

# PROCEEDINGS



## International Conference on Information Technology in Asia 2009

**Towards Human Centred Computing**

**6th – 9th July 2009**

**Hilton Hotel, Kuching, Sarawak, Malaysia**

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**THE SIXTH  
INTERNATIONAL CONFERENCE ON  
INFORMATION TECHNOLOGY  
IN ASIA  
2009**

***PROCEEDINGS OF CITA'09***

*Edited by*

**Alvin W. Yeo  
Jane Labadin  
Narayanan Kulathuramaiyer  
Wang Yin Chai  
Tan Chong Eng**

*Organised by*

**Faculty of Computer Science & Information Technology, Universiti Malaysia Sarawak**

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## *Editorial Preface*

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This is the Proceedings of the 6th International Conference on Information Technology in Asia (CITA'09), held between 6th – 9th July 2009 in Kuching, Malaysia. CITA'09 is organised by Universiti Malaysia Sarawak in collaboration with the ICT Unit, Chief Minister's Department of Sarawak, and Global Information and Telecommunication Institute, Waseda University, Japan.

It has been a decade since the first CITA was held, and the conference continues to play an important role in providing a platform to, in particular, state-of-the-art research in and applications of Information and Communication Technologies (ICTs) in Asia while promoting the exchange of ideas and research results with researchers all over the world. The theme of CITA'09 on Human-Centred Computing underlies our continued efforts to highlight contemporary trends and emerging technologies. This focus also reflects the need to deepen our understanding on how technologies can then be better developed to accommodate and enhance the users' skills and capabilities, with the end goal of improving performance and livelihood of societies.

Despite the economic downturn and the (A)H1N1 influenza pandemic, we have received a good response of 138 submissions from 16 countries. An International Technical Committee reviewed these submissions, and from these, 22 full papers and 29 short papers have been included in this proceeding. These papers are presented in seven major tracks which includes: Knowledge Networks and Management, Software Engineering, Computational Science and Theoretical Computer Science, Networks Related, Human Computer Interaction, Community Informatics, Government/Industry Related and Image Processing. This diverse yet complementary range of topics cover the omnipresent nature of ICTs applied in all aspects of our lives, and represents current work conducted in Asia.

Through the dissemination of research findings via this conference, it is hoped that researchers and practitioners continue to deliberate, share their knowledge and experiences, forge new or strengthen alliances that would better prepare us in staying ahead in today's challenging and dynamic environment.

We would like to acknowledge and express our gratitude to the many people who have contributed greatly to the conference. I would like to thank the members of the International Programme Committee for reviewing the papers, and the members of the organising committee for their tireless effort in making this conference a success. We extend our sincere appreciation to all sponsors for their generous contribution.

We wish you all an enjoyable conference with fruitful deliberations and bid a warm "Selamat Datang" to our visitors to the Land of the Hornbills.

Associate Professor Dr. Alvin W. Yeo

Conference Chair

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# **KEYNOTE SPEAKERS**

## **Keynote 1**

### ***Managing Knowledge That Everybody Knows Already***

**Prof Henry Lieberman**

Media Laboratory, Massachusetts Institute of Technology  
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Traditional knowledge management is focused on representing knowledge that is special in some way: unique to a person or group; technical or specialized knowledge; specific situation-dependent data about people, things or events. What everybody forgets is that that specialized knowledge builds on a base of Commonsense knowledge -- simple, shared knowledge about everyday life activities. A database might represent an airline flight with airline name, flight number, origin and destination time and place, etc. But no database represents the fact that if you traveling less than a kilometer, you can walk; if you are traveling thousands of kilometers, you probably need to fly.

Why bother to represent this obvious knowledge explicitly, since everybody knows these things already? Because computers don't. If we would like to have computers be helpful to people, avoid stupid mistakes, and make reasonable default guesses about what people might want, they have to have Commonsense knowledge. I will present Open Mind Common Sense, a project to collect human Commonsense knowledge; ConceptNet, its semantic representation; and AnalogySpace, a new reasoning technique that draws plausible inferences, despite the fact that our knowledge base is incomplete, imprecise, and inconsistent.

## **Keynote 2**

### ***Unforeseen Effects of the WWW***

**Prof Hermann Maurer**

Institute for Information Systems and Computer Media (IICM)  
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The Web has caused a revolution of how we can access information today, how we easily get answers to many problems, and how we learn. However, there are three issues that are often overlooked. First, it is not easy to extrapolate current developments into the future: we will be in for many more surprises than we think. Second, as fast as the Web has developed, other technologies have developed still faster and their impact on society may be just as significant. Third, one must not overlook that the Web also has some inherent dangers that are more and more emerging. With all enthusiasm we have for the Web we should also be aware of some of the subtle and some of the not so subtle dangers.

In this paper I will address the first two issues in the introduction, and devote the rest of the paper to some of the perceived dangers of the Web. One example is the loss of privacy (due to many organisations collecting detailed profiles on all of us, but also on organisations, economic developments and other issues), some of the loss of privacy also due to an unheard of exhibitionism in social networks. Also, information on the Web is often trusted much too easily, leading to a distorted view of reality. Many of the communication tools lead to a loss of concentration and understanding, the latter enhanced by the dangerous copy-paste syndrome. As Tara Brabazon has stated: "Researching is replaced by searching". Also, it is often overlooked that the convergence of mobile phones with powerful PCs will give us excellent personal assistants, but will also obviate the need to

learn many things humans have had to learn for generations. Thus it seems that we have to completely re-think education and e-Learning: While myriads of attempts are made HOW to improve teaching with technology, the main issues may rather be WHAT and WHEN we teach, since so much (will be or) is available everywhere at our fingertips. Finally, can we really trust technology, or could it fail us at some stage on a gigantic scale?

