

*An Analysis of Cognitive Context and Attitudes of Undergraduate Students towards
Their Patterns of Library Use*

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Abstract

This study examines university students' patterns of library use from their cognitive point of view and in light of certain attitudes toward information searching. Students' knowledge and skill traits in library use are considered as their cognitive context. A two-part questionnaire designed to examine cognitive context and attitudes in library use was used to survey a sample of 254 undergraduates. The resulting data were subjected to three stages of analysis. First, factor analysis identified the constructive concept of cognitive context. Second, cluster analysis revealed uneven groups of students who have similarities in their cognitive contexts. Third, chi square analysis of variance was used to assess the impact of students' attitudes on their library use patterns. Results confirmed that the students use libraries in different ways due to their different cognitive contexts. Cognitive context related to library use was affected by four core factors, while four groups of users reflected diverse cognitive contexts. Significant differences were shown among the four groups in their attitudes toward library use as well. Different cognitive contexts are the basic source of the differing patterns of library use; upgrading of students' cognitive context is recommended.

Keywords: Cognitive Context, Information Seeking, Library Use Patterns

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Introduction

Due to uneven profiles of cognitive competencies, as well as certain attitudes held by undergraduate students, their patterns of library use appear to be quite diversified. It is apparent that these differences in cognitive competencies and attitudes could lead to significant differences in students' eventual educational outcomes. Obviously, these outcomes may be influenced by a variety of factors, including situational, social, psychological, cognitive, geographical or cultural factors, as well as the setup of the existing library system. This study focused mainly on the cognitive context, in particular the students' knowledge and skill sets relating to the search for information, but also gave some consideration to students' attitudes. It may be that the cognitive context has greater power to influence ultimate educational outcomes than any other context.

This study continues a line of research developed in three previous studies. The first study in the series, by Karunanayake and Nagata (2007) examined some affected variables of information need occurrence of an information seeker and developed a comprehensive hypothetical model. The second study, by Karunanayake and Nagata (2008), looked at influences of personal traits in the process of information searching. The results of these two earlier studies were limited to students' cognitive patterns but did not completely reveal the cognitive context. The third study, by Karunanayake and Nagata (2014), distinguished four types of undergraduate library users, based on their profiles of library use, knowledge and perceptions, by looking at the data from the cognitive angle while giving some attention to student attitudes in library use. In the fourth study, reported here, variables of student attitude were again considered along with cognitive context.

Hence, this study is a continuing result of the previous studies. Three main steps were involved in this study: (1) the cognitive context was adapted for building up a constructive concept in library use; (2) students who had cognitive similarities were grouped, based on the same constructive concept, and (3) certain attitudes held by the students were examined to determine whether a degree of relationship existed between the attitudes and the students' cognitive patterns.

Students' cognitive context and its relation with library use patterns have been rarely investigated in pattern studies. The results of this study could have significant practical implications for university libraries in general. The conclusions suggest that several library use patterns, and certain related attitude patterns, may be expected among student groups. Finally, it is recommended that the identified factors which strongly influence library use patterns, and their associated attitudes, should be considered when providing library services. Possible interventions to help university undergraduates overcome their cognitive and attitudinal shortcomings are proposed.

Research Structure

To further elaborate students' library use patterns, two main variables have been taken into consideration: students' cognitive context, and students' attitudes.

1) Cognitive Context: Students are diverse in their cognitive competencies relating to information search. The focus of interest in this study is the way in which different

patterns of cognitive context affect students' practical use of libraries. Cognitive context means cognitive aptitude or disposition behind practices of library use. It always represents a set of two traits: the individual's knowledge and level of skill as these traits relate to information search.

