UNIVERSITI PUTRA MALAYSIA

CONCEPTUALISING CHANGE ON THE WWW:
CAPTURING THE CONSTRUCTIVIST APPROACH IN WEB-BASED LEARNING AMONG ENGINEERING LECTURERS

GUAN ENG CHAN

FPP 2003 9
CONCEPTUALISING CHANGE ON THE WWW:
CAPTURING THE CONSTRUCTIVIST APPROACH IN WEB-BASED
LEARNING AMONG ENGINEERING LECTURERS

By

GUAN ENG CHAN

Thesis Submitted in Fulfilment of the Requirement for the Degree of Doctor of Philosophy in the Graduate School Universiti Putra Malaysia

March 2003
DEDICATION

This thesis is dedicated to the memory of my father, Guan Seng Yew.

“This moment has come ... Patience makes all hardships light.”
CONCEPTUALISING CHANGE ON THE WWW: CAPTURING THE CONSTRUCTIVIST APPROACH IN WEB-BASED LEARNING AMONG ENGINEERING LECTURERS

By
GUAN ENG CHAN

MARCH 2003

Chairperson: Professor Madya Dr. Zakaria Kasa

Faculty: Educational Studies

The Information and Communication technology such as the WWW presents itself as a medium for channelling creative and collaborative learning. The extraordinary growth of the WWW necessitates engineering educators to look into their pedagogic approach to capture the ever-expanding knowledge and technological advancement in their area of expertise.

This study attempts to look into the various factors related to the adoption of the WWW and the way the constructivist approach is related to the adoption of the WWW. The target population for this study are engineering lecturers from Polytechnics in Malaysia. Stratified sampling is applied to ensure that representative samples from the respective engineering departments are obtained in this study, namely the Civil Engineering, the Mechanical Engineering and the Electrical Engineering Department. The sampling size
for this study was 500 engineering lecturers and the selection was based on the table of random numbers. The researcher visited all Polytechnics in Malaysia to conduct the questionnaire research except Sabah and Sarawak. The response rate for this study was 75.6%.

The findings indicated that the four major factors namely organisational, technological, human, and training factors were significantly related with the adoption of the WWW. The human factor had the highest correlation coefficient value with the adoption model ($r = 0.560, p < 0.05$) whereas the organisation factor had the lowest correlation value with the adoption model ($r = 0.469, p < 0.05$) among the variables investigated. The other factors that had shown significant relationship with the adoption of the WWW were the technological factor ($r = 0.541, p < 0.05$) and training factor ($r = 0.511, p < 0.05$). Further multiple linear regression analysis showed that these four factors contributed about 50% of the explained variance of the adoption of the WWW.

The adoption of the WWW was also significantly related to the constructivist approach ($r = 0.591, p < 0.05$), and a correlation analysis indicated that it explained 35% variance of the dependent variable i.e. the constructivist approach. This study has resulted in the formulation of a multi-dimensional model of all the variables under this study linking the various factors influencing the adoption of the WWW in relation with the constructivist approach.
Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Doktor Falsafah

MENGKONSEPSIKAN PERUBAHAN DALAM WWW: MENCAPAI PENDEKATAN KONSTRUKTIVIS DALAM PEMBELAJARAN BERDASARKAN WEB DIKALANGAN PENSYARAH-PENSYARAH KEJURUTERAAN

Oleh
GUAN ENG CHAN
MARCH 2003

Pengerusi: Profesor Madya Dr. Zakaria Kasa
Fakulti: Pengajian Pendidikan

Teknologi Maklumat dan Komunikasi seperti WWW merupakan suatu media untuk menyalurkan pembelajaran kreatif dan kolaboratif. Pertumbuhan pesat WWW memerlukan pensyarah kejuruteraan untuk melihat ke dalam pendekatan pedagogi mereka dalam pencapaian ilmu pengetahuan yang sentiasa berkembang dan kemajuan teknikal dalam bidang kepakaran mereka.