## ***INVITED SPEAKERS***

### ***Speaker 1***

#### ***Workflows and Automation in Next Generation Localisation***

##### **Reinhard Schäler**

Founder and Director of the Localisation Research Centre  
University of Limerick, Ireland  
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Access to information is a fundamental requirement for the realisation of the digital information society. Translation and cultural adaptation as well as the availability of services required to coordinate these activities are necessary pre-requisites to guarantee equal access to information to people independent of their linguistic or cultural background. Today, localisation faces a number of key challenges, the most important ones being those triggered off by the increased volume of digital content coming on stream. Current approaches to localisation cannot adequately respond to these challenges and are no longer viable.

The Centre for Next Generation Localisation (CNGL) is a partnership of four Irish universities and nine industrial partners co-funded by the Irish Government's Science Foundation aiming to develop the next generation localisation factory, incorporating sophisticated integrated language technologies, digital content management technologies, and automated workflows based on shared and interoperable standards and data layers.

While current localisation automation platforms have been successfully deployed by large multinational corporations, they present a number of disadvantages limiting their ability to efficiently deal with the exponential growth in localisation in a flexible manner. They are generally proprietary and limited in their scope; they have limited and slow configuration capabilities; they implement closed standards and lack interoperability; they are operating in a silo, often implemented as an afterthought.

We will report on the work of the "Next Generation Localisation" research group of the CNGL that is designing new and innovative automated localisation workflows based on distributed and component-based services with access to "localisation knowledge" as a backbone and connected via open standard-based service descriptors. It is anticipated that this novel and agile approach will work especially well for small- and medium-sized enterprises and in less-controlled crowd-sourced and collaborative scenarios.

**Speaker 2**

***Bridging the Knowledge Divide***

**Lori Thicke**

Co-founder of Translators Without Borders  
Co-founder and General Manager of Lexcelera, France  
LORI@lexcelera.com

Four-fifths of the people on this planet, those who live in the poorest countries, have little or no access to the basic medical, nutritional, educational, scientific and technical knowledge they need to live healthy and productive lives. New technologies can and must provide the solution for making access to knowledge more democratic.

Greater access to knowledge is needed to:

- Reduce poverty.

***“Access to information and knowledge is the most critical factor in breaking the cycle of poverty in Southeast Asia”***

**Asian Development Bank**

- Save lives.

***“The knowledge exists to save 80% of the children who die each year in Africa. It just isn’t available when and where it is needed.”***

**James Grant, former Executive Director of UNICEF**

- Fight hunger.

***“When women farmers have access to knowledge and technology, crop yields increase significantly.”***

**The International Fund for Agricultural Development (IFAD)**

- Empower people and allow them to make informed decisions.

***“The information gap is very real and clearly whatever we can do to close it must be encouraged. Any initiative that can leapfrog over traditional means of getting information to people must be encouraged. Information is power and it supports democracy and it supports decision-making.”***

**Trevor Manuel, former Finance Minister, South Africa.**

If information is power, the fact that the vast majority of all websites are in English shows where the power is being consolidated. By and large, the many, ancient, rich, and sophisticated cultures of the world remain almost invisible on the Web today.

***“Most quantifiable useable knowledge today is domiciled in the English language... the capability of Africans to access useable knowledge worldwide is terribly curtailed.***

**Kole Omotoso. New African, Jul 2004**

Unequal access to knowledge is widening the gap between the richer and poorer countries of the world. The huge disparities we see in standards of living from one country to another are relatively new, caused by the concentration of the fruits of the Industrial Revolution in just a few parts of the world. Much of Africa and Asia are now missing out on the Information Revolution, just as the Industrial Revolution passed them by 250 years ago. Today, the application of new ICTs give us the possibility of sharing the fruits of the information revolution.

Translators without Borders has been working to bridge the knowledge gap since 1993 by providing free translations to humanitarian organizations. Recently TWB joined forces with a consortium of Irish universities and research institutions to develop a worldwide crowd-sourced translation platform linking humanitarian organizations such as Doctors without Borders with volunteer translators, supported by leveraging technologies such as TM (translation memory) and MT (machine translation). This platform will level the playing field for translators working in developing-world

languages by making translation technologies freely available, which in turn will make large-scale access to knowledge in local languages feasible.

TWB is engaged in providing linguistic access, but the new ICTs have a major role to play in increasing physical access to knowledge via projects such as developing wi-fi infrastructure in emerging economies, building cheaper laptops and even enabling cellphones to function as e-book readers.

We are currently seeing a perfect storm of a wealth of open source digital content, translation leveraging tools and emerging technologies for distribution and delivery, all of which could come together to put knowledge in the hands of the people who need it, wherever in the world they are.

### *Speaker 3*

#### *Developments of e-Government in Sarawak*

**William Patrick Nyigor**

State ICT Unit

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The vision of Sarawak's e-Government (EG) initiative, "Sarawak government service, anytime, anywhere", was formulated by the State Secretary in 1995, and it has guided the State's ICT program since then. Issues, both internal and external, shape the focus, approach and development of the state EG initiative. The definition, framing and scope of EG in Sarawak are continually evolving while the vision remains.

The State's EG initiative underwent two major phases of development since the 1990s. The first phase is the e-Administration program where the focus is the improvement of the government's internal business processes, both the intra-agency processes (internal efficiency and effectiveness – IEE) and the inter-agency processes (G2G). This forms the foundation for the second phase, the delivery of online service (G2C) through the web.

The online service delivery program consists of many sub-phases. Similar to other initiatives elsewhere, online "services" start with information publishing that moved on to transactional services. Receptivity and usage of online services are affected by many factors outside of the state's ICT initiatives. These include socio-economic development, digital penetration rate, literacy rate, social norms, business, physical, technological and other support infrastructures, as well as public ICT literacy rate.

The EG initiative also has to recognize and mitigate the (negative) socio-economic impact of providing online services through the web in a vast, geographically-challenging and diverse state like Sarawak. The state has had to look at parallel channels, hybrid channels, and other online delivery channels in its EG initiative.

Recognizing the pervasive usage of mobile telephony, the state is now finalizing a plan for mobile government to augment the web channel in the third phase of the state EG initiative. The mobile government program is a way to mitigate the impact of the digital divide on online government services, given the very high adoption rate of mobile telephones compared to the Internet. The state mobile government has two parts; mobile computing for the internal government processes (m-G2G), and mobile services for the public (m-G2C).