2) Attitudes: Students' behavior related to library use are related not only to cognitive context, but are also related to attitudes about library use. A choice from a set of options on a matter by a person may result in some practice. Thus to select a preference is to express an attitude on a matter. Expressions of needs or purposes for a matter, or expressions of satisfaction with a matter are types of attitudes. Even a simple variable like purpose of library visits can be interpreted as expression of an attitude while it is also explained as a fact of practice. Therefore, this study considers such expressions as representing underlying attitudes. Attitudes are considered as different from cognitive context, but cognitive context may be related to some attitudes regarding students' library usage.

In this study, a set of five cognitive variables and a set of five attitudes were tested to determine how these are correlated with library use patterns. Detailed results regarding cognitive context and attitudes of students, and relationships among them, were expected to be diversified.

Objectives of the Research

The objectives of the research were operationalized through four research questions, each of which was directed toward basic understanding of the variables as well as toward methodological and theoretical understandings of relationships among them. However, the main focus of the study was on cognitive context. The research questions were as follows.

- 1) What are the factors affecting library use from the point of view of students' cognitive context?
- 2) Are there clusters of students according to different levels of cognitive context?
- 3) How do the library use patterns (cognitive context) relate to the attitudes expressed by students?
- 4) Do different library use patterns exist among students?

Conceptual Framework

To answer research questions 1 through 4, the methodological design covered two kinds of variables, cognitive context variables and attitude variables, in relation to library use. The two parts or sections of the survey questionnaire were constructed to estimate these two kinds of variables. Questions in the first section of the questionnaire were designed for the purpose of cluster analysis, to determine whether or not the students in the survey sample fell into discrete groupings based on differing cognitive contexts. Questions in the second part of the questionnaire were designed to explore the specific attitude patterns of any such groupings. Thus, methodologically, cognitive context had the central position in this study.

In the first section of the questionnaire, questions relating to twelve variables were organized under five observable stages of library use, on the assumption that two

basic traits of information searchers cause differences in library use patterns. Knowledge traits and skill traits underlie the users' practices and thus have an impact on how the library is used and how the information is perceived. Based on these two indicators, which represent the cognitive context, a conceptual framework was prepared. The following table lists each of the observable stages of library use, followed by the knowledge and skill variables to be examined for each stage, followed by the question representing each variable. The five stages are expanded to twelve variables which are focused on cognitive effects in library use.

Table 1:
Stages of Library Use, Associated Variables and
Related Part 1 Survey Questions

Stage one: Search initiation

Knowledge variable: Knowledge of potential information need

(1) I start information seeking in the library with exact and steady ideas of my needs.

Skill variable: Skill of search strategy

(2) I usually setup a search strategy when looking for information.

Stage two: Selection of resources and tools

Knowledge variable: Awareness of digital resources

(3) I am fully aware of the digital documents available in the library.

Skill variable: Skill of search terms

(4) Most of my searches are by author and title of a book.

Stage three: Utilization of library services and system

Knowledge variable: Knowledge of suggested services

(5) I know the Inter Library Loan and other services available in the library.

Skill variable: Negotiation skill for information

(6) I consult the librarian when I have a need of information.

Stage four: Discovering information and materials

Knowledge variable: Knowledge of discovering information and materials

(7) A half of the materials I need are found browsing through bookshelves.

Skill variable: Navigational ability to materials (Physical)

(8) The links between the catalogue and the shelving arrangements are complicated.

Knowledge variable: Knowledge of material settings

(9) I know the entire arrangement of material settings in the library.

Skill variable: Navigational skill to information (Intellectual)

(10) Bibliographies, references, indexers, abstracts are not useful for me when gathering information from the documents I have found.

Stage five: Self-evaluation

Knowledge variable: Knowledge of Experience (Independency)

(11) Each of the searches increased my knowledge in access to information.

Skill variable: Evaluation of the self

(12) I know the library has enough collection and I was able to find the information that I looked for.

In the second section of the questionnaire, questions designed to assess students' attitudes toward library use and information searching was centered on five foci, as listed below.

1. Pattern of access to the library
2. Pattern of access to the materials
3. Pattern of access to the information
4. Alternative strategies (patterns of dependency)
5. Expectations (patterns of query formulation) in libraries.