Kajian ini cuba melihat beberapa faktor yang berkaitan dengan adopsi WWW and cara pendekatan konstruktivis itu berkait dengan adopsi WWW. Populasi sasaran untuk kajian ini ialah pensyarah kejuruteraan di Politeknik Malaysia. Kaedah persampelan berlapis digunakan untuk memastikan bahawa setiap persampelan dapat mewakili setiap jabatan kejuruteraan dalam kajian ini seperti Jabatan Kejuruteraan Awam, Jabatan
Kejuruteraan Mekanikal dan Jabatan Kejuruteraan Elektrik. Saiz persampelan untuk kajian ini ialah 500 pensyarah kejuruteraan and pemilihan adalah berdasarkan kepada Jadual Nombor Rawak. Pengkaji membuat lawatan ke semua Politeknik di Malaysia untuk melaksanakan kajian soal-selidik ini kecuali di Sabah dan Sarawak. Kadar respon untuk kajian ini ialah 75.6%.

Dapatan menunjukkan bahawa empat faktor yang utama iaitu faktor organisasi, teknologi, kemanusiaan dan latihan mempunyai kaitan signifikan terhadap adopsi WWW. Faktor kemanusiaan mempunyai nilai korelasi yang paling tinggi dengan model adopsi (r = 0.560, p < 0.05) manakala faktor organisasi mempunyai nilai korelasi yang paling rendah dengan model adopsi (r = 0.469, p < 0.05) jika dibandingkan dengan faktor-faktor lain yang dikaji. Faktor-faktor lain yang menunjukkan korelasi signifikan dengan adopsi WWW ialah faktor teknologi (r = 0.541, p < 0.05) dan faktor latihan (r = 0.511, p < 0.05). Analisis regresi linear selanjutnya menunjukkan bahawa keempat-empat faktor ini menyumbangkan lebih kurang 50% daripada varian terhadap adopsi WWW.

Adopsi WWW juga berkait secara signifikan terhadap pendekatan konstruktivis (r = 0.591, p < 0.05), dan analisis korelasi menunjukkan bahawa ia menerangkan 35% varian pembolehubah bersandar iaitu pendekatan konstruktivis. Kajian ini juga menghasilkan suatu model pelbagai dimensi untuk semua pembolehubah di bawah kajian ini, yang mengaitkan semua faktor-faktor yang mempengaruhi adopsi WWW dan menghubunginya dengan pendekatan konstruktivis.
ACKNOWLEDGEMENTS

I wish to convey my sincere and deepest gratitude to my supervisory committee who have unrelentingly guided me, shared with me their expertise and vast knowledge which had resulted in the fruition of this thesis. My supervisory committee members are Associate Professor Dr. Zakaria Kasa,(Chairman), Associate Professor Dr. Ramlah Hamzah, and Associate Professor Dr. Bahaman Abu Samah who have been a source of inspiration to my completion of my thesis and programme of study. They are the pillars of my strength from whom I drew immense knowledge and wisdom from their insights and input towards completing this course of study.

My sincere appreciation to the Director of the Polytechnic Management Division in the Technical Education Department, Ministry of Education, Malaysia, for granting me the approval to conduct this study in all Polytechnics in Malaysia. My gratitude goes to the Director of the Planning and Research Division, Technical Education Department for his assistance and guidance. My sincere thanks also go to lecturers from all Polytechnics in Malaysia who have extended their cooperation in responding to the questionnaire.

I am also very thankful to my sponsor, the Ministry of Education, Malaysia, which has provided me the scholarship and the study leave in order to pursue this Ph.D. programme.
To my wife, Lucia Quek Sai Gearn who has always believed and firmly supported my pursuit in academic excellence, and to my children who have been extremely patient with my "lost-time" with them, I am truly grateful to all of you.

To all my friends and associates who always have good words and encouragement for me throughout this programme of study, I am truly blessed with your kindness and assistance in one way or another.