Even though the EG initiative is described as consisting of different phases, these phases do not have a defined ending. There are still a lot of plans and work yet to implement in the different phases even while the state is embarking on mobile government. Individual business processes are analysed separately, and some may undergo the full metamorphosis from manual to mobile forms, while others may not.

***Speaker 4***

***Education Roadmap for New Mobile Technology Training***

**Prof Jung Kwang-Wook**

President of Man & Tel and Professor at KUMI College, Korea.

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New technologies are being developed constantly and daily lives is changing in pursuit of convenience being offered by these advancements. The break-neck speed of mobile technology, predicted to take on the main role in ubiquitous system in near future, is so remarkable that it is creating a technological revolution. Opinions are that this is probably due to the intensified and vigorous research and advancement in creating better mobile convenience that is the craving of the mainstream public in this fast-paced and borderless world.

Buzz words from the hottest technologies often heard today are, for example, Ubiquitous, RFID, USN, UWB, and Bluetooth. Ubiquitous technologies include Home network system and Sensor network system, RFID technology, includes middleware and applications such as Shopping system and Logistic system. In mobile technology field, Bluetooth, Zigbee, as well as UWB are very useful. In addition, the PAN technology group and Antenna propagation, and RF (Microwave) device, design & manufacturing technologies are also very important.

Recently, products developed by converging and adopting multiple technologies, have been gaining more attention by the industry. For example, the convergence of IT and Construction sector, Medical & Health, Automobile, and Shipbuilding industry. These convergent technologies will be summarised in the proposed Roadmap and training plan.

Education in universities should keep pace with developments of technologies in industries and with the constant stream of advanced commercial products being introduced into the market. I shall present in this paper on how we can establish a proper Education Roadmap for new mobile technology.

Additionally, basic theory, experiments and examples of commercial products will be discussed in the process of designing an effective education Roadmap.

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# Table of Contents

## ◀ FULL PAPER ▶

Community Informatics	Human Computer Interaction
<p>Re-Examining Electronic Commerce Adoption Among Bruneian SMEs <i>Afzaal H. Seyal</i> 1</p> <p>The State of E-Community Adoption Among the Malaysian e-Rural Communities <i>Mardziah Hashim, Nor Laila Md Noor, Ahmad Sallehin Khalid</i> 12</p>	<p>Beyond Usability: Exploring the Emotional and Aesthetic Factors of Desktop Virtual Reality-Based Learning Environments <i>Kee Man Chuah, Chwen Jen Chen, Chee Siong Teh</i> 59</p> <p>An Empirical Investigation of Object-Oriented Query Writing for Three User Groups Using Casual Map <i>Lanie, Y.W. Chan, S. Ahmad Zaidi Adruce, N.K. Lee</i> 65</p> <p>Practical Low-Cost Augmented Reality Research into Group Car Driving Behaviour <i>Robert Barbour</i> 73</p>
Computational & Theoretical Science	Image Processing
<p>Constructing A Bayesian Learner Model for INQPRO <i>Choo-Yee Ting, Somnuk Phon-Amnuaisuk</i> 18</p> <p>A Comparative Analysis of Artificial Neural Networks and Logistic Regression in Predicting E-Filing Users <i>Zuriati Ismail @ Khor, Sharifah Sakinah Aidid</i> 26</p> <p>Application of G-Convexity in Mobile Ad Hoc Networks <i>Prakash Veeraraghavan</i> 33</p> <p>Rough Topological Properties of Sets in Information Systems Using Dependency of Attributes <i>Tutut Herawan, Mustafa Mat Deris</i> 39</p> <p>Performance of QSAM Iterative Algorithm for Solving 2D Poisson Equations <i>J Sulaiman, M Othman, M.K. Hasan</i> 47</p> <p>Solving the Examination Timetabling Problem with Controlled Avalanche of Changes <i>Raymond Chiong, Sandeep Dhakal, Bee Theng Lau</i> 53</p>	<p>Low Resolution Contact-Less Palm Print and Knuckle Print Recognition System <i>Michael Goh Kah Ong, Tee Connie, Andrew Teoh Beng Jing, Wong Eng Kiong</i> 80</p> <p>An Automatic Segmentation of Liver Volume That Contained Disconnected Regions Using 2.5D Level Set Approach <i>Puteri Suhaiza Sulaiman, Rahmita Wirza Rahmat, Ramlan Mahmud, Abdul Hamid Abdul Rashid</i> 88</p> <p>Virtual Musical Instruments: Air Drum <i>Somnuk Phon-Amnuaisuk, Kiarash Rezahanjani, Hamid Reza Momeni, Kok-Chin Khor</i> 95</p>
	Networks Related
	<p>Duo-Key Dependent Advanced Encryption Standard (DKD-AES) <i>Bok-Min Goi, Yingying Feng</i> 100</p>

\* *nominated for BEST PAPER Awards*

Anomaly Detection Model for Network Intrusion Detection Using Conditional Probabilities  
*Dewan Md. Farid, Mohammad Zahidur Rahman* 104

QOS Based Protection Scheme in MPLS Networks  
*Sabri M. Hanshi, Wajdi Al-Khateeb* 111

Implementing Path Finding Using Ant Algorithm Approaches By Adopting Modified TSP in Unstructured P2P Network  
*Roime Puniran, Muhammad Shafie Abd Latiff* 116

---

### Software Engineering & Knowledge Management

---

Improving Competency Evaluation of Web-Ontologies Supported By Natural Language Interface To An Ontology Editor\*  
*Muthukkaruppan Annamalai, Zulhizam Sanip* 126

Automation of Program Classification in Source Code Repository  
*Yuhanis Yusof, Massudi Mahmuddin* 133

Biological Inspired Modeling for Filtering Noise in Signal Sound  
*Hammuzamer Irwan Hamzah, Azween Abdullah* 141

Using Case-Based Reasoning and Genetic Algorithm in Framework Documentation Approach  
*Hajar Mat Jani, Lee Sai Peck* 147

