8%	100.0%
		% within Qualification	53.8%	44.6%	63.2%	51.7%
Total		Count	39	74	38	151
		% within Level of Satisfaction From Maintenance Arrangement	25.8%	49.0%	25.2%	100.0%
		% within Qualification	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.566[a]	2	.168
Likelihood Ratio	3.595	2	.166
Linear-by-Linear Association	.639	1	.424
N of Valid Cases	151		

Table 11: Level of Satisfaction from Maintenance arrangement Vs. Qualification

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.37.

Applying Pearson Chi-Square test, the value of asymptotic significance (2-sided) with 2 degree of freedom is 0.168 which is higher than 0.05 (at 95% level of significance), so null hypothesis is found to be significantly good i.e. there is no relationship between the variables. Among the respondents

who are satisfied from maintenance arrangement about 76% respondents are of above graduation level.

8.1.5 The null hypothesis the Qualification of the respondents and type of change required in present maintenance arrangement are disassociated.

Refer Table 12 at the end

Applying Pearson Chi-Square test, the value of asymptotic significance (2-sided) with 4 degree of freedom is 0.171 which is larger than 0.05 (

In all the qualification level, a large number of respondents (61.9%, 58.1% and 37% respectively) required training of their own staff to maintain the systems, which shows they do not want to dependent on the outside agencies.

8.1.6 The null hypothesis that respondents have under gone any training for using computer and age are independent.

			Age			Total
			< 35 years	35-50 Years	> 50 Years	
Has Under Gone Any Training For Using Computer	Yes	Count	12	37	42	91
		% within Has Under Gone Any Training for Using Computer	13.2%	40.7%	46.2%	100.0%
		% within Age	54.5%	67.3%	62.7%	63.2%
	No	Count	10	18	25	53
		% within Has Under Gone Any Training For Using Computer	18.9%	34.0%	47.2%	100.0%
		% within Age	45.5%	32.7%	37.3%	36.8%
Total		Count	22	55	67	144
		% within Has Under Gone Any Training For Using Computer	15.3%	38.2%	46.5%	100.0%
		% within Age	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.108[a]	2	.575
Likelihood Ratio	1.096	2	.578
Linear-by-Linear Association	.139	1	.709
N of Valid Cases	144		

Table 13: Has Under Any Training for Using Computer Vs. Age

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.10.

Applying Pearson Chi-Square test, the value of asymptotic significance (2-sided) with 2 degree of freedom is 0.575 which is greater than 0.05 (at 95% level of significance), so null hypothesis is accepted i.e. age does not make a difference whether a university employee has under gone any training.

A very low, about 13% of respondents in the age group of Less than 35, have under gone training for using computers in their sections/departments. Such a low percentage indicates that the younger group is computer savvy so they not required any training.

9. CORRELATION

			Requirement of Computer Skilled Manpower	Non Availability of Trained Manpower
Spearman's rho	Requirement of Computer Skilled Manpower	Correlation Coefficient	1.000	.181 *
		Sig. (2-tailed)		.028
		N	151	148
	Non Availability of Trained Manpower	Correlation Coefficient	.181 *	1.000
		Sig. (2-tailed)	.028	
		N	148	192

Table 14: Correlation between Requirement of Computer Skilled Manpower & Non Availability Of Trained Manpower

* Correlation is significant at the 0.05 level (2-tailed).

Applying Spearman's correlation the value of correlation coefficient is 0.181 which is significant at the 95% level of significance, therefore the two variables i.e. requirement of computer skilled manpower and non availability of trained manpower are positively correlated. The problem of non availability of trained manpower indicates that there is a requirement of computer skilled manpower in the sections.

			Having Sufficient Software for Working	Non Availability of Relevant Software
Spearman's rho	Having Sufficient Software For Working	Correlation Coefficient	1.000	.291**
		Sig. (2-tailed)		.000
		N	155	152
	Non Availability of Relevant Software	Correlation Coefficient	.291 **	1.000
		Sig. (2-tailed)	.000	
		N	152	159

Table 15: Correlation between Having Sufficient Software for Working & Non Availability of Relevant Software

** Correlation is significant at the 0.01 level (2-tailed).

Applying Spearman's correlation the value of correlation coefficient is 0.291 which is significant at the 99% level of significance; therefore the two variables i.e. having sufficient

software for working and non availability of relevant software are positively correlated. The problem of non availability of relevant software is exists in the section because they are not having sufficient software for their working.

			Is Requirement of More Computers	Inadequate Computers
Spearman's rho	Is Requirement of More Computers	Correlation Coefficient	1.000	.372**
		Sig. (2-tailed)		.000
		N	152	143
	Inadequate Computers	Correlation Coefficient	.372**	1.000
		Sig. (2-tailed)	000	
		N	143	152

Table16: Correlation between Is Requirement of More Computers & Inadequate Computers

**. Correlation is significant at the 0.01 level (2-tailed).

Applying Spearman's correlation the value of correlation coefficient is 0.372 which is significant at the 99% level of significance, therefore the two variables i.e. requirement of more computers and inadequate number of computer are positively correlated. The problem of inadequacy of computers indicates that there is a requirement of more computers in the sections.