Limitations in the two sections and designing of the variables in the questionnaire were based on the day-to-day professional experiences and practical observations of the author.

Methodology

Analysis of the survey questionnaire section one responses, which included twelve questions under five stages for identifying the factors and groups in terms of factor and cluster analyses, was done by multivariable analysis (Principal Component Analysis). It was expected that this analysis would show results that would answer research question 1: "What are the factors affecting library use from the point of view of students' cognitive context?" Based on the resulting factorial structure, the groups of students who showed cognitive similarities were analyzed by cluster analysis (word method) in order to answer research question 2: "Are there clusters of students according to different levels of cognitive context?" It was assumed that some students might have similar tendencies and some might have different cognitive contexts. A degree of discreteness was anticipated.

The survey questionnaire section two focused on five attitudes. Inferential statistical analysis, such as Chi-square tests, was applied to test for statistically significant relationships of the attitudes within the cluster groupings. Research question 3, "How do library use patterns (cognitive context) relate to the attitudes expressed by students?" was analyzed by cross tabulating the clusters with the chosen five attitudes. Finally, research question 4, "Do different library use patterns existed among students?" was explored based on individual students who were designated as belonging to a group by cluster analysis. Accordingly, library use patterns were depicted based on students' groupings and related attitudes.

In summary, the data were analyzed within the framework prepared according to the above research questions (RQs) as follows.

RQ 1 Analyzing the cognitive context by component analysis

RQ 2 Clustering the students according to the cognitive context by cluster analysis

RQ 3 Determining degree of relationships between the cognitive context and attitudes by Chi-square.

- 3.1) Pattern of access to the library
- 3.2) Pattern of access to the materials
- 3.3) Pattern of access to the information
- 3.4) Alternative strategies (patterns of dependency)
- 3.5) Expectations (patterns of query formulation)

RQ 4 Students' patterns of library use

Research Question 1: Analyzing the Cognitive Context by Component Analysis

Four latent factors were found by Principal Component Method as shown in Table 2. The result for the Kaiser-Meyer-Olkin test was 0.57. Factor one and Factor three, and between Factor three and Factor four have shown correlations. Squared loading indicated that factor one has 13.5%. Factor two 11.2%, Factor three 9.7% and Factor four has 8.8% squared loading. "Method of Locating & Searching", "Use of Materials & Services", "Searching Needs" and "Own Competence" respectively named the four factors.

Table 2:
Analysis of Twelve Variables in a Library Search

Cognitive Variables	Components			
	Routine of Locating and Searching	Style of Materials and Services Use	Searching Needs	Own Competence
11. Knowledge of experience	-.662	.156	.057	-.137
4. Skill of unknown search terms*	.598	.223	.361	.063
10. Navigational ability to information (intellectual)*	.494	-.036	-.418	-.065
9. Knowledge of material setting	.436	-.281	.006	-.324
8. Knowledge of discovering materials	.317	-.623	.012	.117
3. Awareness of digital resources*	.063	.584	-.090	.174
6. Negotiation skill*	-.047	.538	-.233	-.027
1. Knowledge of potential information need	-.043	-.194	.655	.073
2. Skill of search strategy	.027	-.093	.603	-.052
12. Judgments about the self and the library*	.269	.124	-.111	.785
5. Knowledge of suggested services	.154	.109	-.238	-.584
7. Navigational ability to materials(Physical)*	-.211	-.266	-.243	.318

*Indicates the questions in negative form.

Extraction Method: Principal Factor Method.

Rotation Method: Promax with Kaiser Normalization.

A Rotation converged in 10 iterations.

Factor one, "Routine of Locating and Searching," is concerned with knowledge and skill of searching and locating materials in the library. Experience in locating the information was indicated as having negative impact with other variables. For some students, the experience did not add further knowledge. They did not use bibliographies, references, etc., for further searches, and relied on knowledge and skill they had when searching and locating materials. This means that they have a routine way of searching and locating materials. On the other hand, there might be some students who have reverse tendencies who have no routine way of searching. So, it is possible to say that this factor indicates a tendency to have a routine way of searching for and locating materials.