### ◀ SHORT PAPER ▶

---

### Community Informatics

---

Digital Divide and Internet Misuse in Urban Homes: A Case Study Approach  
*S. Ahmad Zaidi Adruce, M.M. Mutang* 155

---

### Computational & Theoretical Science

---

Modeling Conceptual Change Using Bayesian Networks  
*Choo-Yee Ting, Yen-Kuan Chong* 159

Black Scholes Pricing Models: An Innovative Ecologist Approach  
*Koh Hock Lye, Teh Su Yean, Kew Lee Ming, Behari Bahari* 164

Parallel Iterative Block and Direct Block Methods for 2-Space Dimension Problems on Distributed Memory Architecture  
*Norma Alias, Tan Yin San, Roziha Darwis, Noriza Satam, Zarith Safiza A. Ghaffar, Norhafiza Hamzah, Md Rajibul Islam* 170

---

### Human Computer Interaction

---

Website Affective Evaluation: Analysis of Differences in Evaluations Result By Gender and Educational Background  
*Anitawati, M.L., Afdallyna, F.H, Nor Laila M.N., Nagamachi, M* 175

Usability Evaluation of Non-Immersive Virtual Reality: Identifying the Characteristics for Creating An Effective Usability Assessment Tool  
*Siew Yung Lau, Chwen Jen Chen* 183

WikiTTX: A Web Collaboration Technology Based Table-Top Exercise System  
*Fahriana Abdul Karim, Khairulmizam Samsudin, Wan Azizun Wan Adnan* 188

A Modified Group Usability Evaluation for Non-Immersive Virtual Reality (VR) System  
*Siew Yung Lau, Chwen Jen Chen* 192

Modeling User's Browsing Behaviour Through The Intertemporal Choice Model  
*Azreen Azman* 197

---

### Government & Industry

---

A Methodology for Developing Service-Oriented Information System Based on Service-Oriented Architecture  
*Fatemeh Alsadat Nikayin, Salimah Mokhtar, Amir Shareghi Najar* 201

Mobile E-Government Opportunities in Developing Countries: The Case of Laos  
*Saysoth Keoduangsieng, Robert Goodwin* 205



The Role of Knowledge Mapping in Development of Knowledge Portal	209
<i>Aida Suzana Sukiam, Azizah Abdul Rahman, Wardah Zainal Abidin</i>	

---

### Image Processing

---

Investigating the Influence of Combined Features to Classifiers' Performance: A Comparison Study on A Protein Fold Prediction Problem	213
<i>Abdollah Dehzangi, Somnuk Phon-Amnuaisuk, Keng-Hoong Ng</i>	
Visualization of Engineering Drawing Using Computer Augmented Reality Approach	218
<i>Ridha Omar, T.J.Iskandar Abd Aziz, Kien Kang Ng</i>	

---

### Networks Related

---

Multi-Level Security for Zigbee Wireless Sensor Networks	222
<i>Tadiwa Elisha Nyamasvisva, Halabi Hasbullah</i>	
Designing High Security Universal USB Dongle for Authentication	228
<i>Mohd Helmy Abd Wahab, Nor 'Aisah Sudin, Ayob Johari, Siti Zarina Mohd Muji, Mohamad Farhan Mohamad Mohsin, Ariffin Abdul Mutalib, Mazlan Paiman</i>	
Trust and Intention Based Model for MANETs	*
<i>Somnath Ghosh, Prakash Veeraraghavan, C. Bhardwaj</i>	
Protection Switching and Restoration Scheme At The Drop Region for FTTH-PON	236
<i>Siti Asma Che Aziz, Mohamad Syuhaimi Ab-Rahman, Kasmiran Jumari</i>	
Evaluation and Analysis of Multimedia Messaging Service (MMS) Framework in Message Delivery	241
<i>Andik Setyono, Md. Jahangir Alam, Raed Ali Al Saqour</i>	

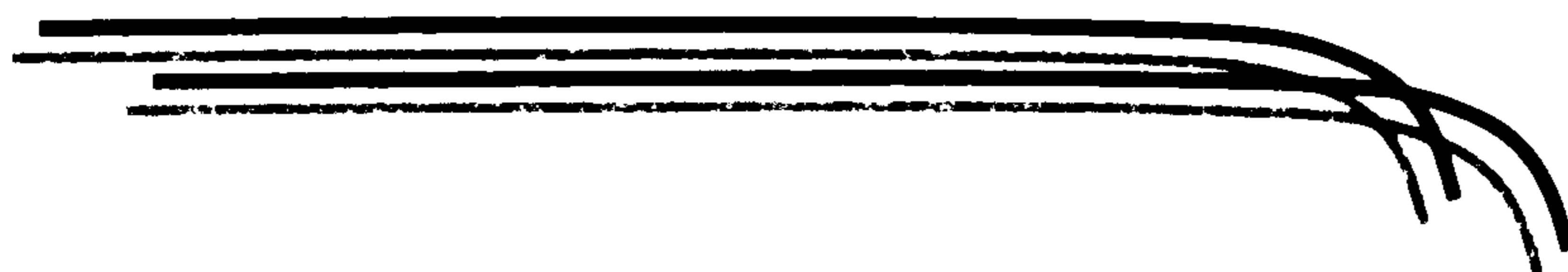
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### Software Engineering & Knowledge Management

