Investigation and Research on Undergraduates' Information Behavior in Ubiquitous Knowledge Environments

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Abstract. Through the questionnaire survey and the structural equation modeling, this thesis concretely weighted the influence of the information behavior on the university students. Studies have shown that information demand behaviors are positively related to information retrieval significantly, and go further to be strongly correlated to information usage; information behavior has a positive correlation to learning objectives and learning effect, and so do information seeking, information retrieval and information usage, among which, information seeking and information usage have a higher influence. We made a point that undergraduates should improve the capability of information seeking and information usage to promote the efficiency of knowledge acquisition.

Introduction

Ubiquitous Knowledge Environments, UKEs in abbreviation, a new technology and knowledge infrastructure organically comprised of network, hardware, software, information resources, human, and etc, is a comprehensive digital information infrastructure in the coming knowledge society, facilitated by computation, storage as well as communication, and designed to be a general and integrated knowledge environment digging the resources of human, datum, information, tool and equipment to fully make use of them[1]. With the development of science and technology network and the approaching of the era of 4G, Ubiquitous Knowledge Environments is becoming something virtual. The ability to catch and obtain information in UKEs is critical to the undergraduate’s academic performance and future employment, while how to improve the ability is a question to be considered in the present university education reform [2].

The thesis establishes a structural equation model with the data from the questionnaire survey, weights the influence of the information behavior in UKEs—including information seeking, information retrieval and information usage—on the university students, and reveals the underlying relationships, in order to effectively promote the efficiency of the university students in information acquisition and utilization.

Research Methods

Carry on a questionnaire survey with paper questionnaires and network questionnaire at the same time. The investigation object of the paper questionnaires is mainly the undergraduates in the universities in Sichuan. Altogether 412 of the paper
questionnaires and network questionnaire are collected, with 377 effective. Enter the questionnaire with SPSS software, and analyze their reliability and validity. Establish a structural equation model with the data, and analyze the model using AMOS 21.0.0.

**Questionnaire Design**
The data in the thesis are obtained from paper questionnaires and network questionnaire. The content of the questionnaire consists of information seeking, information retrieval, information usage and basic information. The part of information seeking deals with the seeking for daily information and academic information; the part of information retrieval deals with the use of literature resources, cyber source retrieval and retrieval tools; the part of information usage deals with the use of information the university students can get. Extracted and tested, the first 100 questionnaires are analyzed in the aspect of reliability and validity. Then the questionnaire structure is adjusted by eliminating the poor results in qualitative analysis along with the obviously subjective results, up to 10 observed variables. At last, the reliability is 78.5%.

**Model Construction**
The model variables are as follows:
- $y_1$: number of database used; $y_2$: number of books borrowed
- $y_3$: number of library electronic resources used; $y_4$: number of reading in the library; $y_5$: number of information resources used in the course learning
- $x_1$: main source of information acquisition; $x_2$: frequency of search engine used; $x_3$: ability to select data
- $k_1$: Distinguishing academic journals and magazines resources
- $k_2$: Distinguishing library resources and cyber source
- $k_3$: Distinguishing free published papers and officially published papers
- $z_1$: the effect of information access on learning objectives
- $z_2$: the effect of information access on learning effect

Supposing among the six explicit variables, $y_1, y_2, y_3, y_4, y_5$ are indicators to measure the “information demand behaviors”, $x_1, x_2, x_3$ are indicators to measure the “information seeking behaviors”, $k_1, k_2, k_3$ are indicators to measure the “information use behaviors”, and $z_1, z_2$ measure their relationship with “academic satisfaction”, the analysis contain four hidden variables:
- $T_1$: information demand behaviors
- $T_2$: information seeking behaviors
- $T_3$: information use behaviors
- $T_4$: academic satisfaction

The relationship between the hidden variables themselves along with the relationship between the hidden variables and the explicit variables built, the rationality of the assumed model further tested with Amos 21.0.0, and the path coefficients in the model determined, the Path Model can be got as follows in Figure 1.
Structure Analyses

Measurement Model

The relationship between the index and the hidden variables is generally written as a measurement equation, in which the coefficient matrix adopts the factor loading in the factor analysis, the measurement errors satisfy the assumption 1) The average is 0, while the variance is constant. 2) There is no serial correlation. 3) They are not related to exogenous and endogenous hidden variables. 4) They are not related to structural equation error.

\[
\begin{align*}
y_1 &= 0.49F_1 + e_1, \quad y_2 = 0.63F_1 + e_2 \\
y_3 &= 0.54F_1 + e_3, \quad y_4 = 0.43F_1 + e_4 \\
y_5 &= 0.41F_1 + e_5, \quad x_1 = 0.62F_2 + e_6 \\
x_2 &= 0.72F_2 + e_7, \quad x_3 = 0.70F_2 + e_8 \\
k_1 &= 0.84F_3 + e_9, \quad k_2 = 0.79F_3 + e_{10} \\
k_3 &= 0.60F_3 + e_{11}, \quad z_1 = 0.92F_4 + e_{15} \\
z_1 &= 0.85F_4 + e_{16}
\end{align*}
\]

Structure Model

Structural equation can be got for the relationship between the hidden variables:

\[
\begin{align*}
F_1 &= 0.19F_1 + e_{12} \\
F_2 &= 0.47F_1 - 0.1F_4 + e_{13} \\
F_3 &= 0.01F_2 + 0.30F_4 + e_{14}
\end{align*}
\]
Empirical Analyses

The Model Parameter Estimation

The output results of the structure equation model indicate:

Firstly, the information behavior of the university students has a great influence on their learning objective and effect, the influence coefficient for learning objective being 0.92, and 0.85 for learning effect. It can be concluded that the information behavior has a decisive influence on their study. The present university education should attach importance to the cultivation of the undergraduate’s information literacy, and equip them with the ability to learn and to process information effectively so as to adapt to the information era.