Factor two, "Style of Materials and Services Use," is concerned with style of usage of library services. There were negative and positive relations among three incidents. The incident of browsing for information was negatively related with other incidents, but questions on other incidents were in negative form. Thus, these incidents are positively related in meaning. Some students depend on browsing, using electronic instruments and negotiating with librarians to get information (though responses indicating the last two activities by students were not so critical). On the other hand, there were some students who have reverse tendencies and they have no such style of library use. It is possible to say that this factor indicates a style of library use.

Factor three, "Searching Needs," is concerned with consciousness of searching needs and efficacy for way of searching. Two incidents are positively related. But there was no incident with negative relation to them. Some students are conscious of their information needs and have efficacy to get information using search tools. On the other hand, there might be some students who are not conscious of their information needs when searching and have no efficacy for information searching. So, this factor indicates the tendency toward consciousness of searching needs and efficacy for way of searching.

Factor four, "Own Competence," is concerned with competence of in-depth use of library services. There were negative and positive relations among three incidents. Two incidents designated ability of the user to use the library deeply and were related positively. The other incident is concerned with awareness of document/information delivery services and was negatively related with other two incidents. All these incidents have a focus of getting to use the library deeply. Some students have no ability to use library deeply and do not know advanced services. They have a lack of the necessary ability. On the other hand, there might be some students who have reverse tendencies and who have ability and knowledge to use library deeply. So, it is possible to say that this factor indicates the tendency to have competence for in-depth usage of libraries.

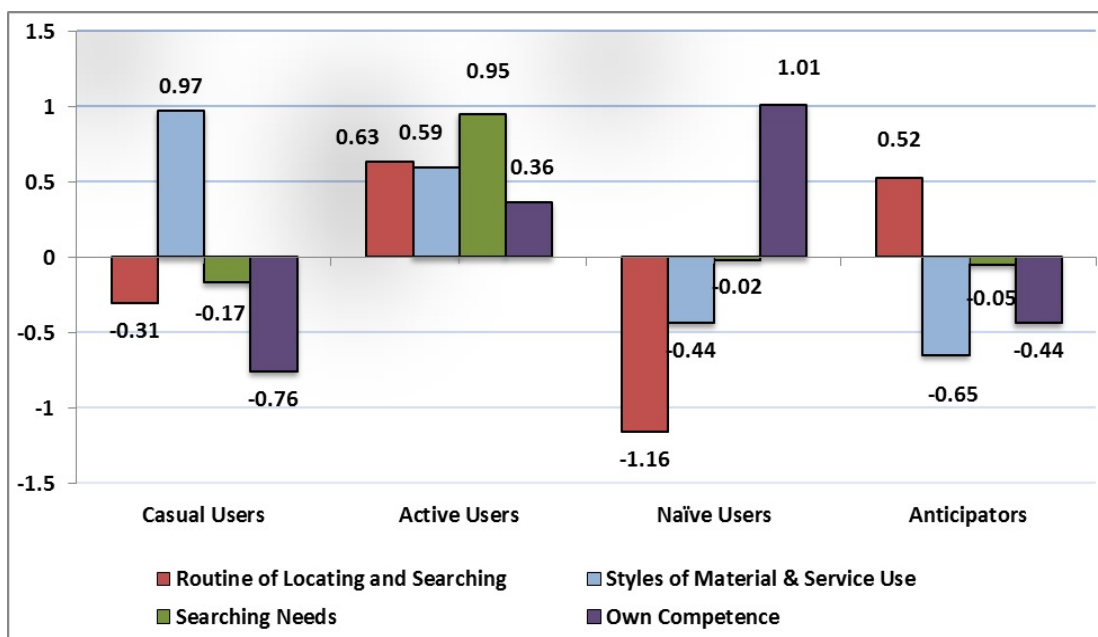
Given the twelve incidents, students responded variously but their knowledge and skill have some tendencies on four factors. Thus the knowledge and skill of students can be imagined as points distributed on cognitive space with four dimensions (factors). This space can be said as cognitive context space on library use by students. Position of a student on this space is calculated as a set of four factor scores of

students, that is, cognitive context of a student is represented as a set of four factor scores.