---

Application of MATLAB Software for Simulation, Data Acquisition and Data Analysis of Surface Plasmon Resonance Phenomena	246
<i>Amir Reza Sadrolhosseini, Mohd Maarof Moxsin, W. Mahmood Mat Yunus, Ionel Valeriu Grozescu, Zainal Abidin Talib</i>	
A Hybrid Approach for Link Based Object Ranking and Classification	250
<i>Santhi Thilagam, Sellappan Palaniappan</i>	
Development of A Collaborative Knowledge Portal: A Goal-Oriented Approach	254
<i>Mohd Sharifuddin Ahmad, Mohd Zaliman Mohd Yusoff, Azhana Ahmad</i>	
Statistical Data Analysis Incorporating Web Text Mining to Establish Correlations Between Grape Wine Taster Comments and Wine Ratings	258
<i>Subana Shanmuganathan, Philip Sallis, Ajit Narayanan</i>	
Intelligent Decision Support System (IDSS) for Talent Management Using Data Mining Techniques	263
<i>Hamidah Jantan, Abdul Razak Hamdan, Zulaiha Ali Othman</i>	
Integrated Techniques for Information Retrieval	268
<i>Khalil Shihab, Nida Chalabi</i>	
Agent Platforms and Technology Behind	272
<i>Neeraj Garg</i>	
Nature-Inspired Self-Organizing Service Oriented Architecture: A Proposal	276
<i>Muhammad Agni Catur Bhakti, Azween Abdullah</i>	
Web Information Extraction for Assessing E-Commerce Website Trustworthiness	280
<i>Muhammad Rushdi Rusli, Ab. Razak Che Hussin, Halina Mohamed Dahlan</i>	
Service Oriented Architecture for Tourism Web Services	284
<i>Ali Selamat, Esa Firmansyah Muchlis</i>	

**FULL PAPER**



# Re-examining Electronic Commerce Adoption among Bruneian SMEs

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**Abstract** - *The paper investigates the extent of e-commerce adoption by 84 small and medium business organisation and to study the significance of three variables under the domain of perception of strategic value as perceived by the management as determinant of e-commerce adoption among Bruneian SMEs. The study validates the existing model and found that two out of three variables organisational and managerial are significant determinants of e-commerce adoption whereas, third variable strategic decision aid, produced in the original model remains insignificant. Based upon the results some recommendations were made for the relevant authorities.*

**Keywords:** Electronic Commerce, adoption, small and medium enterprises, canonical correlation, Brunei Darussalam.

## 1 Introduction

Electronic commerce is defined as “a general concept covering any form of business transaction or information executed using information and communication technologies” [48]. Electronic commerce is not only limited to buying and selling over the Internet, but it is also concerned with transferring or exchanging product/services and/or information via computer networks, including the Internet, Extranet and Intranet [48].

The Internet users around the world have increased exponentially. In 2004, it was over 800 million of which English users were about 35%, Asian users (mostly Japanese, Chinese and Korean) were about 32% (www.clickz.com/stat). However, the e-commerce and online sales grew substantially in the North America and Canada. This tremendous increase in the Internet population has made this as a most favorite and widely research venue across the globe, firstly in the developed world then moving substantially toward the various research dimensions in the developing countries for more than two decades. Due to the potential benefits offered by the electronic commerce especially among the small businesses have led to many success stories and thus letting the economies of the developing countries to believe that this new form of techno-business will further provide the breakthrough in the operations of the small and medium enterprises in optimizing the resources that would be deemed crucial for the sustainable development

of the soaring economies in these developing countries. Opportunities for ecommerce and global marketing have suggested that electronic commerce could be very important and useful to small and medium business and supported by various studies [8] [28] [16] [17] [18].

Despite the benefits of e-commerce the empirical evidences have shown that business organizations especially SMEs in the developing countries are not adopting it rapidly as anticipated, due to the several factors. One of the major impediments is the lack of a comprehensive model and of few studies focusing on the factors contributing towards the adoption of e-commerce in the developing countries.

This paper therefore reports the result of a study that not only address the gap in the technology adoption literature by looking at the adoption of e-commerce of one of the developing countries but also investigates the role of a new set of contributing factors as potential determinants of e-commerce adoption, that factors, to our knowledge were not previously studied within Asia-Pacific context. This study is conducted in Brunei Darussalam-a small oil-based economy with high IT savvy citizens and therefore provides a better understanding of e-commerce adoption by identifying a new set of factors; and significance of strategic value variable as perceived by the top managers of the Bruneian SMEs that further encourage willingness to adopt e-Commerce.

## 2 Overview of Brunei Businesses and Motivation of Study

The IS researchers in the western world studied factors that influence the usage of technology so as to predict, explain and control the Information Systems/technology users [44] [50]. However, we must also understand that businesses in developing countries face challenges that are entirely different from those of developed countries. Most of the prior studies have investigated the role of the external variables with the behavioral components to determine behavioral intention or actual use of the IS systems or use of a particular technology such as e-mail, voice mail or WWW [4] [15] [21] [37] [38].

The results of these prior studies on e-commerce might not be applicable within context of small business in a small but technologically emerging country like Brunei

Darussalam. The country is culturally different not only from those of the western world but also from several of Asia-Pacific countries. Brunei Darussalam is a small sultanate located on the northwest coast of Borneo island. Strategically located between the two technological hubs i.e., Singapore and Malaysia, it has a total population of nearly 0.4 million [5] with main economic activity dominated by the oil and gas sector. The country gross domestic product per capita was B\$ 23,865 (US\$1=1.56) in 2006. Realizing the limitation as to the size of the domestic market, Brunei business environment is determined to utilize the Internet as a major development tool. The government has conceived an IT vision and has taken a range of measures to improve the IT infrastructure and the Internet business environment in the country. Brunei is a technologically oriented country with impressive IT infrastructure. In a recent survey by the World Trade Organization ([www.wto.org](http://www.wto.org)) the country is reported to have improved in access, investment and competition in telecommunication sector. Brunei's telecommunication penetration and infrastructure is ranked high in Asia. The total number of the Internet users is estimated around 41% of the country population. However, broadband population penetration is roughly around 5%. ([www.brudirect.bn](http://www.brudirect.bn)).

This consideration has therefore provided a basic motivation for this research with the key assumption that H. M. Government is putting handsome resources under the umbrella of its e-Government to promote e-businesses program. It is argued that the success of e-Business program cannot be determined or gauged without studying the organizational and managerial factors that contribute towards the adoption of e-commerce especially in the private sector. The results of this study could further be generalized to the other developing nations of Asia-Pacific with similar cultural and geographical environments.