Thank you very much

Guan Eng Chan
Faculty of Educational Studies
Universiti Putra Malaysia
I certify that an Examination Committee met on 21st March, 2003 to conduct the final examination of Guan Eng Chan on his Doctor of Philosophy thesis entitled “Conceptualising Change on the WWW Capturing the Constructivist Approach in Web-Based Learning Among Engineering Lecturers” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and with Universiti Pertanian Malaysia (Higher Degree) Regulation 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

Rohani Ahmad Tarmizi, Ph.D.
Faculty of Educational Studies
Universiti Putra Malaysia
(Chairperson)

Zakaria Kasa, Ph.D.
Associate Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Member)

Ramlah Hamzah, Ph.D.
Associate Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Member)

Bahaman Abu Samah, Ph.D.
Associate Professor
Faculty of Educational Studies
Universiti Putra Malaysia
(Member)

Muhammad Rashid Rajuddin, Ph.D.
Associate Professor
Faculty of Educational Studies
Universiti Teknologi Malaysia
(Independent Examiner)

SHAMSHER MOHAMAD RAMADILI, Ph.D.
Professor/Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date 06 MAY 2003
This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee are as follows:

**Zakaria Kasa, Ph.D.**  
Associate Professor  
Faculty of Educational Studies  
Universiti Putra Malaysia  
(Chairman)

**Ramlah Hamzah, Ph.D.**  
Associate Professor  
Faculty of Educational Studies  
Universiti Putra Malaysia  
(Member)

**Bahaman Abu Samah, Ph.D.**  
Associate Professor  
Faculty of Educational Studies  
Universiti Putra Malaysia  
(Member)

---

**AINI IDERIS, Ph.D.**  
Professor/Dean  
School of Graduate Studies  
Universiti Putra Malaysia

Date: 14 May 2003
DECLARATION

I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

Guan Eng Chan

Date: 21 MARCH 2003
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEDICATION</td>
<td></td>
<td>ii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td></td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRAK</td>
<td></td>
<td>v</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td></td>
<td>vii</td>
</tr>
<tr>
<td>APPROVAL</td>
<td></td>
<td>ix</td>
</tr>
<tr>
<td>DECLARATION</td>
<td></td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td></td>
<td>xvii</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td></td>
<td>xix</td>
</tr>
<tr>
<td>I</td>
<td>INTRODUCTION ........................................................................... 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Background of the Study .................................................. 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ICT Needs ........................................................................... 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Malaysia Educational Mission ....................................... 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Educational Philosophy ............................................... 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Educational Paradigm through Constructivism ..................... 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Present WWW Scenario ................................................ 19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statement of the Problem .................................................. 33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Objectives of the Study ................................................... 35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hypotheses .......................................................................... 37</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Significance of the Study ................................................. 38</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Limitation of the Study ................................................... 41</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Definition of terms ........................................................ 42</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>LITERATURE REVIEW ................................................................ 49</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Web Challenge ........................................................... 50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Web-based Learners ........................................................... 56</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Definition of Technology Transfer ....................................... 59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicles in Technology Transfer ......................................... 60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strategies in Technology Transfer ....................................... 65</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Barriers to Technology Transfer ......................................... 70</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information Channel Barrier ............................................... 71</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Financial Status .................................................................... 71</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skill and Knowledge .......................................................... 72</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Technology Manufacturers and Providers ........................... 72</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roles of Government and Other Organisations .......................... 73</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diffusion of Innovation in Technology Education ...................... 77</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Constructivist Theory on ICT ........................................ 81</td>
<td></td>
</tr>
</tbody>
</table>
Computer Literacy................................................................. 90
Trends in the WWW Used by Educators............................... 92
Support for Teacher Change .............................................. 94
Usage of the WWW in Education........................................ 98
Using the WWW in Technology Education......................... 100
Integrated Skills through Constructivism............................ 104
Research on the Development of the WWW in Education ...... 108
The Future of the WWW in Teaching and Learning ................. 112
Theory of Attitudinal Change and Motivation to Adopt New Technology .......................................................... 113
The Change Agent.............................................................. 114
Innovation in Organisations .............................................. 115
Attitudes toward Educational Technology ........................... 116
Concept of Change............................................................. 117
Factors That May Influence the WWW Utilisation ................. 120
  Organisational Factor .................................................... 120
  Technological Factor ..................................................... 124
  Human Factor .............................................................. 127
  Training Factor ............................................................ 132
Technology Transfer in Education ..................................... 136
  Constructivism Role in Education ................................. 140
  Constructivist Approach by Teachers ............................ 141
Theoretical Framework..................................................... 146
  Theory of Constructivism .............................................. 147
  The Conceptual Model of Diffusion of Innovation ............ 149
  Rogers Model of Diffusion of Innovation .................... 150
  Characteristics of Adopter Categories ......................... 157