Research Question 2: Clustering the Students According to the Cognitive Context by Cluster Analysis

Four groupings of students were found by both Hierarchical (Ward's) and *k*-means methods of cluster analysis. It confirmed the cognitive similarities of these students. A set of four average values represents summarized characteristics of cognitive context of each group as shown in the Table 3.

Table 3
Cognitive Context of the User Groups
Average Factor Scores



The four groupings are as follows.

1) Casual Users: Twenty percent (51) of 254 undergraduates were highly positive only on factor two, “Style of Materials and Services Use,” and were very negative on factor four, “Own Competence.” Responses on factor one, “Routine of Locating and Searching,” was also negative but not so eminent. Students of this group depend on browsing, etc. to get information (factor two) and competence of in-depth use of library (factor four). They may be proficient users without any routine way of searching, but with dependence of browsing.

2) Active Users: Twenty two percent (57) of the undergraduates were positive in all four factors. They were positive in factor one to three, “Searching Needs,” “Routine of Locating and Searching,” “Style of Materials and Services Use,” and they were somewhat positive in factor four, “own competence.” Students of this group have routine ways of searching and locating materials (factor one), depend on browsing, etc., when using the library (factor two), are conscious of their information needs and

have efficacy to use library tools (factor three), but do not have strong competence of in-depth usage of library (factor four). These points suggest that they are ordinary users who use the library intentionally, with efficacy.

3) Naïve Users: Twenty two percent (57) of the students were highly negative for factor one, “Routine of Locating and Searching,” and highly positive for factor four, “Own Competence.” They were also negative for factor two, “Style of Materials and Services Use.” Students of this group do not have routine ways of searching and locating materials (factor one), have no browsing style of library use (factor two), and highly lacking in competence for in-depth usage of libraries (factor four). They are limited in ability to use library.

4) Anticipators: Thirty five percent (89) of the students were negative for factors two through four: “Style of Materials and Services Use,” “Searching Needs,” and “Own Competence,” but were positive for factor one, “Routine of Locating and Searching.” Students of this group do report having routine ways of searching and locating materials (factor one), do not have a browsing style of library use (factor two), and have some-what high competence of in-depth use of library (factor four). Users of this group are somewhat proficient with a routine way of searching.

Research Question 3: Relationships between the Cognitive Context and Attitudes by Chi-square

Following five attitudes were cross-tabulated by groups and choices of each attitude. Chi square testing was conducted for identifying the differences among groups. The five attitudes mainly target efficacy of information searching. It is assumed that the majority of students are experiencing problems when they perform information searching through attitudes. Perhaps users may have a tendency to abandon their searches without questioning the causes of search failures due to insufficient information search efficacy.

3.1 Pattern of Access to the Library:

When asked about their access pattern to the library, (library catalogue-card, library catalogue-online, browsing book shelves, library staff, colleagues, and teachers) the four groups seemed almost identical. All of the groups used online catalogues as their main access method while browsing shelves was the second method of using libraries. Library staff and colleagues were third place. Teachers have played more of a positive role for Naïve users than the other three groups.

3.2 Pattern of Access to the Materials:

In their access pattern to the materials (author, title, subject headings, classification number), the highest number of students in each of the four groups ranked “author” and “title” as their most commonly attempted access point for material searching. There was no significant statistical difference between the choices of either the author or the title. This result can be used to predict that the students have their own search terms and react as “known document searchers”. Only 21% of students used subject headings to search bibliographic records in the library. It may be that available entry vocabulary of the system (catalogue search terms) is not related to the user’s terms of search choice and they need a great deal of improvement in the area of advanced

searching. Most students perhaps did not understand the system terms like known search terms.