### 3 Literature Review

The present study focuses on the two independent research streams taken independently in the IS literature: the strategic value of the certain information technologies to top managers and factors that influence the adoption of IT.

#### 3.1 Perceived Strategic Value of Information Technologies

The role of perceived strategic value of the information technologies has been given due consideration in the previous IS/IT studies over the past decade mainly in the large organizations. Hitt and Brynjolfsoon, [20] studied the relationship between IT investment and the benefits in the form of profitability, productivity and consumer surplus that bring in the organization and found that IT increase two out of these three benefits but does not necessarily increase business profits. Baura *et al.* [3] concluded that the investments have been neutral or negative. In another study Tallon *et al.* [43] argued that

executives rely on their perceptions in determining whether or not a particular IT investment creates value to the firm. Personal experience and peer evaluations were found to be important determinants of IT value.

Few studies have focused on bringing the relative importance of top management perception regarding the strategic value of e-commerce. Amit and Zott [2] have studied the perceptions of the top managers in their analysis on the e-business; however, their results could further be generalized to e-commerce. They developed a model that included four factors including transaction efficiency and resulted in that the greater the transaction efficiency gains would lower the cost and hence more valuable it would be. This was further supported by the study of Saloner and Spence's [33] that resulted reduction of transaction cost would bring buyers and sellers together and would further create value to the e-business.

Subramanian and Nosek [41] created an instrument to validate the strategic value that information system may provide. Through testing the model for 73 firms they brought three factors in creating a strategic value of IS: operational support, managerial productivity and strategic decision aid. All the three constructs had high reliability alpha coefficient and high convergent validity. The factors tested by the Subramanian and Nosek's work was applied by Grandson and Pearson in their studies on e-commerce adoption factors and found high reliability coefficient and convergent validity [17] [18]. Due to lack of research in IT studying factors that create strategic values, the initial work of Subramanian and Nosek [41] and later on Grandson and Pearson work was utilized as a base for the current study.

#### 3.2 Information Technology Adoption

The literature on electronic commerce adoption is full of studies that highlight the various adoption criteria. However, Davis [13] work on the IT adoption has set the basis for the subsequent studies in the domain of information technology adoption. He proposed the Technology Acceptance Model (TAM) that has been tested in numerous studies across technology across culture and across the globe [22] [40] [42]. Lederer *et al.* [25] summarized sixteen articles published from 1991 to 1999 in leading MIS journals that have tested the TAM for different technologies (ATM, E-mail, Voice-mail, Access, Word, Excel, Internet and WWW). TAM has been shown to explain significant amount of variance in intentions to use technology. Legris *et al.* [26] conducted meta-analysis of TAM in six majors IS journal published from 1980 to 2001 and concluded that TAM is useful model but has to be integrated into broader one which would include variables related to both human and social change processes and to the adoption of the innovation models. King and He [24] conducted meta-analysis of 88 published studies and provided sufficient data to support that TAM is valid, robust model with wider applicability and usage. It is interesting to notice that studies on TAM have produced mix results starting from perceived

usefulness to behavioral intentions, from perceived usefulness to actual use and to ease of use to actual use of various IT features studied.

Based on the prior work of Davis [13], Grandon and Pearson [17] [18] defined the role of the external pressure as an important variable to an organizational adoption of e-commerce as direct or indirect pressure exerted by competitors, social referents, other firms, the government, and the industry to adopt an innovation in an organization. By this description, competition, industry factor [1], competitive pressure [27] and competitive intensity [9] defined by various researchers grouped under environmental factor contribute to the e-commerce adoption. Grandon and Pearson [18] empirical study on the e-commerce adoption in Chile SMEs, external pressure is found as a significant factor influencing the e-commerce adoption.

Similarly, literature on adoption of IT in small businesses and adoption of Internet or e-commerce adoption provided a number of facilitating and inhibiting factors of technological adoption [27] such as organizational, managerial and environmental factors [30]. Out of these organizational factors was considered as significant as it tend to focus on the factors that reside within the internal context of an organization such as specialization, formalization, e-readiness, and innovativeness as major determinants of adoption [12]. Mehtens *et al.* [28] studied the Internet adoption among seven SMEs and found that perceived benefits, organizational readiness and external pressure as determinant factors. Cheung *et al.* [8] work further support the similar factors that influence the Internet/WWW adoption.

In Brunei Darussalam several studies were conducted on the use of the Internet [34] [35] that tested TAM by studying the role of perceived usefulness and perceived ease of use in the use of the Internet. The results of first study indicated that perceived ease of use contributed in determining the attitude that predicts the Internet use whereas, in the second study, the use of the Internet was determined by the perceived usefulness component of the belief. On the other hand, the studies on e-commerce adoption among SMEs and have noticed various inter-organizational factors that significantly contributed the adoption of e-commerce.

These research initiatives has opened a venue for the forth coming researches to overcome the acute shortage and dearth of the studies in this developing nations of South East Asia and secondly, the continuous support of His Majesty's Government and undergoing ASEAN pressure on the use of the e-commerce adoption in Brunei businesses. With this focus and development in the telecom service market there is a critical need to undertake more and more studies in this part of the world.

Therefore, the present study was undertaken in the late 2007 to answer the following questions (i) to determine

the suitability of adopting the modified model proposed by Subramanian and Nosek, [41] and then tested and adopted by Grandon and Pearson, [17] [18] in their subsequent studies because of high reliability.(ii) to determine the role of the strategic value variable towards adoption of e-commerce among Bruneian SMEs (iii) to assess the perception of strategic as viewed by top managers of SMEs influencing their decision to adopt e-commerce (iv) to determine the factors that are significant to adopt e-commerce by the top managers of Bruneian SMEs.

## 4 Research Model

Based on the literature review, a normative model was proposed in Figure 1 and the detailed justification of inclusion of the various constructs in the following section.