10. FINDINGS & CONCLUSIONS

The above data analysis and the subsequent study carried out gives rise to the following findings:

1. The adoption of computers for various applications has been found to be higher in Central Universities as compared to State Universities. [Table 8].
2. The Universities at present are not using any custom made software for any of the applications. Instead, end users are making use of standard general purpose packages and have developed small applications to meet their day-to-day requirements. [Table 2].
3. The computer networking has not been adopted fully thereby limiting the data sharing and exchange in the university and restricting its usage substantially. [Table 3].
4. The existing practice of system maintenance requires substantial improvements. [Table 12].
5. The website contents require to be updated dynamically on real-time basis to ensure currentness of the information on the website. Further the website should contain meaningful features to reduce the physical visits of the users for various activities. [Table 6].
6. The need and relevance of MIS in University system should be percolated to the lowest level (service providers). This will help in ensuring that all users confirm and adhere to the system requirements as far as data preparation is concerned. [Table 10].
7. There is a strong need to setup a central computing facility in the university to carryout the above tasks and should own the system for its success. In addition, every user section should assign a coordinator to ensure proper coordination of the MIS services with the Central facility. [Table 14].
8. Regular orientation/awareness programmes must be conducted periodically to empower the service providers/users to ensure effective utilization of the system.

11. CONCLUSIONS

The central universities are better placed in terms of adoption of Information technology for various functions. There is an urgent need to focus attention of various factors such as: availability of custom-made application software for optimum hardware investment, proper networking and maintenance, with strong integrated information system approach rather than compartmentalized applications with adequate skilled manpower support.

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			Qualification			Total
			Graduate	Post Graduate	Ph.D	
Type Of Change Required in Present Maintenance Arrangement	AMC	Count	4	12	7	23
		% within Type of Change Required in Present Maintenance Arrangement	17.4%	52.2%	30.4%	100.0%
		% within Qualification	19.0%	27.9%	25.9%	25.3%
	Training of The Own Staff	Count	13	25	10	48
		% within Type of Change Required in Present Maintenance Arrangement	27.1%	52.1%	20.8%	100.0%
		% within Qualification	61.9%	58.1%	37.0%	52.7%
	Visit Basis + Parts	Count	4	6	10	20
		% within Type of Change Required in Present Maintenance Arrangement	20.0%	30.0%	50.0%	100.0%
		% within Qualification	19.0%	14.0%	37.0%	22.0%
Total		Count	21	43	27	91
		% within Type of Change Required in Present Maintenance Arrangement	23.1%	47.3%	29.7%	100.0%
		% within Qualification	100.0%	100.0%	100.0%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.407[a]	4	.171
Likelihood Ratio	6.269	4	.180
Linear-by-Linear Association	.451	1	.502
N of Valid Cases	91		

Table 12: Type of Change Required in Present Maintenance Arrangement Vs. Qualification
a. 1 cells (11.1 %) have expected count less than 5. The minimum expected count is 4.62.

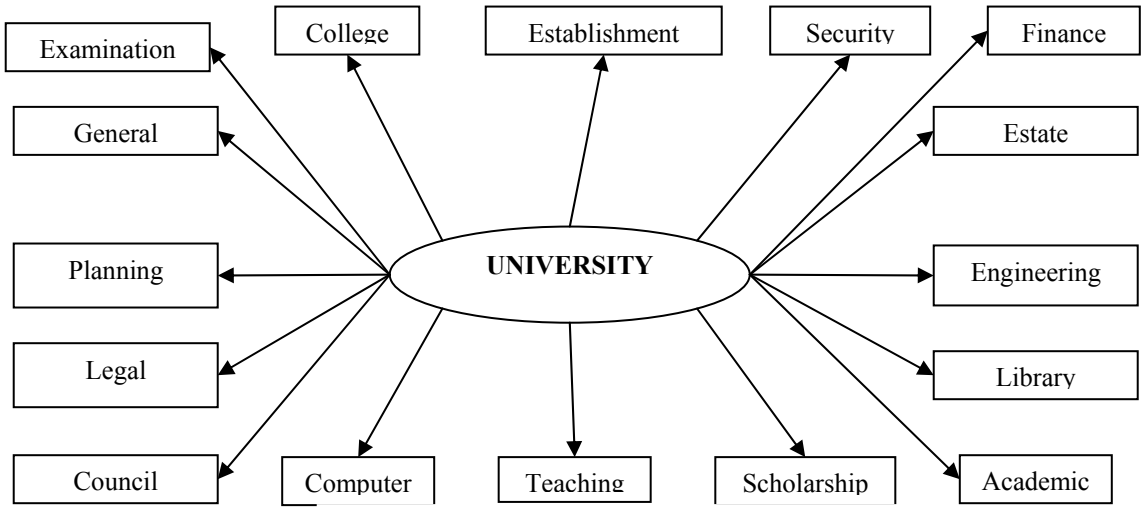

Figure 1: University and its Subsystems