3.3 Pattern of Access to the Information:

Options for information selection from found materials (tables of contents, abstracts, indexes, bibliographies, references, glossaries) were measured. Content notes were the most effective choice of selecting information from documents. Use of bibliographies, references and indexes was the secondary method of information searching from the documents, comparatively. Other options, such as the use of abstracts and glossaries remained as the least used choices of information selection from a document, respectively.

Users experienced some difficulties in achieving successful search results owing to poor search proficiency, especially when selecting materials from the catalogue and selecting information from a document. The majority did not understand the system terms as well as they understood known search terms like author and title; hence there was a tendency towards reduction of the total retrieval results. The majority did not use the subject headings of the subject indexes of the bibliographic records in the library. Perhaps, in the cases of search proficiency failures, students may not have known how to cluster subjects using subject headings by checking the class numbers assigned to each document (which is very effective in the information search process). The majority utilized formal search tools but did not use specific search terms to express their information needs and they may have lacked the intellectual understanding of the relationship between formal search tools and the specific search terms used by those tools, which reflected their cognitive anomalies.

3.4 Attitudes towards Alternative Strategies (Patterns of Dependency):

The attitude, "If the information you received is not sufficient, what will your alternative courses of action be?" included five search strategies; dependency on "catalogs", "other resources", "the librarian", "other library staff", or "abandoning the search". This further examined the trends in respondents' alternative actions. Those incidents especially indicate students' search skills or their desires in the search process. Each of the incidents explains the behavior of students in searching for information in libraries that will facilitate further understanding of the users' actions and desires. Although the categories are very limited, they provide an insight into two basic preferences in information searching; to look-up information oneself or to depend on others.

When the mean scores of the alternative strategies were compared by groups, it was found that "Casual Users" did not abandon the search and tended to search further and look for other resources, too. They relied on catalogues and library staff but rarely consulted the librarian in the search process. Similar patterns of dependency in search strategies were displayed by all the groups.

"Active Users" also relied heavily on the catalogues and looked for alternative resources. There were positive reactions towards the assistance of the library staff and negative reactions regarding approaching the librarian. They also showed further search interest.

“Naïve Users” consult the library staff most often. They had a tendency to ask for help before depending on the catalogues or looking for other resources. They also showed a low tendency to seek out other resources rather than using the catalogues. They stuck to the search process and showed no signs of abandoning the search. No negotiation was sought with the librarian.

“Anticipators” showed the highest level of dependency on the library staff, catalogues and the highest tendency not to abandon the search process. They showed a low tendency to use other resources and were less inclined to ask the librarian for help.

3.5 Attitudes towards the Query Formulation (Expectations):

In the final set of attitude measures in the questionnaire, students were asked what they felt they needed in the search process, especially their expectations (patterns of query formulation) within their experience of using libraries. These aspects were: “need more information on my discipline,” “need guidance to find resources,” “need for information on library services,” “need for personal help to locate materials,” “need for advice to use online catalog,” and “need for help to use library equipment.”

It might be expected, for example, there should be different expectations among those groups who possess different cognitive abilities. “Casual Users” regularly needed a lot of guidance to find resources than any other given reasons. They also showed the highest demand for library services and personal help to locate materials. Information on their disciplines, assistance to use the online catalog and help to use library equipment were the least formulated queries respectively.

Among the members of “Active Users”, there was a higher probability of asking for guidance to find resources in libraries and to ask for guidance in using library services too. Their third demand was for personal assistance to locate materials. Like “Casual Users”, they also set least priority for help finding information on their discipline, use of the online catalog and for help using library equipment.