III METHODS AND PROCEDURES............................................ 158
Introduction........................................................................ 158
Research Design.................................................................. 159
Population and Sample ..................................................... 159
  Sampling Frame........................................................... 160
  Selection of Subjects .................................................. 160
  Sample Size .................................................................. 161
Research Framework......................................................... 165
Operational Variables ................................................. 166
Instrumentation ......................................................... 169
  Construction of Questionnaire .................................... 170
  Translation Procedure .............................................. 173
Reliability and Validity .................................................. 174
  Reliability ............................................................. 174
  Content Validity ....................................................... 176
  Pilot test ............................................................... 177
Data Collection .......................................................... 179
  Non-respondent ......................................................... 183
Data Analysis ........................................................... 183

IV FINDINGS ................................................................. 190
  Introduction ................................................................. 190
General Background of Respondents .................................... 191
  Gender and Age .......................................................... 191
  Qualification and Experience ........................................ 192
General Usage of the WWW ............................................. 194
Level of Usage of the WWW ............................................ 196
Types of Usage of the WWW ............................................ 198
Users versus Non-users of the WWW.................................. 200
  On Selected Personnel Variables .................................. 200
Efforts taken by Engineering Lecturers ............................... 202
Adoption and Utilisation of the Internet and its
  Resources into the Curriculum ....................................... 206
The Variables Relating to the Adoption of the WWW ............. 207
The Model of Adoption of the WWW .................................. 217
  Linear Regression Analysis .......................................... 219
  Relationships of the Variables ...................................... 220
The Multi-dimensional Model .......................................... 220

V SUMMARY, DISCUSSION, CONCLUSION
AND RECOMMENDATIONS .................................................. 233
  Introduction ................................................................. 233
Summary ................................................................. 233
  Summary of the Findings ................................................ 238
  General Pattern of the WWW Usage .................................. 240
Efforts taken by Engineering Lecturers ............................... 241
Adoption and Utilisation of the Internet and its Resources into the Curriculum .......................... 241
The Organisational, Technological, Human and Training Factors Relating to the Adoption of the WWW .......................................................... 242
The Multi-dimensional Model .................................................................................. 243
Discussion ............................................................................................................. 244
  The Pattern of WWW Usage ............................................................................ 246
  Engineering Lecturer's Efforts ........................................................................ 248
  Adoption and Utilisation of the Internet and its Resources into the Curriculum .......................................................... 250
  The Organisational, Technological, Human and Training Factors Relating to the Adoption of the WWW .......................................................... 253
The Model of Adoption of the WWW Relating to the Constructivist Approach .................. 261
Hypotheses Testing ................................................................................................. 262
The Multi-dimensional Model .................................................................................. 264
  Developing Computer Laboratories in Participating Institutions ....................... 268
  Supplementing Infrastructure Development for Web-based Learning through Constructivism ...................................................................................... 270
  Developing the Multidimensional Path Model on the Constructivist Approach .......................................................... 271
Conclusion ............................................................................................................. 274
Implications ........................................................................................................... 279
Recommendations ................................................................................................. 284
  Recommendations for Practice ........................................................................ 284
  Recommendations for Further Research .......................................................... 286
REFERENCES ........................................................................................................ 289
### APPENDIX