Secondly, information demand and information usage influence the study, the influence coefficient being 0.19 and 0.30 respectively. It suggests that increasing information demand will affect learning efficiency in UKEs, and information usage has a greater influence than information demand. The ability to use information efficiently will considerably improve learning efficiency, and help the university students deal with the surging information.

Thirdly, the university students’ use of literature resources, use of library and cyber source, as well as their adoption of the paper information have positive effect on information usage, the influence coefficient being 0.84, 0.79 and 0.60. It can be said that it is an important indicator for a university student's information use ability whether he can make use of literature resources reasonably and effectively. Therefore, the university students’ ability to deal with different resources should be a major concern for information literacy cultivation.

According to the output result of the model, its parameter estimate and significance level is as follows:

<table>
<thead>
<tr>
<th>Latent variables</th>
<th>Explicit variables</th>
<th>parameter estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>y1</td>
<td>0.493***</td>
</tr>
<tr>
<td></td>
<td>y2</td>
<td>0.633***</td>
</tr>
<tr>
<td></td>
<td>y3</td>
<td>0.538***</td>
</tr>
<tr>
<td></td>
<td>y4</td>
<td>0.429***</td>
</tr>
<tr>
<td></td>
<td>y5</td>
<td>0.409***</td>
</tr>
<tr>
<td>F2</td>
<td>x1</td>
<td>0.618***</td>
</tr>
<tr>
<td></td>
<td>x2</td>
<td>0.719***</td>
</tr>
<tr>
<td></td>
<td>x3</td>
<td>0.704***</td>
</tr>
<tr>
<td>F3</td>
<td>k1</td>
<td>0.844***</td>
</tr>
<tr>
<td></td>
<td>k2</td>
<td>0.785***</td>
</tr>
<tr>
<td></td>
<td>k3</td>
<td>0.603***</td>
</tr>
<tr>
<td>F4</td>
<td>z1</td>
<td>0.918***</td>
</tr>
<tr>
<td></td>
<td>z2</td>
<td>0.851***</td>
</tr>
</tbody>
</table>

Note: *** means the significant level is 0.001

It can be seen from table 1 that regression coefficients of the variables reach a significant level. Even in the significant level of 0.001, the factor loading ranges between 0.409 and 0.918, which indicates the strong explanatory power of the indicator for the latent variables.
Table 2. Parameter estimate between the latent variables.

<table>
<thead>
<tr>
<th>Parameter estimate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 &lt;--- F4</td>
<td>0.185**</td>
</tr>
<tr>
<td>F2 &lt;--- F1</td>
<td>0.474***</td>
</tr>
<tr>
<td>F2 &lt;--- F4</td>
<td>-0.009*</td>
</tr>
<tr>
<td>F3 &lt;--- F2</td>
<td>0.013*</td>
</tr>
<tr>
<td>F3 &lt;--- F4</td>
<td>0.298***</td>
</tr>
</tbody>
</table>

Note: *,**,*** means that the significant levels are 0.1, 0.01, 0.001 respectively.

It can be seen from Table 2 that except that the significant levels of the paths F4→F2 and F2→F3 are 0.1, and that the significant level of the path F4→F2 is 0.01, all other significant levels are 0.001, and the estimates vary from -0.009 to 0.474, which indicates a definite causal relationship between the latent variables.

The Model’s Fit Degree

Fit index is used to see whether the assumed Path Model match the collected data, and the data of 200 or more samples are generally evaluated according to the following principle:[3]

1. Chi-square free ratio CMIN/DF, indicates that the model matches well when it ranges from 1 to 3, while stricter fit criterion is between 1 and 2. (2) RMR, residual mean square and square root, when smaller than 0.05, shows that the model is generally acceptable. (3) RMSEA, asymptotic residual mean square and square root, should be as small as possible, when smaller than 0.05, suggests the model matches excellently. (4) GFI, AGFI are fit indicator and adjusted fit indicator respectively. The numbers are between 0 and 1, while a number closer to 1 means a fitter model. A general standard to judge is that GFI/AGFI be above 0.90. A model meeting the required conditions is regarded to be a “fit” model.

Table 3. The Model’s Fit Degree.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMIN</td>
<td>80.465</td>
</tr>
<tr>
<td>DF</td>
<td>60</td>
</tr>
<tr>
<td>CMIN/DF</td>
<td>1.341</td>
</tr>
<tr>
<td>RMR</td>
<td>0.040</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.30</td>
</tr>
<tr>
<td>GFI</td>
<td>0.969</td>
</tr>
<tr>
<td>AGFI</td>
<td>0.953</td>
</tr>
</tbody>
</table>

As can be seen from Table 3, the fit indicators of the model are in the optimal range, thus the model can be regarded as one fit highly.

Conclusion and Suggestion

This thesis makes a research on the effect of the university students’ information behavior on their study in UKEs. It can be concluded from the model’s result that in UKEs, information behavior has a significant influence on learning objective and performance. That is to say, the university education should be liberated from the sole pattern of teachers instilling knowledge into students, to put weight on the ability of the university students to obtain and deal with information automatically, and to cultivate their information literacy. Only in this way will the students exert themselves in study and in future work, and become the talents adapting to the rapidly developing age.

What’s more, the empirical results of the thesis suggest that the information
demand, compared with information use, have a relatively small influence on learning efficiency. Only if the ability to use information, especially the ability to identify the information sources and deal with information, is improved, will the students be able to make use of information efficiently in an environment with increasing information and higher demand for information.

References