“Naïve Users” regularly expected information on library services more than anything else. Locating materials and guidance in finding relevant resources were the second and third expectations. However, they needed help to use the online catalog more than any other group, which was ranked in fourth place. Information on their discipline and use of library equipment were rarely sought.

Query patterns of “Anticipators” indicated that they were the most regular user group to ask for help about library services; more than other groups. They also expected information on other resources from library staff and personal involvement for finding the locations too. Sometimes they would ask for help finding information on their disciplines, using the online catalog and also using library equipment. The query patterns of “Casual Users” and “Active Users” is almost identical. “Naïve Users” needed assistance to use the online catalogue. Also, “Anticipators” expected more information relating to their discipline than information about use of the online catalogue.

Students with different levels of cognitive ability were concerned by different expectations from the library. In general, all groups required a lot of guidance to find information on their discipline to use library services and for personal help to find

materials from the shelves. Guidance for locating materials and assistance in using library services are the main queries among the four groups.

Research Question 4: Students' Patterns of Library Use

Library use pattern is defined as a set of cognitive context and attitudes which affect practices of library use by students. Research question 1 explored cognitive context by applying factor analysis to responses of students to a questionnaire, which was designed based on a methodological framework consisting of twelve incidents focused on knowledge and skill contained in library use practices. Students responded to the twelve incidents in a varied manner, but their knowledge and skill had an impact on the four factors. Thus, the knowledge and skill of students can be plotted in cognitive space with four dimensions (factors). This space can be said to be a cognitive context space on library use by students. Positioning of a student on this space is calculated as a set of four factor scores.

Clustering students based on four factor scores revealed four types of students to achieve the response to research question 2. The students examined were classified into four types of cognitive context. Typical students of each group were as follows: "Casual Users" do not follow routine way of searching but depend on browsing. "Active Users" are ordinary users who use the library intentionally, with efficacy. "Naïve Users" are limited in their ability to use the library. "Anticipators" are somewhat proficient with routine ways of searching. The data show that the cognitive contexts of the university undergraduate students surveyed, with regard to library use are obviously diversified, but the existence of any abstract common structure of cognitive contexts is open to question. Surveyed students in each of the groupings were shown to have similar cognitive contexts, and the four groups differed in cognitive context in relation to the other groups. In other words, different library use patterns as a set of cognitive context and related attitudes on library use were found in the study. Though it is clear that a group with a particular cognitive context will differ in some attitudes from another group, the concrete differences and relationships between cognitive context and attitudes have not been pursued and information that certain differences are there among some groups was not identified, as shown in Table 04.

**Table 4–
Attitudes of Groups Differed Significantly**

Categories of attitude	Items in category of attitude	
	Significant difference found	No significant difference found
1. Access ways to the library	Online catalog**	Card catalog
	Browsing book shelves*	Through, colleague
	Teachers**	
2. Access ways to the catalog		Author, Title, Subject headings, Class numbers
3. Access ways to the information		All items
4. Patterns of dependency		
5. Expectations of patterns of query formulation	Guidance for locating materials**	Information on discipline, identify resources, Use
	Information on library services**	of library equipments

- Indicates unavailable by indifference, x - no difference,
* Significant at 5% and ** Significant at 1%

Conclusions

Library use patterns, in this study, were identified from the cognitive context. Cognitive context was observed from the analysis of the individual search activities that reflect the users' knowledge and skill. The data show that the students' library searches differ according to cognitive context, or the two distinguishable traits (knowledge and skill). The extent of knowledge and skill in relation to library use was illuminated by specific factors. Different patterns of use prevailed among four groups by the influence of the said factors.

Therefore, upgrading cognitive context according to students' disciplines of study and by year of study is recommended. This study has demonstrated that library use patterns vary in relation to students' varied cognitive contexts, influenced to some extent by several sub cluster features (attitudes). Further studies are needed to investigate students' searching patterns with special attention to different contextual situations of library use. As a next step, a follow-up study will investigate the patterns from a sample of undergraduate students selected from Fiji National University in Fiji Islands.

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