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Letters Of Approval</td>
<td>312</td>
</tr>
<tr>
<td>A1</td>
<td>Letter Of Approval From Ministry Of Education, Malaysia</td>
<td>313</td>
</tr>
<tr>
<td>A2</td>
<td>Letter Of Approval From Polytechnic Management Division, Technical Education Department, Ministry Of Education, Malaysia</td>
<td>315</td>
</tr>
<tr>
<td>A3</td>
<td>Polytechnics in Malaysia</td>
<td>316</td>
</tr>
<tr>
<td>B</td>
<td>Instruments</td>
<td>318</td>
</tr>
<tr>
<td>B1</td>
<td>Questionnaire</td>
<td>319</td>
</tr>
<tr>
<td>B2</td>
<td>Soal Selidik</td>
<td>328</td>
</tr>
<tr>
<td>C</td>
<td>Credentials</td>
<td>337</td>
</tr>
<tr>
<td>C1</td>
<td>Credentials for Panel of Experts</td>
<td>338</td>
</tr>
<tr>
<td>C2</td>
<td>Credentials for Language Experts</td>
<td>341</td>
</tr>
<tr>
<td>VITA</td>
<td></td>
<td>342</td>
</tr>
</tbody>
</table>
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Attributes of Instruction and Construction</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Learning Environment</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Outline on Radical Constructivist Approach</td>
<td>89</td>
</tr>
<tr>
<td>3</td>
<td>The Objectivist Approach versus the Constructivist Approach</td>
<td>144</td>
</tr>
<tr>
<td>4</td>
<td>Evaluative Dimensions and Firm Attributes for the WWW Survey</td>
<td>172</td>
</tr>
<tr>
<td>5</td>
<td>Reliability Test of Internal Consistency (Cronbach Alpha)</td>
<td>175</td>
</tr>
<tr>
<td>6</td>
<td>Guildford’s Rule of Thumb Guide on Relationship</td>
<td>186</td>
</tr>
<tr>
<td>7</td>
<td>Correlation Matrix between Relating Variables to WWW adoption and Constructivist approach to Web-based Learning</td>
<td>187</td>
</tr>
<tr>
<td>8</td>
<td>Distribution of the Respondents on Selected Personnel Variables</td>
<td>193</td>
</tr>
<tr>
<td>9</td>
<td>Working Experiences of the Engineering Lecturers in Polytechnics</td>
<td>194</td>
</tr>
<tr>
<td>10</td>
<td>Frequency of Access to the WWW</td>
<td>195</td>
</tr>
<tr>
<td>11</td>
<td>Level of Usage of the WWW by Engineering Lecturers</td>
<td>197</td>
</tr>
<tr>
<td>12</td>
<td>Categories of the WWW Users</td>
<td>198</td>
</tr>
<tr>
<td>13</td>
<td>Types of Usage of the WWW by Engineering Lecturers in Polytechnics</td>
<td>199</td>
</tr>
<tr>
<td>14</td>
<td>Users versus Non-users of the WWW on Selected Personnel Variables</td>
<td>201</td>
</tr>
</tbody>
</table>
15 Efforts taken by Engineering Lecturers to Upgrade Themselves ........................................... 204
16 The Distribution of Organisational, Technological, Human and Training Factors Relating to the Adoption of the WWW .............................................. 209
17 Adopters Categories .................................................................................................................. 213
18 Relationship between Various Factors and the Adoption of the WWW ........................................ 216
19 Regression Analysis of the Adoption Model (Diffusion of Innovation) \( y \) on Various Interacting Factors \( (x_1, x_2, x_3, x_4) \) ........................................................................................................... 218
20 Relationship between the Adoption of the WWW and the Constructivist Approach .................. 221
21 Regression of \( y \) (Model of Adoption) on Four Variables ............................................................... 226
22 Path Coefficient on Regression Analysis ..................................................................................... 227
23 Pearson Product Moment Correlations among the Variables .................................................... 228
24 Summary of Hypotheses Testing ............................................................................................... 263
25 Existing Numbers of Computers and Projected Numbers of Computers Planned .................... 269
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Factors in Technology Transfer</td>
<td>62</td>
</tr>
<tr>
<td>2</td>
<td>Successful Components of Technology Transfer</td>
<td>69</td>
</tr>
<tr>
<td>3</td>
<td>Barriers in Technology Transfer</td>
<td>74</td>
</tr>
<tr>
<td>4</td>
<td>The Components of Self Regulated Ability</td>
<td>105</td>
</tr>
<tr>
<td>5</td>
<td>Fishbein and Azjen Model</td>
<td>116</td>
</tr>
<tr>
<td>6</td>
<td>Force Analysis in Attitudinal Change</td>
<td>117</td>
</tr>
<tr>
<td>7</td>
<td>Understanding Strategic Change: Three Essential Items</td>
<td>118</td>
</tr>
<tr>
<td>8</td>
<td>The Three-stages of Change Model</td>
<td>129</td>
</tr>
<tr>
<td>9</td>
<td>Variables Determining The Rate Of Adoption Of Innovation</td>
<td>165</td>
</tr>
<tr>
<td>10</td>
<td>Multidimensional Model of Adoption of Web-based Learning by Engineering Lecturers</td>
<td>188</td>
</tr>
<tr>
<td>11</td>
<td>Adopters Categories versus Frequency</td>
<td>214</td>
</tr>
<tr>
<td>12</td>
<td>Adopters Categories versus Cumulative Frequency</td>
<td>214</td>
</tr>
<tr>
<td>13</td>
<td>Path Diagram Denoting the Correlated Influences (X₁, X₂, X₃, and X₄) and Uncorrelated Residual U with Dependent variable y₁ as well as y₁ with y₂</td>
<td>225</td>
</tr>
<tr>
<td>14</td>
<td>Correlated influences of X₁, X₂, X₃, and Uncorrelated Residual U</td>
<td>230</td>
</tr>
<tr>
<td>15</td>
<td>Simple Path Diagram between Model of Adoption of the WWW and the Constructivist Approach</td>
<td>231</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