## 5 Methodology

### 5.1 The Subjects and Data Collection

A questionnaire was sent to the top or general managers of one hundred and fifty small medium enterprises selected randomly from the catalogue of participating SMEs in a computer trade show called BITEK 2007 held in the capital, Bander Seri Begawan in March 2007. As the unit of analysis in this study is top managers or owners so the one hundred and fifty questionnaire were sent to them with the advice to be filled-in by the top managers exclusively. We received one hundred questionnaires; however, five were dropped because it was not filled-in correctly and eleven were not filled-in by the top managers or the owners. Therefore eighty four questionnaires were retained for the purpose of the research with the response rate of 56%. The response rate is satisfactory for the logical deduction of the analysis. Table 3 represents the demographic profile of the respondents whereas, Table 1 and 2 reflects the descriptive statistics.

### 5.2 Instrument Development

The instrument consisting of demographic questions, two questions about the business (industry type and total number of employees), four questions about the technology in the firms (no of PCs, presence of Internet service provider, presence of Web site and utilization of e-commerce) and two specific constructs: perception of strategic value measuring three subscales (organizational support, managerial productivity and strategic decision aids with fifteen items) and adoption measuring four subscales (organizational readiness, external pressure, perceived ease of use and perceived usefulness, total of twenty-three items) was adapted after Grandon and Pearson, [18]. All the items on perceived strategic value and adoption constructs were measured on five-point Likert type scale from 1 to 5, with 1 being strongly disagree to 5 being strongly agree. Table 1 and Table 2 summarize the basic descriptive statistics of these constructs.

## 6 Results

### 6.1 Demographics and Descriptive Statistics

The eighty-four questionnaires that were retained for the analysis showed that top managers in our survey are

well educated either with the college degree or Higher National Diploma in the Business and Finance. The majority were male (53%) with 65% of them were in the age group of 30 to 50 years. Table 3 shows demographics and other data.

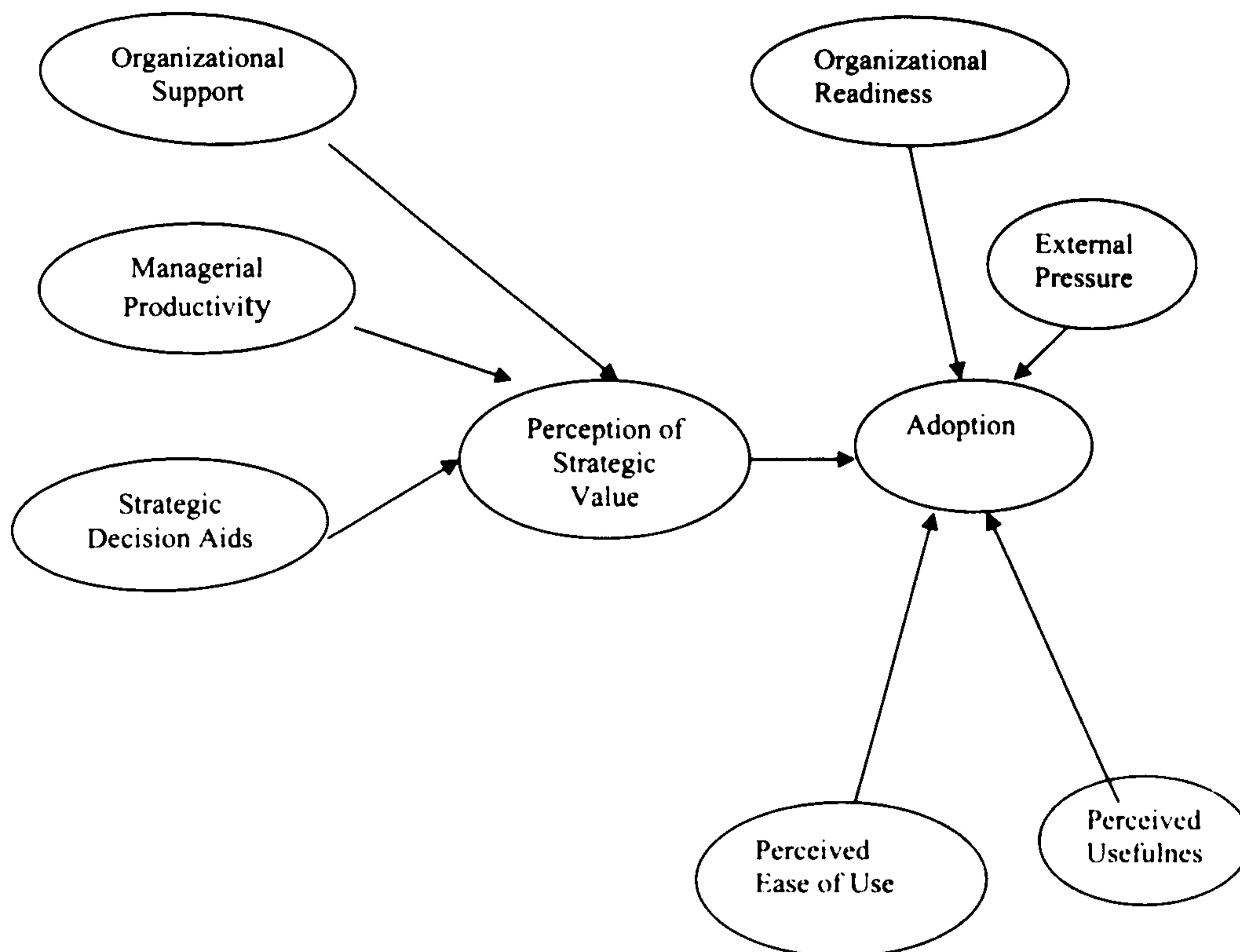


Figure 1: The Normative Research Model (adapted after Grandon & Pearson, 2004)

	Total no of original items	Items Retained	Mean	Std. Dev	Cronbach's $\alpha$	Variance
Operational Support	7	5	3.72	.842	.73	.52
Managerial Productivity	4	4	3.93	.801	.70	.54
Strategic Decision Aids	4	4	3.59	.832	.70	.50

Table 1: Descriptive Statistics of Variables for Perceived Strategic Value Constructs