Background of the Study

The emergence of Information and Communication Technology (ICT) especially the Internet and World Wide Web-based learning has fundamentally changed the ways education are organised and managed. As a matter of fact, the undeniable constant in education in modern society is change. Today, the educational system is geared towards fulfilling the societal needs in information technology and production. In its drive to equip the schools with computer technology, the Ministry of Education of Malaysia is embarking on a smart school programme for 90 schools nationwide (Zoraini, 1998). These are the learning institutions that are equipped with modern tools and computers which will prepare the school children for the information age. The era of information explosion and revolution has necessitated the transformation of educational settings in schools into creating skills and knowledge necessary for the masses to use tools and computers for production and information access.

We need to capitalise the change evolving around us especially in the area of ICT. The modern world is so overwhelmed with information that effective education today mandates change. Fundamental changes in society restructure our lives and create new demands and expectations on the role of schools. Alluding to the fact that ICT is
available here, Malaysians are generally falling behind due to their inexperience because we are not thinking hard enough on the needs, demands and conditions needed to incorporate technology into our educational system (Chooi, 1999). All these demands and others compel the school to innovate and reform its programmes. Adopting the latest technology is seen as a prerequisite for the advancement and improvement of the society at large (Tengku Shahrom, 1996). Technology has gained its importance in extending human potential and cannot be left alone to develop by chance. On the contrary, schools are expected to play a major role in helping people to understand technology and cultivate the skills and knowledge needed. Before that mission can be accomplished, teachers are expected to be early technology adopters, to equip themselves with the information technology needed to be at par with the technological development.

The Information and Communication technology (ICT) especially with the introduction of internet has revolutionised the way lessons are being conducted by teachers. The World Wide Web usage in computer presents some phenomena that students can interact and learn through interactive method by investigation and query with the programme. The internet allows learners to experience a different mode of learning which is individualised and self-accessed, that demands learner’s willingness to change (Jamalleah, 1996). Tengku Shahrom (1996) advocated that the use of technology can dramatically raise knowledge levels of students, help them to learn problem-solving techniques, develop skills required to manage massive amount of information and analyse concepts from different perspectives. In short, teachers who adopted this innovative teaching-learning approaches using ICT, enable their students acquired life-long learning
skills and productive employment. Already the education system is putting interactive ICT at the core of teaching-learning and management process. Smart schools are being set up where learning will be dynamic, lively and brimming with interaction through the use of multimedia technology and worldwide networking (Ministry of Education, 2000b). A high-tech infrastructure for information technology at the various universities is already providing access to strategic information, international databases and knowledge resources. Most of the universities around the country have a digital optic fibre backbone, and several of them have already incorporated distance learning programmes for professional and technical degrees. As Datuk Sri Mohd Najib, former Minister of Education aptly described;

_Smart schools are being planned.... not only to meet the requirements of Multimedia Super Corridor (MSC), but also to create a new generation of Malaysians who are more creative and innovative in their thinking, adept with new technology, and able to access and manage completely the information technology_ (Zoraini, 1998).

Coupled with the needs of the society at large for trained, skilled and knowledge workers in industrial sectors, smart schools in Malaysia are moving as preparatory sites for future knowledge workers (Zoraini, 1998). In the 80’s, the needs of the society continued to change and exerted pressure on the schools to adopt changes within the realm of the society. Secondary schools in Malaysia must therefore understand change and school administrators must be prepared to adopt these changes in accordance with the societal demand. It is important to look carefully at how teachers learn to use technology, for they are quite clearly the change agent to transforming the teaching and learning in the
classroom. The changes have shifted the traditional industrial arts programme into technology education.

In accordance with Ameritech's views, a market-sensitive education system is evolving here in Malaysia. Our schools and universities are taking up the challenge of globalisation by changing not only the content of curriculum and programmes but more importantly the delivery systems. ICT-enhanced teaching and learning are already making computers in schools, distance learning, video conferencing and internet link common place especially in tertiary education. We have to race ahead to achieve a significant transformation of our educational infrastructure in order to meet the next millennium as a technologically competent and scientifically adept society. We must break through the barrier between what is happening outside the classroom and inside the classroom. Schools need to give learners access to the internet technology that is driving the world and we need to plan for such change (Tengku Shahrom, 1996).

Our education structures need the necessary technological edge to enable the building of a pool of well-educated, highly skilled and strongly motivated professionals. The nation's human capital is its most important economic and development resource. Thus, a sense of
urgency is needed to establish Malaysia as a fully industrialised country in the 21st century.

According to Najib (1998), the government is facilitating change and seeking innovative approaches to expand the education base. Strategies for growth and development of education in the Seventh Malaysia Plan which include a Malaysia Inc. approach in education is making it possible for the private sector to meet the needs for tertiary education by offering degree, diploma and certificate level courses.

Technological literacy is the primary claim of adherents of technology education. All Polytechnic graduates ought to be technologically literate, meaning that they can understand the nature of technology, appropriately use technological devices and processes, and participate in society’s decisions on technology issues. To ensure the inculcation of technological literacy, a need was identified for educational programmes ‘where learners become engaged in critical thinking’.

ICT Needs

The need to provide students with an evolved understanding and ability to think critically about both the old and new technological issues should be the driving force behind the introduction of new methodology and instruction. The ICT through the computer, then provides a valuable channel for teachers to present this form of learning (Berson, 1996). Through the use of ICT programmes, students engage in a greater amount of