	<i>Total no of items</i>	<i>Items Retained</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Cronbach's <math>\alpha</math></i>	<i>Variance</i>
Organizational Readiness	2	2	3.69	.822	.72	.50
External Pressure	5	3	3.27	.951	.60	.52
Perceived Ease of Use	5	4	3.73	.732	.78	.61
Perceived Usefulness	6	5	3.78	.711	.79	.55

Table 2: Descriptive Statistics of Variables for EC Adoption Constructs

<i>Variables</i>	<i>Descriptions</i>	<i>Percentage</i>	
<i>Gender</i>	Female	46%	
	Male	54%	
<i>Age</i>	Below 30	27%	
	30-39	30%	
	39-50	35%	
	Above 50	8%	
<i>Educational qualifications</i>	First degree	45%	
	Business Diploma	28%	
	High School	13%	
	Others	13%	
	No answer	1%	
<i>Business size (No of employees)</i>	11-20	36%	
	21-50	24%	
	50-100	22%	
	Above 100	18%	
<i>Years of experience as managers</i>	Less than six months	16%	
	6 months-1 year	18%	
	1-5 years	38%	
	Above 5 years	28%	
<i>Years of experience in the present business</i>	Less than one year	18%	
	1-5 years	11%	
	5-10 years	50%	
	Above 10 years	22%	
<i>Type of business</i>	Hotel/Food Catering	16%	
	Manufacturing	11%	
	Banking/Insurance	11%	
	Wholesale/Retail	11%	
	IT related	16%	
	Construction	5%	
	Printing/Publishing	7%	
	Travel/Shipping	3%	
	Others	20%	
	<i>Total number of PCs the business have</i>	Less than 5	23%
		5-10	34%
More than 10		43%	
<i>Internet Service Provider</i>	Yes	80%	
	No	20%	
<i>Business have Web site</i>	Yes	77%	
	No	23%	
<i>Business use E-Commerce</i>	Yes	74%	
	No	26%	

Table 3: Showing Demographic and General Data

Item No	Items	Component 1	2
OS 1	Improves distribution Channels	.58	
OS 5	Provides effective support role to operations	.70	
OS 6	Support linkages with suppliers	.81	
OS 7	Increase ability to compete	.52	
MP 1	Provides managers better access to information		.55
MP 2	Provides managers access to faster decision making		.60
MP 3	Improves communications in the organizations		.74
MP 4	Improves productivity of the managers		.82

Table 4: Rotated Component Matrixes for Perceived Strategic Value

## 6.2 Statistical Analysis

The statistical analysis package SPSS was used for the descriptive data analysis and to conduct the reliability and factor analysis, whereas, STATISTICA was used to conduct the canonical correlation analysis. The analysis of the data was conducted into two stages. At the first stage data was passed through the exploratory factor analysis to analyze and measure whether the total number of factors and loadings of items involved in the two main constructs: perceived strategic value and adoption conform to the proposed model. This has answered our research questions 2 that the what factors determine the perceived strategic value of e-commerce in SME/and of the third question that total number of factors that involved in the decision to adopt e-commerce by top managers of SMEs.

In order to find the answer of our second question to explore the relationship of perceptions of strategic value influencing the decision to adopt e-commerce, canonical analysis was conducted. This technique involves developing a linear combination of independent variables (strategic value variables) and dependent variables (adoption variables) to maximize the correlation between the two sets [19].

## 6.3 Exploratory Factor Analysis

### 6.3.1 Perceived Strategic Value Construct

An exploratory factor analysis (EPA) was run using SPSS 13. All items measuring the perception of the perceived strategic value of e-commerce were considered during the first run i.e. conducting the reliability analysis. Two items measuring: reduce cost and improve customer service were dropped as having being the lowest corrected item-total correlation of .08 and .35, and do not meet the criteria as specified by Hair *et al.* [19]. Secondly during the EPA, three items: reaping operational benefits, support strategic decision and help manager to make decision were dropped from subsequent analysis as they load more than .40 on two factors as specified by Hair *et al.* [19] The construct was recalculated and total of ten out of fifteen items were retained in the final analysis as given in Table 4.

The factor analysis used principal components in order to extract the maximum variance from the items. To minimize the number of items that have high loadings on

any given factor, a varimax rotation was utilized. Using the Kaiser Eigenvalues criterion, we extracted three factors solution that collectively explained 55.12% of the variance in all item. Hair *et al.* provide guidelines for identifying significant factor loadings. In order to obtain a power level of 80% at a 0.05 significant level, a factor loading of 0.50 or higher should be considered as a cut-off value. Table 4 reflects that all factor loadings are higher than .50 values thus fulfill the criteria. Four items loaded cleanly on the organizational support factor, four items on the managerial productivity factor, and two on the decision aids factor. Convergent and discriminant validity was assessed via factor analysis and Table 4 shows that all items having loading greater than .50 and loaded stronger on their on their associated factors than on others. Thus, both the convergent and discriminant validities were demonstrated. The reliability was assessed using Cronbach's alpha. Table 1 shows that the values for alpha vary from .70 to .73 that meet the acceptable level of 0.7 levels for field research [31].

### 6.3.2 Adoption construct

The adoption construct initially consisted of 23 items. Prior to the factor analysis reliability analysis was run and six items were dropped due to the lowest corrected-item total correlation was less than .40 cut-off values. The remaining seventeen items were used for the factor analysis in the first round. Principal components extraction with varimax rotation and required Eigenvalues above 1.0 were considered. As in the case of perceived strategic value construct, the first run of the factor analysis resulted in fifteen items. Two items were dropped from the analysis and the construct was recalculated. The final run has resulted fifteen items on four factors loading cleanly with a total explained variance of 61%. Table 5 shows rotated component matrix with all the items loading ranging from .50 to .84.

Convergent and discriminant validity was achieved as Table 7 shows that all items load high on their respective factors and loading fairly exceeds the cut-off value of .50 except one item EU1 that are just sufficient. The reliability of these constructs as assessed by the alpha value is considerably high ranging from .60 to .79 as shown in Table 2. Thus reliability, convergent and discriminant validity were demonstrated.